NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

HERBACEOUS WIND BARRIERS

(Ft.)

CODE 603

DEFINITION

Herbaceous vegetation established in rows or narrow strips in the field across the prevailing wind direction.

PURPOSE

- Reduce soil erosion from wind.
- Reduce soil particulate emissions to the air.
- Protect growing crops from damage by wind or wind-borne soil particles
- Enhance snow deposition to increase plant-available moisture.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to lands where crops or forages are grown.

CRITERIA

General Criteria Applicable to All Purposes

Herbaceous barriers will be designed to reduce wind velocities to meet purposes and resource objectives.

Vegetation. Herbaceous wind barriers shall be composed of perennial grass, that have the following characteristics:

- Adaptation to local soil and climate conditions.
- Stiff, erect non-spreading growth habit.
- Resistance to lodging.
- Good leaf retention.
- Tolerance to soil deposition
- Minimum competition with adjacent crops.

Examples of grass species that meet these requirements include: Switchgrass, Tall wheatgrass, and Intermediate wheatgrass. Criteria for the establishment and selection of perennial herbaceous vegetation are in conservation practice standards Forage and Biomass Planting (512) and/or Filter Strip (393), in Section IV, Field Office Technical Guide (FOTG), and Section II, FOTG, Pastureland and Hayland Interpretations, Certified Perennial Grass Varieties Recommended for Nebraska" Extension Publication EC90-120. Refer to Field Office Technical Guide (FOTG) Section IV – Range Planting (550) or Pasture and Hay Planting for species adaptation and Herbaceous Vegetation Design Procedures (550DP) for guidance on establishment of vegetation.

Barrier Width. Barriers shall consist of perennial grass a minimum of 30" wide, providing the required porosity can be achieved, and the barrier contains no gaps.

Barrier Direction, Spacing and Composition. The barrier direction, spacing, and composition needed to achieve the desired purpose shall be designed using the currently approved wind erosion technology.

Additional Criteria to Reduce Soil Erosion and/or Particulate Generation from Wind

Barrier Height. Barriers designed for this purpose shall have a minimum expected height of 1.5 feet during the wind erosion period for which the barriers are designed.

Barrier Porosity. Barriers established for this purpose shall be designed to achieve a porosity of 40-50 percent. Minimum porosity can be achieved if general criteria for: Vegetation, Barrier Width and Barrier Height are achieved.

Barrier Direction and Spacing. The spacing between barriers shall be measured along the prevailing wind erosion direction during the critical wind erosion period (s) being planned for the field. Spacing shall not exceed 10 times the

expected height of the barrier plus additional width permitted by the soil loss tolerance (T), or other planned soil loss objective. Calculations shall account for the effects of other practices in the conservation system. (See Table 502-3, Wind erosion direction factors, of the National Agronomy Manual, 3rd Ed., October 2002, for adjustment factors).

Harvest. Harvest of hay or seed from perennial barriers, grazing, or mowing for weed control, shall be managed to allow regrowth to the planned height before periods when wind erosion, crop damage, or drifting snow are expected to occur

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

During those periods when wind sensitive crops are susceptible to damage by wind and wind-borne soil particles, wind erosion shall not exceed the crop tolerance as specified in the National Agronomy Manual (Part 502), other accepted references or other planned crop protection objectives. Assessments shall account for the effects of other practices in the resource management system.

Barrier Height. Barriers designed for this purpose shall have a minimum expected height of 0.5 feet during those periods when growing crops are susceptible to damage by wind or wind-borne soil particles. The designed height of the barrier will depend on the distance between the barrier and the crop being protected.

Barrier Porosity. Barriers established for this purpose shall be designed to achieve a porosity of 40-50 percent during the period when growing crops are to be protected. Minimum porosity can be achieved if general criteria for: Vegetation, Barrier Width and Barrier Height are achieved.

