

**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 may be composed of perennial or annual vegetation, living or dead. Plant materials shall be selected for the following characteristics:

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

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.

Number of rows. Barriers may consist of one row of plants, providing the required porosity can be achieved with a single row that contains no gaps and the previous criteria is met. When two or more rows are required to achieve the required porosity and to avoid gaps, the rows shall be spaced no more than 36 inches apart.

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.

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.

Additional Criteria to Protect Growing Crops from Damage from 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 blowing 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.

NRCS-Minnesota

June 2010

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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.

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-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), applicable Field Office Technical Guides, other accepted technical references, or other planned crop protection objective.

*Crop tolerance to damage from wind erosion is the maximum rate of soil blowing 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 Manage 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 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.

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.

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 injurious 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. Two or more rows are often more effective than one row, with a minimum width of two feet between rows. Stiff stems are important in providing cover during severe winter storms.

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

Plans and specifications for the establishment and maintenance of this practice shall include:

1. Purpose
2. For individual barriers:
 - a. Vegetation type (annual or perennial)
 - b. Species
 - c. Number of rows per barrier
 - d. Distance between barrier rows
 - e. Seeding / planting rate
 - f. Seeding / planting depth
 - g. Planned effective barrier height
 - h. Barrier width
3. For a barrier system:
 - a. Number of barriers in system
 - b. Distance between barriers
 - c. Total area in barriers
 - d. Total amount of seed / number of plants required
4. Site preparation requirements
5. Method of seeding / establishment
6. Fertilizer and soil amendments needed

7. Mulch material (if required)

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

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

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

The PLANTS Database 2009. (<http://plants.usda.gov>, 2 July 2009). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. USDA, NRCS.

SPECIFICATIONS

TABLE 1. Suitable Plants For Herbaceous Wind Barriers

Plant Species	Seeding Rate Plants/Ac	Seeding Rate Pounds/Ac PLS	Established Plants/10 ft.Row	Minimum Number of Rows For:	
				Erosion Control (40-50% porosity)	Snow Mgt. (60-75% porosity)
Field Corn					
Twin Row (3 ft. apart)	53,000		38	2	2
30" Rows	20,000		11	6	4
	25,000		14	5	3
	30,000		17	4	3
36" Rows	20,000		14	5	4
	25,000		17	4	3
	30,000		21	4	2
Sweet Corn					
Twin Row (3 ft. apart)	56,000		30	2	2
30" Rows	31,000		18	5	4
	36,000		21	5	3
	41,000		24	4	3
36" Rows	31,000		21	5	3
	36,000		25	4	3
	41,000		28	4	2
Popcorn					
Twin Row (36" Spacing)	56,000		30	2	2
30" Rows	13,000		8	15	9
	18,000		10	11	7
	23,000		13	8	6
36" Rows	13,000		9	12	8
	18,000		12	9	6
	23,000		16	7	5

NRCS-Minnesota
June 2010

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TABLE 1. Suitable Plants For Herbaceous Wind Barriers (Cont)

Plant Species	Seeding Rate Plants/Ac	Seeding Rate Pounds/Ac PLS	Established Plants/10 ft.Row	Minimum Number of Rows for	
				Erosion Control (40-50% porosity)	Snow Mgt. (60-75% porosity)
Flax (6" rows)					
	2,460,000	30	282	3	2
	2,870,000	35	329	3	2
	3,280,000	40	376	2	2
Pearl Millet					
7" Rows		4	46	11	6
		5	57	9	5
		6	68	8	4
30" Rows		4	195	3	2
		5	244	2	1
		6	293	2	1
36" Rows		4	234	2	1
		5	293	2	1
		6	351	2	1
Sorghum					
7" Rows	300,000	20	40	3	2
	375,000	25	50	3	2
	450,000	30	60	2	1
30" Rows	75,000	5	43	3	2
	150,000	10	86	2	1
	225,000	15	129	1	1
36" Rows	75,000	5	52	3	2
	150,000	10	103	1	1
	225,000	15	155	1	1

TABLE 1. Suitable Plants For Herbaceous Wind Barriers (Cont)

Plant Species	Seeding Rate Plants/Ac	Seeding Rate Pounds/Ac PLS	Established Plants/10 ft.Row	Minimum Number of Rows	
				Erosion Control (40-50% porosity)	Snow Mgt. _____ (60-75% porosity)
Sudangrass					
7" Rows	220,000	4	30	15	9
	275,000	5	37	12	7
	330,000	6	44	10	6
30" Rows	220,000	4	126	4	2
	275,000	5	158	3	2
	330,000	6	189	2	1
Sunflower					
30" Rows	17,000		10	12	8
	22,000		13	19	6
	27,000		16	8	5
36" Rows	17,000		12	10	7
	22,000		15	8	5
	27,000		19	6	4
Tall Wheatgrass					
(6" Rows)		15	136	4	2
		20	181	3	2
		25	227	2	2
Switchgrass					
(6" Rows)		3	134	4	2
		4	179	3	2
		5	223	2	2
Big Bluestem					
(6" Rows)		7	132	4	2
		9	170	3	2
		11	208	2	2