

Grassed Waterway (Ac.) 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.

PURPOSES

This practice may be applied as part of a conservation 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. Grassed waterways shall not be designed for the conveyance of polluted runoff from livestock facilities.

The drainage area above the grassed waterway must be protected against erosion to the extent that expected sedimentation will not shorten the planned effective life of the grassed waterway. Alternatively, where the landowner does not control the drainage area, the design and operation and maintenance plan will account for expected sediment loading.

CRITERIA

General Criteria Applicable to All Purposes

Grassed Waterways shall be planned, designed, and installed to meet all federal, state, local and tribal 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 the water before crops are damaged. A maximum of 50 percent of the peak runoff from the 10-year frequency, 24-hour duration storm may be carried out-of-bank.

Grassed waterways that are part of a waste management system, for the diversion of clean water, shall have the capacity to carry the peak runoff from the 25-year frequency, 24-hour duration storm.

Stability. Design velocities shall be from 1.5 to 4.5 feet/sec. or those obtained by using the procedures, “n” values, and recommendations in the NRCS Engineering Field Handbook (EFH), Part 650, Chapter 7; whichever is less. Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels may be used in place of NRCS EFH, Chapter 7. Maximum velocities shall be determined using a retardance of “D” or less. See Exhibit 7-2 and Michigan Supplement Exhibits 7-2.1 and 7-2.2 in NRCS EFH, Part 650, Chapter 7.

Width. The bottom width of trapezoidal waterways shall not exceed 50 feet.

Side slopes. Side slopes shall not be steeper than a ratio of three horizontal to one vertical. Side slopes shall be designed to accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway.

Depth. The capacity of the waterway must be large enough so that the water surface of the waterway is

below the water surface of the tributary channel, terrace, or diversion that flows into the waterway at design flow.

The minimum total depth of the grassed waterway shall be 0.8 feet. When out-of-bank flow will cause erosion or other damage, a minimum of 0.2 feet freeboard above the designed depth shall be provided.

Earth Fill Areas - All steep gully banks shall be sloped before filling. The slope before filling shall not be steeper than a ratio of 1 horizontal to 1 vertical. Earth fill shall be compacted.

Drainage. Designs for sites having prolonged flows, a high water table, or seepage problems shall include: Subsurface Drains Practice Standard (606); Underground Outlets Practice Standard (620); Stone Center Waterways (NRCS Engineering Field Handbook (EFH), Part 650, Chapter 7), or other suitable measures to avoid saturated conditions.

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 earthen ditch, a grade stabilization structure, filter strip, or other suitable outlet.

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

Vegetative Establishment. Grassed waterways shall be vegetated according to NRCS Conservation Practice Standard Critical Area Planting (342).

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.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office

Technical Guide, Section II, Invasive Plant Species, for plant materials identified as invasive species.

CONSIDERATIONS

Consider the potential effects of installation and operation of Grassed Waterways on the cultural, archeological, historic and economic resources.

Consider vegetated filters and sediment traps, to reduce the amount of sediment that leaves a field.

Consider increasing the channel depth, and/or designing areas of increased width or decreased slope to handle sediment that will be deposited in the grassed waterway. 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 cannot 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.

Use supplemental irrigation as necessary to promote germination and vegetation establishment.

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

Establish filter strips on each side of the grassed waterway to provide wildlife habitat and improve water quality by reducing sediment, fertilizer, and pesticides entering the grassed waterway.

Use the Grassed Waterway Design Charts in the NRCS Michigan Supplement to Engineering Field Handbook (EFH), Part 650, Chapter 7, as appropriate. Simple design procedures may be used for drainage areas up to 80 acres depending on watershed slope and location.

Avoid or protect if possible important wildlife habitat, such as woody cover or wetlands when determining the location of the grassed waterway.

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

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

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

Encourage contour farming to reduce buildup of soil adjacent to the waterway from farming operations.

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 layout of the grassed waterway.
- 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.
- 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.

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

Support data documentation requirements are as follows:

- Inventory and evaluation records
 - Assistance notes or special report
- Survey notes, where applicable
 - Design survey
 - Construction layout survey
 - Construction check survey
- Design records
 - Physical data, functional requirements and site constraints, where applicable
 - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
 - Location map
 - “Designed by” and “Checked by” names or initials
 - Approval signature
 - Job class designation
 - Initials from preconstruction conference
 - As-built notes
- Construction inspection records
 - Assistance notes or separate inspection records
 - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

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.