Barrier Direction and Spacing. The spacing between barriers shall be measured along the prevailing wind erosion direction during those periods when sensitive crops are susceptible to damage by wind and wind-borne soil particles. Spacing shall not exceed 10 times the expected height of the barrier plus additional width permitted by the crop tolerance to damage from wind erosion as specified in the National Agronomy Manual (Part 502), Section I of the Field Office Technical Guide (see Table 1 below):

Table 1 Estimated Crop Seedling Tolerances to Soil Loss (Blowing)

Crop	Estimated Crop Seedling Tolerance (T/Ac/Yr.)
Alfalfa	0 to 0.5
Corn	2.0
Grain Sorghum	1/
Green/snap beans	1.0
Lima beans	1.0
Millet	1/
Oats	1/
Peas	1.0
Potatoes	1.0
Rye	1/
Soybeans	2.0
Sugar beets	0 to 0.5
Sunflowers	2.0
Sweet corn	2.0
Wheat	1/

1/ Will likely tolerate soil blowing equal to or greater than the tolerable soil loss.

*Crop tolerance to damage from wind erosion is the maximum soil erosion that a growing crop can tolerate, from crop emergence to field stabilization, without an economic loss to crop stand, crop yield or crop quality.

Calculations shall account for the effects of other practices in the resource management system.

Additional Criteria to Enhance Snow Deposition to Increase Plant-Available Moisture

Barrier Height. Barriers designed for this purpose shall have a minimum expected height of 1.5 feet during period of expected snow

cover. Select vegetation to achieve appropriate barrier height to manage snowdrift depth and length for manipulation of snow storage.

Barrier Width. Barriers may consist of perennial grass a minimum of 60" wide, providing the required porosity can be achieved, and the barrier contains no gaps.

Barrier Porosity. Barriers established for this purpose shall be designed to achieve a porosity of 60-75 percent during periods of expected snow cover. Select appropriate vegetation and density to provide needed barrier porosity to account for local conditions and desired snowdrift and depth. Minimum porosity can be achieved if general criteria for: Vegetation, Barrier Width and Barrier Height are achieved.

Barrier Direction and Spacing. The effective spacing shall be measured along the prevailing wind erosion direction during periods of expected snow cover. For uniform distribution of the drifting snow, spacing shall not exceed 12 times the expected height of the barrier.

Additional Criteria to Provide Food and Cover for Wildlife

Vegetation. Barriers are often designed to enhance wildlife habitat in conjunction with one of the other purposes. Select grass species that are adapted to the site and that meet the intended needs of the targeted wildlife species.

Forbs and/or legumes must be included as an essential component within seed mixtures to provide benefits to a wider array of wildlife species.

To meet the quality criteria requirements for wildlife habitat (food, water, cover, etc.) in Section III of the FOTG, the planned system must provide a total rating of 0.5 or higher for the conservation treatment unit. Rating shall be recorded using Cropland Habitat Evaluation Worksheet (NE-CPA-32).

CONSIDERATIONS

Transport of wind-borne sediment and sediment-borne contaminants offsite are reduced by this practice when used in a resource management system. Consider need for other practices in combination with herbaceous wind barriers to meet the resource objectives.

Herbaceous wind barriers are more suitable than field windbreaks for use under center pivot and linear move irrigation systems due to height considerations. Windbreaks may be located outside the windward edge of the system.

Spacing between barriers may be adjusted, within the limits of the criteria above, to accommodate widths of farm equipment to minimize partial or incomplete passes.

Selection of plants for use in barriers should favor species or varieties tolerant to herbicides used on adjacent crops.

Certain plants may be alternate hosts for pests that may cause injury to adjacent crops and may not be satisfactory for use in barriers.

Consider plants that serve as a habitat for beneficial, pest-eating insects or parasitizing insects, as well as pollinating insects. When enhancement of insect pollinator habitat is a secondary objective, diversity of flowering plant species should be encouraged.

Consider planning barriers to attract undesirable insects away from crops.

Where compatible with the primary purposes of the practice, priority should be given to plant species that will also provide food and cover for wildlife. The selected species should be adapted to the site and meet the needs of the targeted wildlife species.

