

# FARM WATER QUALITY PLANNING MANAGEMENT PRACTICE

## Herbaceous Wind Barriers # 603

*University of California Cooperative Extension  
Natural Resources Conservation Service*



Herbaceous wind barriers are established in narrow strips across the prevailing wind direction to trap wind-borne sediment and provide protection downwind of the strips. Each strip can be composed of one or more rows of plants or planted around the perimeter of the field. Plants can be annual or perennial.

For taller shrubs and trees, see Hedgerow Planting #412 and Windbreak #380.

### **Advantages**

- Reduces wind erosion
- Reduces transport of wind-borne contaminants offsite
- Protects crop from damage by wind-borne soil particles
- Enhances wildlife habitat
- May provide habitat for beneficial species
- May provide structural barriers to wind-borne pest migration

### **Disadvantages**

- May require weeding and/or fertilization
- May provide habitat for pests

**Practice Effectiveness for Reducing Water Quality NPS Pollution Potential**

<b>Erosion-sheet &amp; rill</b>	<b>Erosion-streambank</b>	<b>Pesticides-leaching</b>	<b>Pesticides-dissolved in runoff</b>	<b>Pesticides-adsorbed to sediment</b>	<b>Nutrients-leaching</b>	<b>Nutrients-surface waters</b>
				slight		

Empty boxes indicate information not yet collected for this practice

**Additional sources of information regarding herbaceous wind barriers:**

UC Sustainable Agriculture Research and Extension Program <http://www.sarep.ucdavis.edu/>  
 UC Weed Research and Information Center <http://wric.ucdavis.edu/>

Some of the information in this management sheet has been taken from the Natural Resource Conservation Service (NRCS) Handbook of Conservation Practices practice #603. Contact your local NRCS office or visit <http://www.nrcs.usda.gov> for more information.

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE SPECIFICATION

**603 – HERBACEOUS WIND BARRIERS**

**I. SCOPE**

The work shall consist of furnishing all materials and placing them on all designated areas to the limits as shown on the drawings, or as staked in the field, and perform cultural operations to grow the plants and to maintain the life of the stand.

**II. MATERIALS**

*Seed*

All seed shall be delivered to the site tagged and labeled in accordance with the California Agricultural Code, and shall be acceptable to the county agricultural commissioner.

Seed shall be of a quality which has a minimum pure live seed content of 90 percent (percent purity x percent germination) and weed seed shall not exceed 0.5 percent of the aggregate of pure live seed and other materials.

Bag tag figures will be evidence of purity and germination. Time since date of seed test shall not exceed nine months.

*Fertilizer*

Fertilizer shall be applied as specified on the practice requirement sheet. It will be uniform in composition, dry and free flowing, pelleted or granular.

All fertilizer shall be labeled in accordance with applicable state regulations and bear the warranty of the producer for the grade furnished.

*Inoculant*

The inoculant for treating legume seeds shall be a pure culture of nitrogen fixing bacteria prepared specifically for the plant species and shall not be used later than the date indicated on the container. A mixing medium, as recommended by the manufacturer or approved substitute, shall be used to bond the inoculant to the seed. For nonpellet inoculated seed, two times the amount of the inoculant recommended

by the manufacturer shall be used and seed shall be sown within 24 hours.

For pellet inoculated seed, at least 30 pounds of inoculant shall be used per 1000 pounds of raw seed and the seed shall be labeled to show the lot number, expiration date, and percent coat of the finished product. Pellet inoculated seed shall be kept cool and sown within 180 days of pelletization.

*Chemicals*

All pesticides used in performing this practice shall be federally, state, and locally registered and shall be applied strictly in accordance with authorized and registered uses, directions on the label, and other federal or state policies and requirements. Chemical containers shall be properly stored and disposed of in a safe manner.

**III. SEEDING MIXTURE AND PLANTING DATE**

The seed(s) and rate(s) specified on the practice requirements sheet shall be used.

The seeding rate(s) shall be the weight exclusive of any coating material. Any legume seed used shall be inoculated.

Planting shall be performed during the period that is specified on the practice requirement sheet.

**IV. SEEDED PREPARATION**

The area to be planted shall be weed free and have a firm seedbed which has previously been roughened by scarifying, disking, harrowing, chiseling, or otherwise worked to a depth of 2 to 4 inches, except when planting no-till. No implement shall be used that will create an excessive amount of downward movement of clods on sloping areas.

Rocks larger than 6 inches in diameter, trash, weeds and other debris that will interfere with seeding or maintenance shall be removed.

Seedbed preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory seedbed.

## **V. FERTILIZING AND SEEDING**

### *Fertilizing*

Fertilizer shall be distributed uniformly over the seedbed at the rate specified on the practice requirement sheet.

Fertilizer shall be applied in any way that will result in uniform distribution. The fertilizer shall be incorporated into the soil. Incorporation may be as part of the seedbed preparation, or as part of the seeding operation.

### *Seeding*

Seed shall be drilled or broadcast by hand, mechanical hand seeder, or power operated seeder. Seed shall be incorporated into the soil, but not more than 1 inch deep.

Seeding shall be performed as nearly as practical across the slope.

## **VI. IRRIGATION**

When specified, irrigation water shall be applied during the establishment period at the time and rates listed on the practice requirement sheet.

## **VII. ADDITIONAL CULTURAL OPERATIONS**

### *Seasonal buffer strip*

The types of equipment used and the cultural operations performed shall maintain a plant population that provides at least 60 percent ground cover during the critical erosion period. Mowing may control plant height. No tillage shall be performed during the critical erosion period except for injecting or banding fertilizer through knives.

