



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

VEGETATIVE BARRIER

CODE 601

(ft)

DEFINITION

Permanent strips of stiff, dense vegetation established along the general contour of slopes or across concentrated flow areas.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce sheet and rill erosion
- Reduce ephemeral gully erosion
- Reduce sediment transport to surface waters

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where sheet and rill erosion or ephemeral gully erosion are resource concerns.

CRITERIA

General Criteria Applicable to All Purposes

Physical characteristics of plants

Stiffness index

Establish vegetative barriers with vegetation having the minimum Vegetation Stiffness Index (VSI) designated in table 1, measured at a point 6 inches above the ground.

Table 1. Stem Diameter and Minimum Stem Density Values for Vegetation Stiffness Index (VSI) Values of 0.05 and 0.10.

Stem Diameter (Inch)	<u>Concentrated Flow Areas</u>	<u>Other Purposes</u>
	Stem Density Per Square Foot @VSI=0.10	Stem Density Per Square Foot @VSI=0.05
0.10	1000	500
0.15	200	100
0.20	60	30
0.25	30	15
0.35	7	4
0.50	2	1
=/>1.00	1	1.0

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.

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NRCS, NHCP
January 2020

Density

Gaps between plants will be no greater than 3 inches at the end of the first growing season.

Species selection

Species must be adapted to local soil and climate conditions, easily established, long-lived, and manageable.

Select species that exhibit characteristics required for adequate functions, such as emergence through several inches of sediment or resuming growth from buried stem nodes, rhizomatous or stoloniferous growth habit, and stems that remain intact and erect year-round.

Establishment

Barriers may be established vegetatively or from seed.

Seeding dates, depths, and rates will be appropriate for the species selected and the conditions of the site. Seeds will be placed to ensure good seed-to-soil contact.

Barriers established vegetatively will be planted at a density to ensure a functional barrier as quickly as possible (usually two growing seasons). For most herbaceous species, this will require a spacing in the row of no more than 6 inches for bare-root seedlings, cuttings, sod chunks, plugs, rhizomes, or divisions consisting of no less than 5 viable stems. Suckering shrubs or herbaceous species established from 6-inch (gallon) potted material will be established at a spacing in the row of no more than 12 inches.

Site preparation must be sufficient to ensure seed germination or proper rooting conditions for vegetative material establishment. Ensure good root-to-soil contact and packing after planting.

Plan appropriate site stabilization measures when needed, during the barrier establishment period.

The mature barrier widths will be the largest of 3-feet wide or 0.75 times the design vertical interval. Broadcast or drilled seed will be sown in a strip at least 3-feet wide. Seed sown with a row planter will be seeded in a minimum of 2 rows.

Plant materials considered invasive or noxious shall not be established in the vegetative barrier

Additional Criteria for Reducing Sheet and Rill Erosion**Gradient**

Gradients along the barrier will be no less than 0.2 percent and no greater than 1.0 percent except where the vegetative barrier crosses concentrated flow areas. Gradients entering a concentrated flow area may be up to 1.5 percent for 100 feet for better row alignment.

All tillage and equipment operations in the interval between barriers will be parallel to the vegetative barrier.

A berm or channel must exist immediately upslope of the barrier to divert water along the vegetative barrier. Minimum berm height/channel depth will be 3 inches. Water flowing along a vegetative barrier berm/channel must be delivered to a stable outlet.

Spacing

Horizontal spacing between the vegetative barriers will be determined using the lesser of—

- The horizontal distance between barriers when the vertical interval is 6 feet, or
- The water erosion planning length of slope “L” that achieves the allowable soil loss for the field, considering the planned practices in the conservation management system.

Crop strip width will be planned in multiples of widths of planting, tillage, spraying, and harvest equipment. This spacing may be adjusted up to 10 percent between the barriers.

Vegetation

The species composition will provide the designated minimum stem density with the designated stem diameter and have a minimum VSI of 0.05. See Table 1 for guidance.

Additional Criteria to Reduce Ephemeral Gully Erosion

Alignment

Vegetative barriers are installed across concentrated flow areas perpendicular to the direction of water flow.

Width and length

Vegetative barriers consist of a minimum of two rows. Vegetative barrier length will vary depending on the topography. Each strip will be long enough to ensure that the ends of the strip are at least 1.5 feet higher than the center of the concentrated flow area (see table 1). When the concentrated flow area has a preexisting headcut, place one barrier at the bottom of the headcut and the other at the top.

Spacing

Spacing between the vegetative barriers will be based on the vertical interval of 1.5 feet for conditions where no tillage is performed between the barriers and 3 feet for all other conditions where sediment deposition and bench development is anticipated.

