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# Agroforestry Notes

USDA Forest Service, Rocky Mountain Station • USDA Natural Resources Conservation Service

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## Outdoor Living Barn: A Specialized Windbreak

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In April of 1987, a spring blizzard swept through northern Kansas and southern Nebraska killing nearly 60,000 newborn calves and other winter stressed animals. This tremendous loss could have been lessened had protection, such as outdoor living barns (OLB), been provided to reduce the windchill. An outdoor living barn is a specialized windbreak, typically composed of trees and shrubs, and strategically located in open grasslands, center pivot irrigation corners, and pasture areas to protect livestock during severe weather situations.

The purpose of an OLB is to: 1) defuse and deflect cold winds away from livestock, moderating the windchill; and 2) trap and hold blowing snow, preventing it from covering feed, water, and livestock. Outdoor living barns pay for themselves by cutting livestock losses, lowering feed costs, and sustaining animal health during stressful weather conditions.

### Design

The following OLB designs are given as guidelines and should be adjusted to meet local conditions, constraints, and landowner objectives.

**Shape:** typically in the form of a “U” or upside down “L” as shown in Figure 1.



Figure 1 — Various design configurations of outdoor living barns.

**Orientation:** perpendicular to prevailing winter and early spring wind direction.

**Number of rows:** ranges from three to five, and if there is adequate space, more rows may be added. To control high snow levels, design OLB's with a “trip row” to trap snow before it reaches the windbreak. The trip row should be planted to attain a 60-80 percent density and be located at least 100 feet upwind from the outside row of the windbreak. Figure 2 shows an example OLB design with a trip row.



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**Table 1: Minimum area requirements for livestock in confined areas.**

	Cattle		Sheep	Swine
	Beef	Cow/Calf		
Area Requirement (ft <sup>2</sup> /animal)	25-35	40	8-10	15-20

**Length:** depends on the number of animals requiring protection and the minimum area requirement of confined livestock (table 1).

### Example

Design an OLB for 50 brood cows held in an open pasture. Assumptions: 1) landowner wants a three-row design with a “trip row” (figure 2), and 2) mature tree height (H) of conifer species is 30 feet. First, determine interior top and side row lengths.

Measurements of the inside rows are calculated as follows (figure 2):

1. Protection Pocket Size (PPS) — the minimum size of area for confined livestock:

Formula: # livestock x required area (ft<sup>2</sup>)/head {table 1} = PPS

Example: 50 brood cows x 40 ft<sup>2</sup> = 2000 ft<sup>2</sup>

2. Length of interior top row (LTR)

Formula:  $(\sqrt{\text{PPS} \times 4}) + 40 \text{ ft} = \text{LTR}$

Where: the square root of the PPS multiplied by 4 represents the length outside of the exclusion fence on the interior of the OLB, to allow the herd to roam. The addition of 40 feet is the sum of the added distance required for location of the fence (20 feet for both ends).

Example:  $(\sqrt{2000 \times 4}) + 40 \text{ ft} = (45 \times 4) + 40 = 220 \text{ ft (LTR)}$

3. Length of interior side rows (LSR):

Formula:  $\sqrt{\text{PPS}} + 5(H) + 100 \text{ ft} = \text{LSR}$

Where: 5(H)\*\* equals five times the mature height of the tallest tree in the OLB, the addition of 100 feet is recommended to reduce wind eddy effects and keep “end drifts” out of the OLB.

Example:  $\sqrt{2000} + 5(30) + 100 \text{ ft} = 45 + 150 + 100 = 295 \text{ ft (LSR)}$

\*\* In areas of high snow accumulation (Minnesota, Wisconsin, North Dakota, South Dakota, Wyoming, Montana) this figure may be increased to as much as 10(H) to accommodate large drifts and not create “death traps.”

The calculated LTR and LSR are 220 feet x 295 feet, respectively (figure 2). Now, the remaining outside rows can be established using appropriate “between row” distances. The formulas for LTR and LSR presented above are to be used as guidelines, and should be adjusted on an individual project basis to provide proper dimensions. When designing an OLB, it is important that the dimensions of the planting: 1) meet landowner objectives; 2) are adjusted to accommodate animal species and site conditions; 3) allow adequate space for feeding and a water source; and 4) provide maximum protection from severe local weather events.

### Species

Trees are typically planted for an OLB, but as with other windbreak designs, a mixture of tree and shrub species is recommended. The height and density of a windbreak determines its effectiveness (percent of wind speed reduction). Deciduous and some coniferous tree species will provide the effective height attribute, while coniferous tree species

