NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE SPECIFICATION

CROSS WIND TRAP STRIPS (ACRE)

CODE 589C

Definition: Herbaceous cover resistant to wind erosion, established in one or more strips across the prevailing wind erosion direction.

Purpose: This practice may be applied as part of a conservation management system to reduce soil erosion from wind, induce wind-borne sediment, induce snow deposition, protect growing crops from damage by wind-borne soil particles and improve air quality by reducing the generation of airborne particulate matter.

Resource Management System: Cross wind trap strips are established as part of a resource management system to address the soil, water, air, plant, animal, and human needs as related to the owner's goals and objectives. It is important to consider crop rotation, nutrient and pest management, and other supportive conservation practices when designing a wind erosion reduction system.

Background: This practice can be used on cropland or other land susceptible to wind erosion. Typically, this practice will not resolve wind erosion problems by itself, but must be used in conjunction with other practices such as Residue and Tillage Management; No Till (Code 329), Reduced Till (Code 345), Herbaceous Wind Barriers (Code 603), Stripcropping (Code 585), etc.

When designing a wind erosion reduction system, the predicted soil losses must be less than or meet the soil loss tolerance (T) established for the planned soil map unit.

Design: Vegetation utilized in this practice must be strong enough to withstand the force of wind without breaking during critical wind erosion periods. Strips may be composed of annual or perennial vegetation, growing or dead. Selected vegetation must be adapted to the local site, must be non-invasive, be able to withstand snow drifting, be tolerant of sediment deposition, and provide minimal competition with adjacent crops.

The porosity of the barriers needs to be such that air velocity is reduced to undamaging speeds, but not necessarily completely stopped. **Strips must have at least 50% or greater vegetated cover with 50 to 70 stems per square foot.** Different crops have different abilities to withstand damage by winds and blowing soil. The following table identifies crop tolerance to blowing soil.

Table 1. Crop Tolerance to Blowing Soil

TOLERANT T	MODERATE TOLERANCE 2 tons/acre	LOW TOLERANCE 1 ton/acre	VERY LOW TOLERANCE 0 to 0.5 ton/acre
Barley	Alfalfa (mature)	Broccoli	Alfalfa seedlings
Buckwheat	Canola	Cabbage	Asparagus
Flax	Corn	Asparagus	Cantaloupe
Grain Sorghum	Onions (>30 days)	Cucumbers	Carrots
Millet	Orchard crops	Garlic	Celery
Oats	Safflower	Green/Field beans	Flowers
Rye	Soybeans	Lentils	Sugar beets
Triticale	Sunflowers	Peas	Most other vegetables
Wheat	Sweet Corn	Potatoes	

Number of Strips − Crosswind trap strips shall consist of one or more strips oriented as perpendicular as practical to the prevailing wind erosion direction.

Width of Strips − Trap strips shall be designed wide enough to trap saltating soil particles and store wind-borne sediments originating upwind. For all purposes, trap strips will be at least 15 feet wide and vegetation or stubble in the strip one foot or more in height during expected critical wind erosion period(s). When the effective height of vegetation will be less than one foot in height, the trap strip must be at least 25 feet wide.

Barrier Direction and Spacing − The effective spacing and direction of the strips should be designed so that wind erosion is reduced to tolerable limits of the crop/forage being protected (see Table 1 above). For best results barriers should be oriented perpendicular to the prevailing winds during seedling periods. When this orientation is not possible, spacing between barriers should be reduced.

Other considerations − Trap strips may be more suitable than field windbreaks under irrigation pivots due to height concerns. Strip widths may need to be adjusted, within the criteria listed above, to accommodate widths of farm machinery to minimize partial or incomplete passes. In most cases, species should be selected that is resistant to herbicides used on adjacent crops.

Criteria to Reduce Soil Erosion from Wind

When the primary purpose of the trap strips is to reduce soil erosion by wind, locate the trap strips:

- at the windward edge of the fields; or
- immediately upwind from areas to be protected from erosion or deposition, or
- in recurring patterns interspersed between erosion-susceptible strips.

Strip orientation shall not result in an angle of deviation that exceeds 45 degrees during the periods when wind erosion is expected to occur. The width of strips shall be determined using the Wind Erosion Prediction System (WEPS) method of predicting wind erosion.

Criteria to Induce Deposition and Reduce Transport of Wind-borne Sediment and Sediment-borne Contaminants Downwind

Trap strips shall be established immediately upwind from areas to be protected from sediment deposition. Determine trap strip design width and spacing by:

1. Determining the contributing area “L”.
2. Estimating the wind erosion rate in tons/acre/year from the contributing area.
3. Selecting a trap strip width based on length and deposition depth less than or equal to 2.4 inches per year.