Minimum level bottom section length

The minimum level bottom section length (in feet) shall be numerically equal to the peak discharge [in cubic feet per second (cfs) for a 2-year 24-hour design storm from the total watershed upslope of the lowest barrier. This equates to a specific discharge of 1 cfs/ft of vegetative barrier. Level bottom section is defined as the bottom width of a trapezoidal waterway. This will be shaped during construction or formed by sediment deposition. (See table 1) Use methods in chapter 2 of the NRCS National Engineering Handbook (NEH) (Title 210), Part 650, "Engineering Field Handbook" to estimate peak discharge for local soil, climate, and management conditions.

If the channel does not have a level bottom section, design the barriers so that the peak discharge through the barriers for a 2-year, 24-hour storm does not exceed allowable velocities for the soil, vegetation, and slope conditions as determined using chapter 7 of 210-NEH-650.

Vegetation

Establish species that will provide the designated minimum stem density with the designated stem diameter and have a VSI of 0.10. See table 1 for guidance.

CONSIDERATIONS

The "benching" process that occurs on slopes where barriers are installed (tillage erosion moves soil from the upper part of the cropped strip, which then accumulates in the lower part of the cropped strip) can expose soil material that is unfavorable for crop growth.

Using management practices such as NRCS Conservation Practice Standards (CPSs) Conservation Crop Rotation (Code 328) and the Residue and Tillage Management (Codes 329 and 345), with Vegetative Barrier (Code 601) increases the effectiveness of the barrier.

This practice may improve the efficiency of other practices such as stripcropping, filter strips, riparian forest buffers, grassed waterways, diversions, and terraces.

Practices such as water and sediment control basins, subsurface drainage, and underground outlets may be needed to adequately handle surface and subsurface water.

On tilled fields, ensure sufficient soil profile depth to retain productivity where benches will develop. Soil upslope of barriers will gradually build up while soil down slope of the barrier will be removed.

Established vegetative barriers systems can pond water above the barriers. Subsurface drains may need to be installed across the slope parallel to the barrier, or through the ponded areas above barriers that are installed across concentrated flow areas.

When compatible with the purposes and criteria for this practice, plant materials can be selected to attract undesirable insects away from crops or desirable insects that are beneficial to the adjacent crops.

When compatible with the purposes and criteria for application of this practice, plant materials can be selected that enhance food and cover for targeted wildlife.

When compatible with the purpose and the barrier vegetation, avoid conducting activities within the barrier during the nesting season to minimize impacts to birds.

Stagger rows of planted vegetation to increase resistance to overland flow through the vegetated barrier

PLANS AND SPECIFICATIONS

Develop plans and specifications for each field or treatment unit according to the Criteria section requirements above, and Operation and Maintenance section requirements below. Specifications must describe the requirements to apply this practice to achieve the intended purpose. Record the following specification components in an approved NRCS CPS Vegetative Barrier (Code 601) implementation requirements document.

- Field map with location of vegetative barriers
- Purpose of the barrier
- Width of crop strip (when appropriate)
- Vegetative barrier and crop strip orientation (when appropriate)
- Width of each barrier
- Vegetative species and cultivar
- Establishment date, establishment method, seeding rate (when seeded), or spacing of vegetative planting stock
- Site stabilization, if needed to ensure establishment

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for this practice. Planned activities may include, but are not limited to—

- Establishment failures will be replanted or reseeded immediately; gaps in seeded barriers may be reestablished more effectively and immediately with transplanted plant material.
- Mowing of herbaceous barriers may be used as a management practice to encourage the development of a dense stand and prevent shading of crops in adjacent fields. Mow at a 15-inch stem height, or the recommended height for the species, whichever is taller.
- Barriers may be burned (where permitted), if the species used will tolerate fire. Carry out burns just prior to the spring regrowth period, while the vegetation is dormant. All burns will be conducted in accordance with a smoke/burn management plan.
- Control weeds as necessary to ensure a dense stand within the barrier.
- Perform pest control with techniques and pesticides that will not significantly damage the vegetative barrier.
- Washouts or rills that develop will be filled and replanted immediately. Gaps in established barriers will be reestablished with transplanted plant material.

REFERENCES

Dabney, S.M., Z. Liu, M. Lane, J. Douglas, J. Zhu and D. C. Flanagan. 1999. Landscape benching from tillage erosion between grass hedges. *Soil Tillage Res.* 51:219-231.

Dewald, C., J. Henry, S. Bruckerhoff, J. Ritchie, D. Shepard, J. Douglas, and D. Wolfe. 1996. Guidelines for the establishment of warm season grass hedge for erosion control. *J. Soil Water Conserv.* 51(1):16-20.

Douglas, J.L., and C.E. Mason. 1996. An alternative erosion control practice for cropland. USDA NRCS Jamie L. Whitten Plant Materials Center Progress Report. 12(7).

Dunn, G.H., and S.M. Dabney. 1996. Modulus of elasticity and moment of inertia of grass hedge stems. *Trans. American Society of Agricultural and Biological Engineers* 39(3):947-952.