

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

GRASSED WATERWAY

(Acre)
CODE 412



DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

PURPOSES

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

- 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 such control can be achieved by using this practice alone or combined with other conservation practices.

CRITERIA

General Criteria Applicable To All Purposes.

Grassed waterways shall be planned, designed, and constructed to comply with all Federal, State, and local laws and regulations.

Capacity. The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. When the waterway slope is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum in such cases shall be the capacity required to remove the water before crops are damaged.

Velocity. Design velocities shall not exceed those obtained by using the procedures, "n" values, and recommendations in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-lined Open Channels.

Where site conditions warrant the use of a structural lining, the design shall be in accordance with NRCS conservation practice standard, Lined Waterway or Outlet, Code 468.

Width. Waterways and outlets shall be either parabolic or trapezoidal in cross section. The bottom width of trapezoidal waterways or outlets shall not exceed 100 feet unless multiple or divided waterways or other means are provided to prevent meandering of low flows. The minimum width shall be that necessary to carry the designed capacity either at or below designed depth. Waterways, which will be crossed by farm equipment, shall be designed to accommodate the land user's equipment.

Side Slopes. Side slopes shall not be steeper than a ratio of two horizontal to one vertical. They shall be designed to accommodate the equipment anticipated to be used for

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maintenance and tillage/harvesting equipment that will cross the waterway.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at, or below, the design water surface elevation in the terrace, diversion, or other tributary channel at their junction when both are flowing at design depth.

A minimum freeboard of 0.2 foot above the designed depth is required where the flows must be retained to prevent damage. This freeboard is above the designed depth when the vegetation has the maximum expected retardance.

Drainage. Designs for sites having prolonged flows, a high water table. Or seepage problems shall include as applicable subsurface drains (NRCS conservation practice standard Code 606), underground outlets (NRCS conservation practice standard Code 620), stone center waterways, or other suitable measures to avoid saturated conditions.

Minimum capacity of lined sections shall be the peak rate of runoff from the 1-year, 24-hour storm. The required stone size in relation to slope and depth of flow can be obtained from NEFH, Part 650, Exhibit 7-6.

Installation sequence. On deep sands and other soils in hydrologic group A or B rated as "too sandy", according to soil interpretations in the Field Office Computing System (FOCS) or Section II of the Field Office Technical Guide (FOTG), grassed waterways will have either (1) a stable vegetative cover, vegetated disposal areas, or filter strips established before the water management systems are constructed or (2) underground outlets installed concurrently.

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 before the water management system is constructed or (2) underground outlets will be installed concurrently with the system.

Outlets. All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earth ditch, a grade stabilization structure, filter strip, or other suitable outlet.

Waterways may outlet in crop fields when it is not practical to construct the outlet across the flat part of the field. A non-vegetated shallow channel should be constructed across the crop field meeting the following criteria:

1. The outlet will be stable and will not create undue scour or land degradation.
2. The grade of the waterway is less than 0.5% and deposition is occurring.
3. The occasional loss of crops is acceptable to the land user/operator when large rainfall events occur.

The release of water in crops is not recommended but may be allowed under the above restrictions.

Vegetative Establishment. Grassed waterways shall be vegetated according to NRCS conservation practice standard Critical Area Planting, Code 342.

Seedbed preparation, time of seeding, mixture rate, stabilizing crop, mulching, or mechanical means of stabilizing, fertilizer, and lime requirements shall be specified for each applicable area. Topsoil shall be stockpiled and spread to provide a seedbed for the vegetation.

Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, straw or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established.

CONSIDERATIONS

Important wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting 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. Mid- 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.

Proper planning, design and layout of grassed waterways is essential to enable erosion control vegetation to be established, used and maintained. The most critical time in successfully installing grassed waterways is when vegetation is being established. Special protection such as mulch anchoring, nurse crop, straw or hay bale dikes, filter fences or other diversion methods are warranted at this critical period. Supplemental irrigation may also be warranted. The vegetation should be well established before large runoff flows are permitted in the channel.

Where vegetation is to be established by seeding, consider limiting the maximum design velocity to not exceed 4 feet per second on erosion resistant soils and 3 feet per second on easily eroded soils.

In lieu of structural drainage measures, water-tolerant vegetation may be an alternative on some wet sites.

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

Establish filter strips on each side of the waterway to improve water quality.

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

Grassed waterways may affect the volume and rate of runoff. The effects of this practice on the water budget should be considered. A well established grassed waterway will reduce surface runoff and increase infiltration and percolation to the groundwater, trap sediment, and reduce nutrients and pesticides leaving the land. Where this is desirable, design velocities should be as low as practicable.

Consideration should be given to fencing the waterway where needed to protect the vegetation.

Many soils either do not need or are not well suited for a water management system. Reference will be made to soil interpretations in FOCS or Section II of the FOTG to determine those features that affect the construction function or might cause problems after construction. Some fields are not well suited to a system because they are too sandy, stony, shallow, or steep. Professional judgment should be used in evaluating the suitability for a water management system on fields with these soil features. Grassed waterways should be installed only where field conditions facilitate stable systems.

Grassed waterway channels should be protected from sediment deposition. If sediment delivery cannot be controlled before it reaches the waterway, consideration should be given to installing vegetative filter strips to intercept the sediment. Where possible, design velocities should be greater than 2 feet per second to avoid sediment deposition, especially at the outlet.

Consideration should be given for greater freeboard where the hazard potential increases.

Construction related effects on downstream water resources must be considered. Measures shall be taken during design, construction and vegetative establishment to minimize erosion and pollution. This may include details and specifications for such items as silt fences, hay bale barriers, temporary vegetation, mulching, etc.

PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterway shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

A vegetative plan shall be developed for each waterway or group of waterways. Vegetative treatment shall be applied as shown in the specifications or plans. Vegetation includes seedbed preparation, liming, fertilizing, seeding, and either natural mulch or manufactured mulches when needed.

Any job sheets, drawings, plans, or narrative statements needed shall be included in the plans and specifications.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.

Seeding shall be protected from concentrated flow and grazing until vegetation is established.

Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods.

Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be filled, compacted, and seeded immediately. Remove sediment deposits to maintain capacity of grassed waterway.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.

Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition.

Control noxious weeds.

Do not use as a field road. Avoid crossing with heavy equipment when wet.

REFERENCES

ARS Agricultural Handbook 667
NEFH, Part 650, Chapter 7
NRCS Conservation Practice Standards, Codes
Critical Area planting, Code 342
Lined waterway or Outlet, Code 468
Code 393
Subsurface Drain, Code 606
Underground Outlets, Code 620
Soil interpretations in Section II of the FOTG
FOCS, Technical Soils Report