The following step-by-step procedure describes how to design a cross wind trap strip:

Step	Procedure
1	Determine the contributing area [**Example 20 acres**]
2	Calculate the wind erosion rate of the contributing area using WEPS [**Example 5 T/A/Y**]
3	Sum the total erosion from contributing area. [**Example: 20 ac X 5 T/A/Y = 100 tons/year**]
4	Estimate percent saltation and surface creep trapped in the strip. Factors range from 50-80%.
5	Calculate total sediment that can be potentially trapped in strip. Soil trapped in strip equals (total tons/acre from contributing area) X (saltation factor) [**Example: 100 T/Y X 80% = 80 tons/year**]
6	Find bulk density value for the design soil (Chemical and Physical Properties table from Web Soil Survey. From Table 2, determine the depth per ton of soil. [**Example: soil bulk density of 1.3. Depth is 0.007 inches per ton of soil**]
7	Select trap strip width: 15, 20, 25, 30 … If 15 is feet selected, calculate trap strip acres = [(strip width feet x strip length feet) ÷ 43,560 square feet per acre] [**Example: 20 acre field = [(1,320 feet x 660 feet) ÷ 43,560]. Calculation for 15 feet wide strip is: 15 feet x 1,320 ÷ 43,560 sq. feet/acre = 0.45 acre**
8	Calculate deposition depth (soil trapped X bulk density value ÷ strip acres) [**Example: 80 tons x 0.007 inch/ton ÷ 0.45 ac = 1.24 inches/year**]

Table 2. Relative Soil Bulk Density Relationships to Depth of Soil

Soil Bulk Density (g/cc)	Weight (lbs/ft^3)	Depth/Ton (inches)
0.5	31.2	0.018
0.6	37.4	0.015
0.7	43.7	0.013
0.8	49.9	0.011
0.9	56.2	0.010
1.0	62.4	0.009
1.1	68.6	0.008
1.2	74.9	0.007
1.3	81.1	0.007
1.4	87.4	0.006
1.5	93.6	0.006
1.6	99.8	0.005
1.7	106.1	0.005
1.8	112.3	0.005
1.9	118.6	0.005
2.0	124.8	0.004

Criteria to Protect Growing Crops from Damage by Wind-borne Soil Particles

For best results, trap strips must be established immediately upwind from areas used for sensitive crops. No erosion-exposed areas will be located between the trap strips and the crops to be protected. Design strip widths shall be designed using WEPS during specific crop stage periods. The effective width shall not exceed the width permitted by the crop tolerance to wind erosion (see Table 1).

Criteria to Provide Food and Cover for Wildlife

When planning trap strips consider vegetation that provides food and/or cover for the targeted wildlife species. Refer to Conservation Practice Standard Upland Wildlife Habitat Management (Code 645) for recommended species and seeding mixtures. The minimum width for wildlife purposes is 30 feet and a height of 1.5 to 3.0 feet to provide adequate cover for wildlife species.

Seedbed Preparation

Provide a firm, weed-free seedbed that:

- Ensures seed will contact soil moisture uniformly (seed to soil contact).
- Facilitates seedling emergence.
- Provides a medium that does not restrict or allow roots to become dry.
- Eliminates seedling competition from weedy species.
- Provides a seedbed that is sufficiently firm.

Operation and Maintenance:

Maintenance must be carried out to insure that this practice functions as intended. These actions include normal activities in the application and use of the practice and repair and maintenance of the practice.

1. After establishment, strips will be fertilized as needed to maintain plant vigor. Fertilizer application rates shall be according to the Montana Fertilizer Guidelines, EB 161. Noxious and nuisance weeds shall be controlled.

2. Mowing or grazing shall be managed to allow regrowth to the planned height before periods when wind erosion or crop damage is expected to occur. When mowing is necessary, it shall be done outside of the primary nesting season for ground nesting birds.

3. Wind-borne sediment accumulated in strips shall be removed and distributed over the surface of the field when the depth of entrapped sediment reaches 6 inches. If necessary the trap strip should be re-established.

4. Trap strips shall be re-established or relocated as needed to maintain plant density, width and height.

5. Periodically evaluate the trap strip effectiveness to meet the planned purpose(s) and adapt management as needed.

6. Strips composed of perennial vegetation that are designed to enhance wildlife habitats should not be mowed unless their height or width exceeds that required to achieve the barrier purpose, or they become competitive with adjoining crops/forage.

7. Annual strips shall be re-established each year by planting at recommended dates, leaving rows standing and maintaining throughout the critical period for which the strip was designed.

8. Gaps in perennial strips shall be re-established as soon as practical to maintain effectiveness.