Herbaceous Wind Barriers (Feet) 603

DEFINITION

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

PURPOSES

- Reduce soil erosion and/or particulate generation from wind.
- Protect growing crops from damage by wind-borne soil particles.
- Manage snow to increase plant-available moisture.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to cropland or other land where crops are grown.

This standard describes how to use and manage herbaceous wind barriers for the identified purpose.

CRITERIA

General Criteria Applicable to All Purposes

Vegetation. Criteria for the establishment of perennial herbaceous vegetation are in the 342 Critical Area Planting Standard of the Field Office Technical Guide (FOTG) or the Plant Materials Center fact sheets. Refer to MSU Extension Bulletin E-2107, Seeding Practices for Michigan Crops, or other accepted technical references for planting specifications to establish annual herbaceous vegetation.

Herbaceous wind barriers may be composed of perennial or annual vegetation, growing or dead. Plant materials shall be selected for the following characteristics:

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

Number of Rows. Barriers may consist of one row of plants, providing the required porosity can be achieved with a single row, and that the row contains no gaps. More than one row shall be planned for each barrier on sites, such as sandy soils, that negatively affect the establishment or survival of the barrier.

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.

Barriers that are harvested need to be managed so that they are of sufficient height and condition to meet their intended purpose.

Barrier Direction and Spacing. The effective spacing between barriers shall be determined using current approved wind erosion prediction technology. When barrier direction deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced. See NRCS-MI eFOTG Section I, Wind Erosion Direction Factors, Table 4 adapted from National Agronomy Manual, Table 502-3, for adjustment factors.

Use the critical or predominate Wind Erodibility Group and the Wind Erosion Soil Loss Prediction (E) table to determine barrier spacing for the intended purpose. To determine wind erosion rate by the soil type: see NRCS-MI eFOTG, Section I, Wind and Water Erosion Prediction sections, to assign the applicable Soil Loss Tolerance and Wind Erosion Group.

Calculating Porosity. The number of rows of vegetation needed to achieve the required porosity listed in this standard shall be determined using the most current wind erosion technology. See Table 1 of this standard.

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. Annual barriers

will be managed so barriers are of sufficient height and condition to meet their intended purpose.

Protective Barrier

It is recommended that a strip of rye 12-15 feet wide be sown in the fall at the same spacing as the vegetative barrier. It can help prevent the barrier from being "buried" alive from wind erosion deposition during establishment. Also, crop residue, straw bedded manure, or cover crops can be substituted for a rye barrier to prevent barrier burial from wind erosion. All protective barriers should be upwind of the barrier.

Annual barriers need to be re-established each year by planting at the recommended dates. For areas prone to soil erosion by wind, the annual barriers need to achieve the minimum height to protect the crop during the critical erosion period.

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 on 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.

When barrier direction deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced. See Table 4, Wind Erosion Direction Factors, adapted from National Agronomy Manual Table 502-3 for adjustment factors, or the NRCS-MI eFOTG.

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

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, and the crop height at which it will no longer need the protection of a barrier.

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 Table 502-4, Crop Tolerance to Blowing Soil, of the NRCS-MI FOTG, other accepted technical references, or other planned crop protection objective.

* 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. Some species are more vulnerable at flowering rather than emergence, e.g., tomatoes.

Calculations shall account for the effects of other practices in the resource management system. The spacing between barriers shall be determined using current NRCS-MI FOTG approved wind erosion prediction technology to estimate wind erosion during specific crop stage periods.

Additional Criteria to Manage Snow to Retain Additional Soil Moisture

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

Barrier Porosity. Barriers established for this purpose shall be designed to achieve a porosity of 60-75 percent during periods of expected snow cover. This porosity is best, as it helps to achieve more even distribution of snow within the barrier system.

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.

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

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 home for beneficial, pest-eating insects, pollinators, and pest predators. Consider planning barriers as trap strips to attract undesirable insects such as virus spreading aphids.

