

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

GRASSED WATERWAY

(Ac.)

CODE 412

DEFINITION

A shaped or graded channel that is established with suitable vegetation to carry surface water at a non-erosive velocity to a stable outlet.

PURPOSE

- To convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding.
- To reduce gully erosion.
- To protect/improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where the soil loss reduction can be achieved by using this practice alone or in combination with other conservation practices.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct grassed waterways to comply with all Federal, State, and local laws and regulations.

Capacity. As a minimum design the waterway to convey the peak runoff expected from the 10-year frequency, 24-hour duration storm. Increase capacity as needed to account for potential volume of sediment expected to accumulate in the waterway between planned maintenance activities.

When the waterway slope is less than 1 percent, out-of-bank flow may be permitted if

such flow will not cause excessive erosion. At a minimum, design the waterway to remove the water before crops are damaged.

Stability. Determine the minimum depth and width requirements for stability of the grassed waterway using the procedures in the NRCS National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 7, Grassed Waterways; Agricultural Research Service (ARS) Agriculture Handbook 667, Stability Design of Grass-Lined Open Channels; or other equivalent method.

Do not exceed the maximum velocities in the table below:

Vegetation	Maximum Permissible Velocity
Bermuda	4.0 feet/second
Tall Fescue or Bahia	3.0 feet/second
Sericea Lespedeza	2.5 feet/second

Use stone center or lined waterway sections where vegetation alone will not provide adequate stability. As a minimum, provide adequate capacity to convey the peak rate of runoff from the 1-year, 24-hour storm in the lined section of the waterway.

Shape. Use a parabolic or trapezoidal cross section for the grassed waterway shapes. On trapezoidal waterways used a level bottom across the entire bottom width of the channel section.

Width. Keep the bottom width of trapezoidal waterways less than 100 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

Use a minimum top width of 25 feet for grassed waterways installed in cropland, which will be crossed by farm equipment.

Side slopes. Keep the side slopes flatter than a ratio of two horizontal to one vertical.

Accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway in the designed width.

Keep side slopes four horizontal to one vertical or flatter when the waterway will be crossed by farm equipment.

Depth. Provide adequate capacity in the waterway to ensure that the water surface of the waterway is below the water surface of the tributary channel, terrace, or diversion that flows into the waterway when both are flowing at design depth. Use a minimum depth of one foot in waterways installed in cropland.

Provide freeboard above the designed depth when flow must be contained to prevent damage. Provide freeboard above the designed depth when the vegetation has the maximum expected retardance. Use a minimum freeboard of 0.25 feet.

Drainage. When needed to help or keep vegetation established on sites having prolonged flows, high water tables, or seepage problems, include Subsurface Drains (606), Underground Outlets (620), stone center waterways or other suitable measures in waterway designs.

Outlets. Provide a stable outlet with adequate capacity. The outlet can be another vegetated channel, an earthen ditch, a grade-stabilization structure, filter strip or other suitable outlet.

Vegetative Establishment. Vegetate grassed waterways according to NRCS Conservation Practice Standard Critical Area Planting (342).

Select species suited to the current site conditions and intended uses. Select species that have the capacity to achieve adequate density, height, and vigor within an appropriate time frame to stabilize the waterway.

Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, rock, straw or hay bale dikes, fabric checks, filter fences, or runoff diversion to protect the

vegetation until it is established. Planting of a close growing crop, e.g. small grains or millet, on the contributing watershed prior to construction of the grassed waterway can also significantly reduce the flow through the waterway during establishment.

Prepare a vegetative plan for each grassed waterway that specifies:

- Seedbed preparation
- Time of seeding
- Grass species to be planted
- Seeding rate
- Mulching rate
- Method of anchoring mulch
- Lime and fertilizer requirements

Prior to planting, provide a copy of the vegetative plan to the land user responsible for planting and maintaining the waterway.

Use Grassed Waterway, Georgia Conservation Practice Job Sheet 412 or a similar document to develop the plan.

Installation Sequence. Install and successfully vegetate grassed waterways prior to the installation of terraces, diversions, and other components of the water disposal system that drains into the waterway.