In addition, when enhancement of wildlife habitat is a secondary objective, plant species diversity should be encouraged. Barriers that result in multiple structural levels of vegetation within the barrier will maximize wildlife use.

If the barrier is also designed to provide escape or nesting cover for wildlife, locate barriers where they connect areas of existing perennial vegetation whenever possible and include plants that will have a minimum expected height that provides adequate cover for the targeted species.

Barriers that connect areas such as woody draws often provide additional escape and travel cover. If additional width is needed to provide multiple wildlife benefits, it may be desired to use Conservation Practice Standards 589C, Cross Wind Trap Strips, to achieve the conservation objective.

Where damage to barriers by grazing animals is a concern, selection of plant species less palatable to animals may reduce damage.

Where water erosion from melting snow, accumulated within the barrier system, is a concern, supporting erosion control practices such as residue management can reduce the hazard. Where feasible, aligning barriers across the slope can enhance moisture infiltration and reduce erosion from runoff.

Encourage the use of adapted native plant materials whenever possible.

Avoid use of invasive species.

Consider using species of plants that sequester more carbon and/or increasing the width of the herbaceous barrier to improve carbon sequestration.

Consider barriers to enhance the micro-environment for plant growth.

PLANS AND SPECIFICATIONS

Specifications for establishment and maintenance of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and Operation & Maintenance described in this standard.

Specifications shall be recorded on specification sheets, job sheets, Nebraska Conservation Planning Sheets, narrative statements in the conservation plan, or other acceptable documentation.

Additional Specifications required based on erosion prediction documentation:

1. Location of barriers.
2. Direction/alignment and distance between strips.
3. Width of barriers and cropped strips.
4. Seeding rates, dates, variety/species, seeding methods, depth, etc.
5. Row and tillage direction.

Specifications shall be recorded using approved specification sheets, job sheets and narrative statements in the conservation plan, or other acceptable documentation.

The plans shall include a sketch map or photograph of the field showing the approximate location of the barriers.

OPERATION AND MAINTENANCE

Annual barriers shall be re-established each year by planting at recommended dates, leaving rows standing and maintained throughout the critical period for which the barrier was designed.

Gaps in perennial barriers shall be replanted as soon as practical to maintain barrier effectiveness.

After establishment, perennial barriers shall be fertilized as needed. Weeds shall be controlled by cultivation, spot treatment when using chemicals, or other acceptable methods.

Wind-borne sediment accumulated in barriers shall be removed and distributed over the surface of the field as needed.

Barriers shall be re-established or relocated as needed.

Barriers composed of perennial vegetation to also enhance wildlife habitat should not be mowed unless their height or width exceeds that required to achieve the barrier purpose, or they become competitive with the adjoining land use. When mowing of vegetation or prescribed burning is necessary, it should be done outside the primary nesting season for grass-nesting birds.

Harvest of hay or seed from perennial barriers, grazing, burning, or mowing for weed control, shall be managed to allow regrowth to the planned height before periods when wind erosion, crop damage, or drifting snow are expected to occur. Annual barriers will be managed so barriers are of sufficient height and condition to meet their intended purpose.

REFERENCES

Brandle, J.R., D.L. Hintz and J.W.Sturrock. 1988. Wind Break Technology. ISBN 0-444-43019-9. Elsevier Science

CORE4 Conservation Practices – The Common Sense Approach to Natural Resource Conservation. 1999. USDA, NRCS

National Agronomy Manual. 190-V. 3rd ed., Part 502, Wind erosion. 2002. USDA, NRCS

Section I, Erosion Prediction, Nebraska Field Office Technical Guide

Skidmore, E.L. and N.P. Woodruff. 1968. Wind Erosion Forces in the United States and their use in predicting soil loss. Agriculture Handbook 346. USDA

USDA-NRCS. PLANTS Database. 2010. http://plants.usda.gov. (verified April 2010)

Certified Perennial Grass Varieties Recommended for Nebraska" Extension Publication EC90-120