

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION
HERBACEOUS WIND BARRIERS
(feet)
CODE 603

SCOPE

This document establishes the technical details, workmanship, and quality and extent of materials required to install the practice in accordance with the Conservation Practice Standard. The information shall be considered when preparing site-specific specifications for the practice.

The NRCS Hawaii Jobsheet for this practice shall be used to document the site-specific specifications for installing, operating, and maintaining the practice on a specific field or treatment unit. Other documents (worksheets, maps, drawings, and narrative statements in the conservation plan) may be used in addition to the Jobsheet to document site specifications or to plan or design the practice.

DESIGN OF WIND BARRIERS

Refer to Table 1 for a list of species suitable for herbaceous wind barriers. Select species that are at least twice as high as the mature height of the sheltered crop if the purpose is to protect plants from wind damage. The Table and pictures of most of the plants are also included in the Hawaii Vegetative Guide available online at:
<ftp://ftp-fc.sc.egov.usda.gov/HI/pub/technotes/vegetative/>

Barriers should be oriented perpendicular to the prevailing wind direction for maximum wind protection. The maximum deviation will be 45 degrees from the perpendicular, unless the field has or is being planned for other 'legs' of barriers or windbreaks.

- Wind barriers will be planted in single or double rows. Between-row and within-row spacing will be according to the spacing in Table 1.
- Space the barriers at a distance of 10 times the expected effective height (10H) to reduce wind velocity by approximately 50 percent. The windbreak porosity shall be between 40-50%.
- Barriers should also be spaced closer when it is not practical to place them perpendicular to the prevailing wind. Do not exceed the 10H travel path of the wind direction.
- The distance between barriers will be a multiple of the commonly used cultivation or field equipment plus 4 feet.
- For wind-sensitive crops (Table 2) needing a greater reduction of wind speed, space the barriers 5 to 7 times the effective height.
- If there is no windbreak or barrier around the field, the herbaceous wind barrier must extend 5H at each end of the row. This will prevent the wind from wrapping around the ends and back into the field.

- Minimize gaps within the wind barrier row. A gap will cause a wind funnel and will cause additional crop damage and soil erosion. If a gap in the row is necessary, overlap the gap with an additional row of wind barrier. To calculate the distance of the additional row, add 10H to the gap distance.
- Plan to irrigate the barriers if the annual rainfall is not sufficient or uniform.
- If planting bananas, determine if the farm is located in a banana quarantine area. Do not use corms from a quarantine area in a non-quarantine area.

ESTABLISHMENT

Plant annual barriers early enough to afford wind protection to the crop or cultivated land exposed to erosive winds.

Plow, subsoil or harrow as needed. The planting bed can be:

- clean-tilled, firm and weed free seedbed or;
- contain dead residue from the prior crop or;
- planted in killed sod with planting holes or a furrow cut into the residue.

Use seed with high germination percentage and good quality vegetative material. The cane pieces will have a minimum of two internodes. Use mature cane pieces for planting. Strip all leaves from cane piece. Cover seed with 1/2 inch of soil. Cane pieces will be buried a maximum of 1 inch.

Fertilize and lime according to soil test results and recommendations.

Irrigate if needed. Irrigation is recommended in areas where rainfall is not abundant and/or not well distributed throughout the year. The irrigation system selected should allow the windbreak lines to be irrigated independently of the crop plants. For example, separate control valves for barrier rows.

Table 1. Suitable Species (Page 1 of 2)

Common Name/Cultivar	Scientific Name	Adapted Elevation (feet)	Adapted to Annual Rainfall ^{1/}	Min-Max Plant Spacing (inches w/in row X row)	Planting Material (per 1,000 feet of single row barrier)	Notes
Perennials Effective Height 12- 15 feet						
banagrass	<i>Pennisetum purpureum</i>	0 – 3,000	40+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Produces viable seed. Control volunteers. A potential pest in other grass crops. An up-right, tall strain of Napiergrass.
dwarf Brazilian banana cv. Santa Catarina Prata	<i>Musa</i> sp.	0 – 3,500	50+	(60) X (72-120)	corm --201 each	Check State and local regulations about diseases of banana and possible quarantine.
Napiergrass cv. Mott	<i>Pennisetum purpureum</i>	0 – 3,000	40+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Sterile seeds. Will not volunteer.
Napier x pearl millet hybrid cv. PMN Hybrid	<i>Pennisetum</i> sp.	0 – 3,000	40+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Sterile seeds. Will not volunteer.
wild cane hybrid	<i>Saccharum</i> hybrid clone Moentai	0 – 3,000	35+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Sterile seeds. Will not volunteer. Can require a lot of trimming on lee side. Irrigating minimum amount for effective wind barrier reduces maintenance.
Annuals Effective Height 6 - 8 feet						
corn	<i>Zea mays</i>	0 – 4,000	40+	(6-12) X (9-18)	approx. 10 ounces / 1000 ft	Produces viable seed. Control volunteer. Recommend double row.
forage sorghum hybrids	<i>Sorghum</i> sp.					Recommend double row for all forage sorghum hybrids.
Garrison Bale-all III	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.

