

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.

The permissible velocity for waterways lined with vegetation of good cover and with proper maintenance shall not exceed 5 ft./sec. For channels with poor cover and little maintenance, the velocity shall not exceed 3 ft./sec.

Width - The bottom width of trapezoidal waterways shall not exceed 100 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

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 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 tributary channel, at their junction when both are flowing at design depth.

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

Protective Armor - When the grade of the waterway for any reach is sufficiently steep to create velocities greater than 5 ft. per sec., a protective armor of a 3-dimensional nylon filament

mat may be used. In these cases the maximum velocities shall not exceed 10 ft./sec. When velocities exceed 10 ft./sec. for any reach, the waterway for that reach shall be designed in accordance with Practice Standard (468) Lined Waterway or Outlet.

Drainage - Designs for sites having prolonged flows, a high water table, or seepage problems shall include NRCS Practice Standard (606) Subsurface Drains, (620) Underground Outlet, stone center drain 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.

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

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.

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 it is established.

CONSIDERATIONS

The most critical time in successfully installing grassed waterways is when vegetation is being established. Special protection such as mulch anchoring, straw or hay bale dikes, or other diversion methods are warranted at this critical period. Supplemental irrigation may also be warranted. The vegetation should be well established before large flows are permitted in the channel.

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.

Water-tolerant vegetation may be an alternative 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.

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

Planning

1. The drainage area must be treated adequately against sheet and rill erosion before a grassed waterway is installed to keep sediment from damaging the vegetation and reducing capacity of the grassed waterway.
2. Vegetated waterways perform most dependably in areas where dense stands of sod forming perennial grass can be used that will permit increasing water velocities several feet per second as compared to the bare earth channel. When only shallow rooted annual species can be maintained, safe velocities cannot appreciably exceed those for bare earth. When annual species are the only choice for waterway cover, supporting grade control structures will usually be needed for gully control.
3. Planting should be timed so plants will be established prior to expected runoff. Grassed outlets are easily damaged by continuous flows over long periods. Waterways receiving irrigation tailwater or prolonged trickle flows from snow melt will often require mechanical conveyances of sufficient capacity to contain the low-volume sustained flows.
4. Where irrigation water is available for establishment and maintenance, properly vegetated waterways can often provide esthetically pleasing solutions to erosion control problems for parks, golf courses and other green-belt areas. In such settings the waterways will require protection from

excessive traffic. Turf grasses that will withstand close frequent mowing should ordinarily be used for waterways on non-agricultural land.

5. Waterways require protection from channel flows until the vegetation is fully established and must have continuous protection from damage by vehicular traffic and grazing. Herbicides that would damage the cover must not be used. When temporary berms or dikes are used to keep runoff from entering the waterway during establishment, allow sufficient distance from the waterway edge to accommodate removal without damaging the waterway.
6. Invading pocket gophers can cause excessive damage to waterways if not controlled. Maintenance plans should make provisions for prompt eradication.
7. Waterway shaping must be completed and associated mechanical structures (drops, pipes, permanent sprinkler systems, etc.) installed and inspected for conformance to design before starting vegetative measures.
8. The vegetative species chosen must be compatible with the overall crop management system. This is of special importance when selecting perennial or reseeding type annual species.
9. Annual species used for erosion control should be capable of rapid vigorous establishment and growth. Species should be selected for machine operations minimal and avoid use of equipment when soils are wet.
10. The planting mixture will be in conformance with the Vegetative Guide in Section II-D of the Field Office Technical Guide.
11. When used as a stable outlet for another practice, waterways may increase the likelihood of dissolved and suspended pollutants being transported to surface waters when these pollutants are delivered to the waterway.

Cultural Resources Considerations

NRCS' objective is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice will have any effect on any cultural resources.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

GM 420, Part 401, the California Environmental Handbook and the California Environmental Assessment Worksheet provide guidance on how the NRCS must account for cultural resources. The Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Endangered Species Considerations

Determine if installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS' objective is to benefit these species and others of concern, or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates that the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

This practice is used either to stabilize an active gully or serves as a stable outlet channel for contouring, contour stripcropping, diversions, terraces, rock barriers, water control structures,

hillside ditches, and underground outlets. Since they are usually installed in areas of concentrated flow, their effect on the quantity of ground and surface water is minor. There may be a slight reduction in the peak discharge from the drainage area.

1. Effects on the components of the water budget, especially on volumes and rates of runoff.

Water Quality

This practice may reduce the erosion in a concentrated flow area, such as in a gully or in ephemeral gullies. This may result in the reduction of sediment and substances delivered to the receiving waters. Vegetation may act as a filter in removing some of the sediment delivered to the waterway, although this is not the primary function of a grassed waterway.

Any chemicals applied to the waterway in the course of treatment of the adjacent cropland may wash directly into the surface waters in the case where there is a runoff event shortly after spraying.

1. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substance carried by runoff.
2. Filtering effects of vegetation on movement of sediment and dissolved and sediment-attached substances.
3. Short-term and construction-related effects on downstream water resources.

PLANS AND SPECIFICATIONS

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

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.