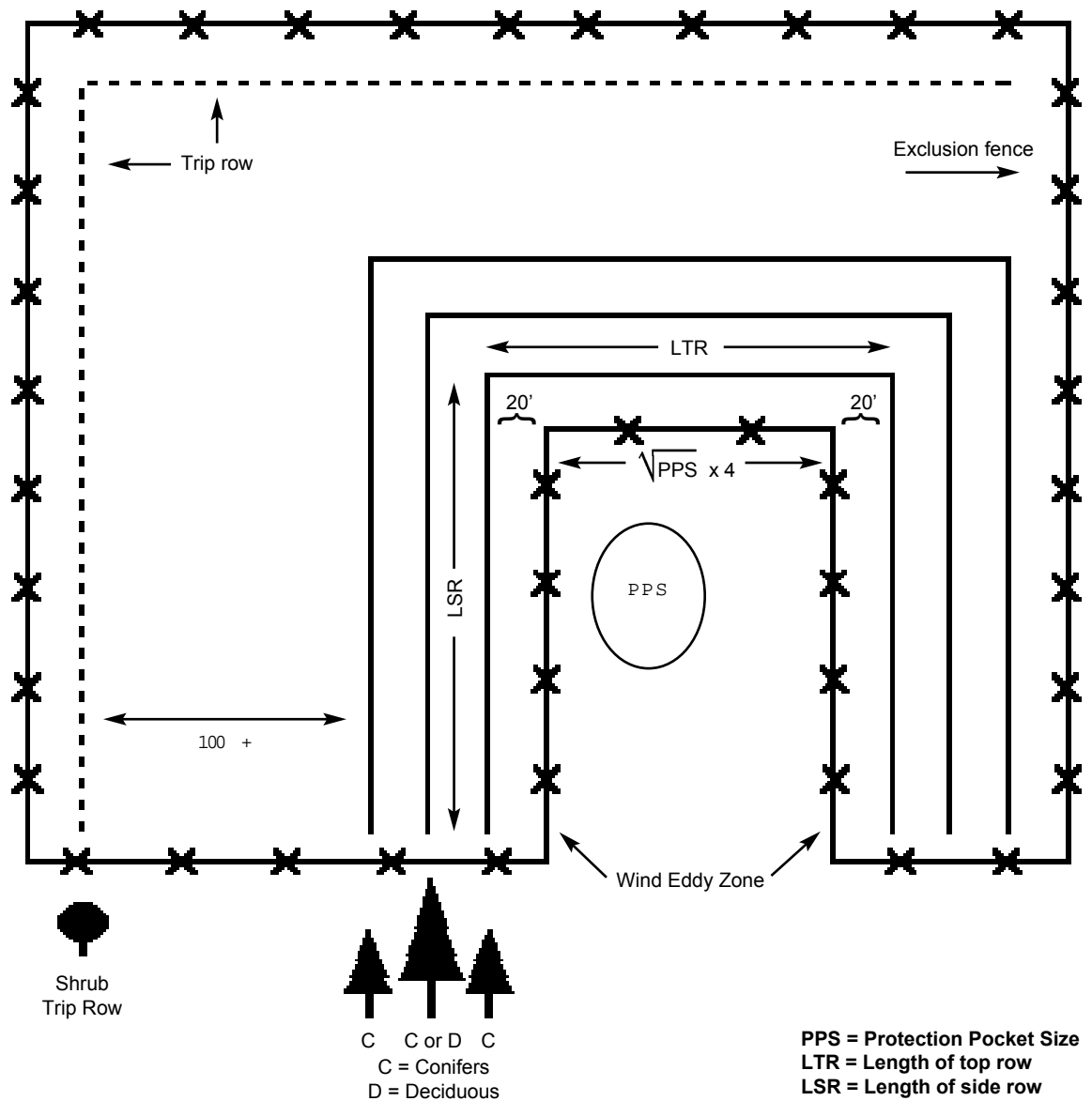


Figure 2 — Possible Outdoor Living Barn design configuration with a trip row.

are best for regulating lower level density. An OLB with a “trip row” should have a density of 40 to 60 percent; otherwise the OLB density should be 60 to 80 percent.

### Location

Livestock drift with the direction of the storm. For example, if a late winter storm comes out of the northwest, the herd will “drift” to the southeast corner of the pasture. Therefore, locate the OLB in the area of the pasture where the herd would most likely congregate during a typical storm event. Locate the OLB close to a permanent water source like a stock tank. Also, the OLB should be readily accessible by vehicle to facilitate livestock feeding and veterinary activities during extreme weather. It’s important that surface water drainage be away from the protection pocket to keep livestock dry and out of mud as much as possible.

### Maintenance

It is critical that livestock be excluded from an OLB planting. Construct a stout fence or electrified wire fence at least 20 feet away from the tree rows. This will

protect the trees from damage by animal rubbing or grazing. Place a top rail on a wire fence to keep snowdrifts from breaking or sagging the wire. Eliminate competition from weeds and other plants. Continue weed control until the canopy closes and effectively shades out competition.

The objective of an OLB is to create a continuous vegetative barrier. Gaps in the planting will funnel wind and snow through the barrier and into the protected pocket. Replant gaps created by loss of plants as soon as possible.

## Summary

There are many acres of open grasslands and pasture that could offer excellent winter grazing for livestock, if adequate protection from adverse weather is provided. Investing in a long-term living structure that increases survival of newborns, reduces winter and summer stress, decreases feeding costs, and at the same time provides wildlife habitat is a wise investment. An outdoor living barn may be the answer.

## Additional Information

“Cutting Energy Costs with Trees, Livestock Protection, Windbreaks, and Outdoor Barns.” Wyoming Association of Conservation Districts, 2505 East Fox Farm Road, Cheyenne, WY 82007. Phone: 307-632-5716.

Windbreak Technology Short Course, Student Handbook. NRCS.

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