Herbicides used shall not endanger the planted species except that areas adjacent to the strip may be kept free of unwanted vegetation.

### *Permanent buffer strip*

Cultural operations performed shall maintain a plant population that provides at least 60 percent ground cover during the critical erosion period. No mowing shall be performed except when required for control of noxious weeds. No tillage shall be performed except for injecting for banding fertilizer through knives and for overseeding with a seed drill.

Herbicides used shall not endanger the planted species, except when required for control of noxious species.

The strip may be relocated just above or just below the original strip from time to time to minimize any slope changes due to farming around the strip.

## **VIII. OTHER REQUIREMENTS**

Operations shall be done in such a manner that soil erosion and air and water pollution are minimized and held within legal limits.

The owner, operator, contractor, and other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operation being performed with due regards to safety of all persons and property.

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**HERBACEOUS WIND BARRIERS**

(feet)

**CODE 603**

**DEFINITION**

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

**PURPOSES**

This practice may be applied as part of a resource management system to support one or more of the following:

- Reduce soil erosion from wind.
- Protect growing crops from damage by wind-borne soil particles.
- Manage snow to increase plant available moisture.
- Provide food and cover for wildlife.

**CONDITIONS WHERE PRACTICE APPLIES**

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

**CRITERIA**

**General Criteria Applicable To All**

**VEGETATION:** Criteria for the establishment of perennial herbaceous vegetation shall be made from guidelines developed locally and contained in the Field Office Technical Guide.

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 climatic conditions.
- Stiff, erect non-spreading growth habit.
- Resistant to lodging.
- Good leaf retention.
- Minimum competition with adjacent crops.
- Compatible with adjacent crops.

**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, rows shall be spaced no more than 36 inches apart.

**Barrier Direction and Spacing** - The effective spacing between barriers shall be determined using current approved wind erosion prediction technology. When barrier directions deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced. (See table 502-3 of the National Agronomy Manual, 3<sup>rd</sup> Ed., June 2000, for adjustment factors)

**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. State Agronomists shall provide field offices with calculations or tables as needed in their state.

**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.

**Additional Criteria To Reduce Soil Erosion 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** - When barrier direction deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced.

The spacing between barriers shall be measured along the prevailing wind erosion direction during the critical wind erosion period 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.

The effective spacing between barriers shall be determined using current approved wind erosion prediction technology. 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**

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.

**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-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** - When barrier direction deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced.

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 wind erosion as specified in applicable Field Office Technical Guide, other accepted technical references, or other planned crop protection objective.

Crop tolerance to damage from wind erosion is the maximum soil erosion or physical damage that a growing crop can tolerate, from emergence to field stabilization, without an economic loss to crop stand, crop yield or crop quality (See table 502-4 of the National Agronomy Manual, 3<sup>rd</sup> Ed., June 2000, for crop tolerances).

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

**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.

**Barrier Direction and Spacing** - When barrier direction deviates from perpendicular to the prevailing wind direction, the spacing between barriers shall be correspondingly reduced.

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 barrier species that are adapted to the site and that meet the intended needs of the targeted wildlife species.

**Barrier Width** - Barriers established for this purpose shall have a minimum width of two feet.

**Barrier Height** - Barriers established for this purpose shall have a minimum expected height that provides adequate cover for the targeted wildlife species.

## CONSIDERATIONS

Transport of wind-borne sediment and sediment-borne contaminants offsite are reduced by this practice when used in a 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 barriers.

Consider plants that serve as a home for beneficial, pest-eating insects, pollinators and pest predators. Consider planting 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 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. The use of evergreens in barriers designed to provide winter cover might increase their value. 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.

Some plants are damaged by blowing wind as well as by wind-borne soil particles. In such cases, the spacing between wind barriers may have to be reduced from that obtained using wind erosion prediction technology.

Encourage the use of adapted native plant materials whenever possible.

## Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NCR's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species.

If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

## Water Quantity

Decreased wind velocity and flow over protected areas near barriers have shown an increase in infiltration and soil moisture due to decreased surficial evaporative demand. An increase in soil moisture may occur in areas because of moderate or large snowfalls. Snow catch would increase the amount of water infiltrated and seasonally increase soil moisture. Localized areas

of extensive snow catch or drift could be subject to an increase in infiltration and deep percolation during snowmelt, which could act to elevate a water table.

### **Water Quality**

Disturbance of the practice area by planting may cause temporary increase in erosion but these effects would be short term and are not expected to be severe. Overall effects may reduce overall erosion and sediment yields. The barrier may decrease watercourse sedimentation from wind-blown soil from fields that would be protected by the windbreak. This reduction in sedimentation would reduce the availability for transport to receiving waters of sediment and sediment-attached substances. Chemical effects on water quality are not expected to be significant.

### **PLANS AND SPECIFICATIONS**

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

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

### **OPERATION AND MAINTENANCE**

Annual barriers shall be reestablished each year by planting at recommended dates, leaving rows standing after crop harvest, or leaving standing strips when incorporating a cover crop into the soil and maintained throughout the critical period for which the barrier was designed.

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

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

Harvest of hay or seed from perennial barriers, grazing or mowing for weed control shall be managed to allow re-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 wind periods have passed.

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

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 or pruned unless their height or width exceeds that required to achieve the barrier purpose, or they become competitive with the adjoining land use. When mowing or pruning is necessary, it shall be done during the non-nesting season.

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

### **REFERENCE**

National Agronomy Manual, 3<sup>rd</sup> Edition, June 2000.