On deep sands, grassed waterways will have either (1) a stable vegetative cover, vegetated disposal areas, or filter strips established at least one full growing season (for the desired perennial vegetation) before the water management systems are constructed or (2) underground outlets can be installed concurrently with the other components of the water management system, in lieu of the grassed waterway

On soils in hydrologic group A or B not rated as "too sandy" and soils in hydrologic group C or D, grassed waterways may be installed concurrently with the water management system if either the drainage area is so small or the waterway slope is so gentle that vegetation can establish without rill or gully erosion occurring while the vegetation becomes established. This condition will be determined by considering the sites' erodibility,

waterway slope and velocity, and drainage area.

If favorable conditions do not exist for concurrent installation of the water management system and establishment of vegetation, then either (1) grassed waterways will be established at least one full growing season (for the desired perennial vegetation) before the water management system is constructed or (2) underground outlets will be installed concurrently with the system.

CONSIDERATIONS

Establish an appropriate width of vegetation on one or both sides of the waterway or add other sediment control measures above the waterway such as residue management to improve water quality and reduce sediment deposition in the waterway. Consider increasing the channel depth and/or designing areas of increased width or decreased slope to trap and store sediment to reduce the amount of sediment that leaves a field. Be sure to provide for regular cleaning out the waterway when trapping sediment in this manner.

Avoid areas where unsuitable subsurface, subsoil, substratum material that limits plant growth such as salts, acidity, root restrictions, etc., may be exposed during implementation of the practice. Where areas can not be avoided, seek recommendations from a soil scientist for ameliorating the condition or, if not feasible consider over-cutting the waterway and add topsoil over the cut area to facilitate vegetative establishment.

Avoid or protect if possible important wildlife habitat, such as woody cover or wetlands when determining the location of the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways so they do not interfere with hydraulic functions. Medium or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g., riparian areas, wooded tracts and wetlands. When possible, select species of vegetation that can serve multiple purposes, such as benefiting wildlife, while still meeting

the basic criteria needed for providing a stable conveyance for runoff.

Water-tolerant vegetation may be an alternative to subsurface drains or stone center waterways on some wet sites.

Use irrigation in dry regions or supplemental irrigation as necessary to promote germination and vegetation establishment.

Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

Consider including diverse legumes or other forbs that provide pollen and nectar for native bees. In dry regions, these sites may be able to support flowering forbs with higher water requirements and thus provide bloom later in the summer

The construction of a grassed waterway can disturb large areas and potentially affect cultural resources. Be sure to follow state cultural resource protection policies before construction begins.

Due to frequent high intensity rainfall during the summer months, establishment of satisfactory vegetative cover in the waterway is often difficult. Consider installing and vegetating waterways between September 1 and December 1 to avoid this problem.

When companion plants are included in the seeding mixture, limit the seeding rate of the companion plant to reduce the competition with the preferred perennial species.

Avoid planting with the slope in the waterway to aid in the establishment of vegetation in the waterway.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for grassed waterways that describe the requirements for applying the practice according to this standard. As a minimum include the following items in the plans and specifications:

- A plan view of the layout of the grassed waterway.

- Typical cross sections of the grassed waterway(s).
- Profile(s) of the grassed waterway(s).
- Disposal requirements for excess soil material.
- Site specific construction specifications that describe in writing the installation of the grassed waterway. Include specification for control of concentrated flow during construction and vegetative establishment.
- Vegetative establishment requirements.

OPERATION AND MAINTENANCE

Provide an operation and maintenance plan to review with the landowner. Include the following items and others as appropriate in the plan.

- Establish a maintenance program to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.
- Protect waterway from concentrated flow by using diversion of runoff or mechanical means of stabilization such as silt fences, mulching, haybale barriers and etc. to stabilize grade during vegetation establishment.
- Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods. Permit grazing in the waterway only when a

controlled grazing system is being implemented.

- Inspect grassed waterways regularly, especially following heavy rains. Fill, compact, and reseed damaged areas immediately. Remove sediment deposits to maintain capacity of grassed waterway.
- Avoid use of herbicides that would be harmful to the vegetation in and adjacent to the waterway area.
- Avoid using waterways as turn-rows during tillage and cultivation operations.
- Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition. Mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.
- Apply supplemental nutrients as needed to maintain the desired species composition and stand density of the waterway.
- Control noxious weeds.
- Do not use waterways as a field road. Avoid crossing with heavy equipment when wet.

REFERENCES

USDA, ARS. 1987. Stability design of grass-lined open channels. Agriculture Handbook 667.

USDA, NRCS. 2007. National Engineering Handbook, Part 650, Engineering Field Handbook, Chap. 7, Grassed waterways.