

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.

PURPOSE

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 one 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.

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.

**NRCS, MT
June 2002**

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard contact the Natural Resources Conservation Service.

NOTE: This type of font (AaBbCcDdEe 123..) indicates NRCS National Standards.
This type of font (AaBbCcDdEe 123..) indicates Montana Supplement.

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.

Drainage. Designs for sites having prolonged flows, a high water table, or seepage problems shall include Field Office Technical Guide (FOTG), Section IV—Practice Standards and Specifications, 606—Subsurface Drains, 620—Underground Outlets, Stone Center Waterways, 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 FOTG, Section IV—Practice Standards and Specifications, 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.

Waterway shaping should be done at a time of year to allow for seeding and adequate growth of vegetation to provide protection for the following runoff season.

When waterway cannot be seeded at the time to provide adequate cover, the site will be mulched with straw or a fast growing temporary cover crop will be planted to provide protection. See FOTG, Section IV—Practice Standards and Specifications, 484—Mulch, or 340—Cover Crop.

All dormant seeding shall be planted in a temporary cover or mulched to provide soil protection during the winter and following spring.

Spring seeding should only be completed when there is enough soil moisture to germinate the seed and maintain growth. This usually requires at least 18 to 24 inches of moist soil.

Establishment of permanent vegetation is required on all waterways.

Seedbed Preparation

The seedbed will be prepared to a minimum depth of two inches without mulching and four inches when area is mulched.

The seedbed will be firmed when establishing grass without mulch; it will not be packed when the area is to be mulched. See FOTG, Section IV—Practice Standards and Specifications, 512—Pasture / Hayland Planting for more details on seed bed preparation.

Fertilization

Where topsoil is removed during construction, fertilization on remaining subsoil will be necessary in most cases. Fertilizer should be based on soils test, if there is not a soils test, apply a minimum of 30 pounds of N and 40 pounds of P₂O₅—unless there is potential for nutrient runoff. In such case no fertilizer should be applied until after vegetation establishment.

Additional nitrogen may need to be applied when mulching:

MULCH LBS.	NITROGEN LBS./AC.
4,000	15
5,000	20
6,000	25

After establishment, occasional applications of fertilizer may be applied to invigorate vegetative growth.

Mulching

Mulching or temporary cover is required where design flow rates are in excess of three feet per second. Use a minimum of 4,000 to a maximum of 6,000 pounds per acre of clean grain straw. Mulching shall be anchored two to four inches deep.

Temporary Cover Crop

Prepare firm, clean, well packed seedbed. Plant temporary cover in prepared seedbed. Drill seed in two operations—one at an angle to the other.

Plant one of the species listed below.

CROP SPECIES	SEEDING RATE		PLANTING	
	LBS./AC.	DEPTH	METHOD	DATE
Sorghums	30	2"	drill	06/01–07/15
Spring wheat	60	2"	drill	05/01–07/01
Barley	80	2"	drill	05/01–07/01
Oats	60	2"	drill	05/01–07/01

Waterway seeding rates and time

SPECIES	RATE PLS LBS./AC.	TIME	
		SPRING	DORMANT
Western wheatgrass	12	05/01–05/30	10/25–04/01
Thickspike wheatgrass	10	05/01–05/30	10/25–04/01
Smooth brome	10	05/01–05/30	10/25–04/01
Kentucky bluegrass	6	05/01–05/30	10/25–04/01
Reed canarygrass	8	05/01–05/30	10/25–04/01
Creeping meadow foxtail	6	05/01–05/30	10/25–04/01
Intermediate wheatgrass	14	05/01–05/30	10/25–04/01
Pubescent wheatgrass	14	05/01–05/30	10/25–04/01

Recommended grass species for waterways

SPECIES ^{1/}	HEIGHT GROWTH CHARACTERISTIC	CLIMATIC MINIMUM PRECIPITATION RANGE	WET LAND	TEXTURE ALKALINE SLIGHTLY/ FINE	ADAPTATION SOIL SALINE OR		
					MODERATE	MEDIUM (4-8 mmhos)	COARSE (8-15 mmhos)
Western wheatgrass	short	12+	fair	good	fair	good	fair
Thickspike wheatgrass	short	12+	poor	fair	good	good	poor
Smooth brome	medium	12+	poor	good	poor	good	poor
Kentucky bluegrass	short	18+	poor	good	poor	poor	poor
Reed canarygrass	tall	^{2/}	good	good	good	poor	poor
Creeping meadow foxtail	medium	^{2/}	good	good	good	fair	poor
Intermediate wheatgrass	medium	15+	poor	good	poor	fair	poor
Pubescent wheatgrass	medium	12+	poor	good	fair	fair	poor

^{1/} All species are sod forming

^{2/} Requires moist soil for good growth

Planting Procedures

1. Seeding methods and equipment
 - a) drill with double disc grain drill or grass seed drill in a serpentine fashion to minimize direct water flow down drill rows;
 - b) broadcasting—tailgate seeder or with hand equipment before packing. Seeding rate must be doubled when broadcasting. For best results a harrow should be used to cover seed after broadcasting.
2. Spring plantings—seed after spring runoff.
3. Planting into temporary cover—dormant seed grasses

Weed Control

Chemical

Use herbicides before planting to control any perennial or annual weeds, and past emergent once established.

Where potential for environmental degradation may occur, herbicides should NOT be used.

Mechanical

Clip weeds prior to seed head formation or harvest as a hay crop. Excess vegetation should be removed.

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.

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, **if necessary**, on each side of the waterway to improve water quality.

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

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).

A grassed waterway plan will include:

1. **Design soil map unit, planning, and soil map of the field with area being treated outlined.**
2. **Topography map with outline of watershed for waterway.**
3. **Planting job sheet from FOTG, Section IV—Practice Standards and Specifications, 512—Pasture Hayland showing pounds PLS designed, planted, and vegetative species including cultivar.**
4. **Soil test—if procured.**
5. **Seedbed preparation, fertilization, vegetative establishment date, seeding, and timing.**
6. **Calculations of cut, fills, total of yardage moved including survey notes and associated notes.**

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.

Remove excess vegetative growth annually.

Repair any damage to the waterway at the end of the runoff period. Fill all rills or gullies and reseed.

Keep sides leveled so water will always flow into the waterway and not cause rilling to the outside of waterway.