Selection of plant species less palatable to animals may reduce damage to barriers from grazing wildlife.

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.

When barriers are designed to enhance wildlife habitat, plant species diversity should be encouraged. Barriers that result in multiple structural levels of vegetation within the barrier will maximize wildlife use. Plant barriers provide food and cover for the targeted wildlife species. Barriers shall consist of two or more rows a minimum of 2 feet apart. Plants should have a minimum (typically 18 inches) expected height that provides adequate cover for the targeted wildlife species.

An annual soil trap planting of rye, sorghum, or buckwheat 12-15 feet wide upwind and adjacent to the barrier will improve cover and extended barrier life. Leave a two-foot space between the annual and perennial barrier to prevent competition.

To provide wildlife cover, consider using switch grass, Sudan grass or Tall Wheatgrass.

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 2 feet between rows. Stiff stems are important in providing cover during severe winter storms.

Encourage the use of adapted native plant materials whenever possible.

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

Cash flow and improved cost-benefit can be improved by using sweet corn or popcorn and harvesting the ears for profit. The stalks must be left standing to retain their designed purposed function.

PLANS AND SPECIFICATIONS

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

Specifications shall be recorded using approved specification sheet 603, job sheets, and narrative statements in the conservation plan, or other acceptable documentation.

The Herbaceous Wind Barrier Plan will include the following information:

- Purpose
- Barrier Width
- Barrier Height
- Barrier Length
- Acres in Barrier Area
- Species/Cultivar by Barrier Number
- Site Preparation
- Planting Method
- Operation and Maintenance

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. This can also be achieved by leaving standing strips of rye cover crop between spring tillage operations to prepare for the spring planted field crop; i.e., sugar beets, peppers, etc.

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

After establishment, perennial barriers shall be fertilized as needed or at the same time and rate as adjacent field crops. 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 determined appropriate.

When accumulation reaches 6 inches, re-establish or relocate barriers as needed.

Barriers shall be re-established or relocated as needed.

Barriers composed of perennial vegetation that are designed to 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 is necessary, it shall be done during the non-nesting season.

Prescribed burning (338) to enhance plant vigor may be completed after nesting/resting periods.

Harvest of hay or seed from perennial barriers, grazing, or mowing for weed control, shall be managed to allow new growth to the planned height before periods when wind erosion, crop damage, or drifting snow are expected to occur. Annual barriers may be grazed or harvested after critical periods have passed.

TABLE 1 - SUITABLE PLANTS FOR HERBACEOUS WIND BARRIERS

Plant Species	Seeding Rate Plants/AC	Seeding Rate Pounds/AC	Established Plants/10 Ft. Row	Minimum Number of Rows For Erosion Control : Snow Mgmt. (40-50% porosity) : (60-75% porosity)	
FIELD CORN					
Twin Row (36” 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 (36” apart)	56,000		30	2	2
30” Rows	31,000		18	5	4
	36,000		21	5	3
	41,000		24	4	3

TABLE 1 - SUITABLE PLANTS FOR HERBACEOUS WIND BARRIERS - Continued

Plant Species	Seeding Rate Plants/AC	Seeding Rate Pounds/AC	Established Plants/10 Ft. Row	Minimum Number of Rows For Erosion Control : Snow Mgmt. (40-50% porosity) : (60-75% porosity)	
SWEET CORN - Continued					
36” Rows	31,000		21	5	3
	36,000		25	4	3
	41,000		28	4	2
POPCORN					
Twin Row (36” apart)	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
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 - Continued

Plant Species	Seeding Rate Plants/AC	Seeding Rate Pounds/AC	Established Plants/10 Ft. Row	Minimum Number of Rows For Erosion Control : Snow Mgmt. (40-50% porosity) : (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 (JOSE)					
(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
MISCHANTHUS SPP.					
(6" Rows)		Plug	136	4	2
			179	3	2
			208	2	2

* Native species. Big Bluestem will require a fluffy seed drill or beardless seed.