Table 1. Suitable Plant Species (Page 2 of 2)

Common Name/Cultivar	Scientific Name	Adapted Elevation (feet)	Adapted to Annual Rainfall ^{1/}	Min-Max Plant Spacing (inches w/in row X row)	Planting Material (per 1,000 feet of single row barrier)	Notes
Annuals Effective Height 6 - 8 feet						
sorghum-sudan hybrids ^{2/}						Recommend double row for all sorghum-sudan hybrids.
Funk 83-F	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/1000 ft	Produces viable seed. Control volunteers.
Germain Bravo	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/1000 ft	Produces viable seed. Control volunteers.
Germain SS-222	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/1000 ft	Produces viable seed. Control volunteers.
T-E (Taylor Evans) Goldmaker	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.
T-E Haygrazer	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/1000 ft	Produces viable seed. Control volunteers.
Warner Sweet Bee Sterile II	<i>Sorghum</i> sp.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.

Note: Cultivars listed have been successful, however others may also be satisfactory. List is not all-inclusive. Species not included on the list may be used, based on prescriptions by qualified NRCS technical specialists.

^{1/} May require irrigation for establishment and during dry season.

^{2/} Resistant to root-knot nematodes.

Table 2. Crop Tolerance to Wind and/or Wind Blown Soil
(Page 1 of 1)

Tolerant Crops

Barley	<i>Hordeum vulgare</i>
Buckwheat	<i>Fagopyrum</i> sp.
Oats	<i>Avena sativa</i>
Grain sorgham	<i>Sorghum bicolor</i>

Moderate Tolerance Crops

Corn	<i>Zea mays</i>
Sunflower	<i>Helianthus annuus</i>
Sweet corn	<i>Zea mays</i>
Cucumbers	

Low Tolerance Crops

Avocados	<i>Persea americana</i>
Grapefruit	<i>Citrus paradisi</i>
Grapes	<i>Vitis</i> spp.
Lemons	<i>Citrus limon</i>
Limes	<i>Citrus aurantifolia</i>
Oranges	<i>Citrus sinensis</i>
Tangerines	<i>Citrus reticulata</i>
Broccoli	<i>Brassica oleracea</i> var. <i>botrytis</i>
Cabbage	<i>Brassica oleracea</i> var. <i>capitata</i>
Green peas	<i>Pisum sativum</i>
Beans	<i>Phaseolus</i> spp.
Green beans	<i>Phaseolus</i> sp.
Lima beans	<i>Phaseolus</i> sp.
Snap beans	<i>Phaseolus</i> sp.
Tomatoes	<i>Lycopersicon esculentum</i>

Very Low Tolerance Crops

Alfalfa (new seedlings)	<i>Medicago sativa</i>
Asparagus	<i>Asparagus officinalis</i>
Table beet	<i>Beta vulgaris</i>
Carrots	<i>Daucus carota</i>
Celery	<i>Apium graveolens</i> var. <i>duke</i>
Cucumbers	<i>Cucumis sativus</i>
Egg plant	<i>Solanum melongena</i> var. <i>esculentum</i>
Flowers	All species
Lettuce	<i>Lactuca sativa</i>
Onions	<i>Allium cepa</i>
Peppers	<i>Capsicum annuum</i>
Soybeans	<i>Glycine max</i>
Spinach	<i>Spinacia oleracea</i>
Strawberries	<i>Fragaria x ananassa</i>
Watermelons	<i>Citrullus lanatus</i>