

**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 and vegetative protection are needed to control erosion resulting from concentrated runoff.

**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.** The minimum capacity shall convey the peak runoff expected from the 10-year frequency, 24-hour duration storm. Capacity shall be increased 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, the design

capacity shall remove water before crops are damaged.

**Stability.** Determine the minimum depth and width requirements for stabilization 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.

Waterway must outlet to a stable structure.

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

**Side slopes.** Keep the side slopes flatter than a ratio of two horizontal to one vertical. Accommodate maintenance and tillage/harvesting equipment crossings by designing the minimum side slope at 6:1.

**Depth.** The minimum waterway flow depth must be designed so that the water surface is below that of the tributary channel, terrace, or diversion flowing into the waterway.

Provide freeboard above the designed depth when flow must be contained to prevent damage. Freeboard shall also be provided when vegetation has the maximum expected retardance.

Channel depth shall be increased 0.3 feet, except on waterways of 1 percent or less where overflow is permissible in order to account for loss of channel capacity due to accumulation of plant residue, sedimentation or normal seedbed preparation.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service [Rhode Island](#) State Office or download it from the Rhode Island [electronic Field Office Technical Guide](#) (eFOTG).

**NRCS, RI  
February, 2010**

**Drainage.** Waterway designs shall include Subsurface Drains (606), Underground Outlets (620), stone center waterways or other suitable measures for establishing vegetation or maintaining existing vegetation on sites prone to prolonged flows, high water tables, or seepage.

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

**Vegetative Establishment.** Grassed waterways shall be vegetated according to Rhode Island NRCS Conservation Practice Standard Critical Area Planting, code 342. Species selection must suit current site conditions and intended uses. Selected species must 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, filter fences, or runoff diversion to protect the vegetation until established.

## CONSIDERATIONS

To improve water quality, reduce sediment deposition, and maintain wildlife habitat in the waterway, establish an appropriate width of vegetation on one or both sides of the waterway. Sediment control measures above the waterway such as residue management are also beneficial.

To reduce the volume of sediment leaving a field, consider increasing channel depth and/or designing areas of increased width or decreased slope to trap and store sediment. Frequent sediment removal in the channel is needed when trapping sediment in this manner.

During practice implementation, avoid exposing unsuitable substratum material that limits plant growth, such as salts, acidity, or root restrictions. Where exposure can not be avoided, seek recommendations from a soil

scientist for improving the conditions or, if not feasible, over-cut the waterway and add topsoil over the cut area to facilitate vegetative establishment.

Where turf reinforcement is considered for stabilization of erosive or unsuitable subsurface material, installation of turf reinforcement materials shall be done in accordance with manufacturer recommendations.

Avoid or protect important wildlife habitat, such as woody cover or wetlands when determining the location of the grassed waterway. When 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 supplemental irrigation as necessary to promote germination and vegetation establishment.

In areas where livestock and vehicular crossings may occur, provide adequate rock crossing design in accordance with Animal Trails and Walkways (575) and Access Road (560), to prevent damage to the waterway and its vegetation.

Consider including diverse legumes or other forbs that provide pollen and nectar for native bees.

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.

## 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 the plans and specifications shall include:

- A plan view of the grassed waterway.
- Typical cross sections of the grassed waterway(s).
- Profile(s) of the grassed waterway(s) with depth and existing channel grades shown on drawing.
- Seeding dates, seeding mixture (lbs./acre) and method of application for disturbed areas.
- Fertilizer and lime requirements and application rates in lbs. /sq. ft.
- Mulching requirements.
- Disposal requirements for excess soil material.
- Site specific construction specifications that describe the installation of the grassed waterway. Include specification for control of concentrated flow during construction and vegetative establishment.

## 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 or adjacent to the waterway.
- 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.
- Waterways are not to be used as turn-rows during tillage and cultivation operations. Waterways are not to be used as field roads. Avoid crossing with heavy equipment when wet.

## REFERENCES

Rhode Island NRCS Conservation Practice Standards

Critical Area Planting, (342)

Subsurface Drainage, (606)

Underground Outlet, (620)

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.