

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.

The soil, hydrology and vegetative characteristics existing on the site and the contributing watershed shall be documented before construction of the waterway begins.

PURPOSES

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

The effect of any modification to the existing surface and/or subsurface drainage system on other landowners will be evaluated in the design. Surface and subsurface drainage that affects upstream or downstream landowners shall have written permission.

- To convey runoff from terraces, diversions, or other water concentrations without causing erosion, flooding or ponding.
- To reduce gully erosion.
- To protect/improve water quality.

Capacity. The minimum capacity shall be that required to confine the peak runoff expected from a storm of 10-year frequency, 24-hour duration obtained by using the procedure in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 2.

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.

When the waterway grade is less than 1 percent, out-of bank flow may be permitted if such flow will not cause excessive erosion. The minimum capacity in such cases shall be that required to carry within the channel the discharge as determined by using the "B" drainage curve.

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.

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. Velocities that are less than 1.5 feet per second shall require special considerations in the O & M section.

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

Width. The bottom width of trapezoidal waterways shall not exceed 50 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 used for normal farming operations.

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

Depth. The minimum design 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.

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

Outlet. All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages.

Vegetative Establishment. Whenever possible, excess water shall be directed away from the waterway until vegetation is established. Any protective works shall be removed and the disturbed areas within the waterway cross section seeded to permanent grass after the vegetation in the waterway is established.

Apply lime as needed to adjust pH to at least 6.5.

Fertilize according to soil tests or at a minimum rate of 500 lbs. of 12-12-12 fertilizer, or its equivalent, per acre as soon as the waterway has been constructed within the seeding periods.

Seed with one of the following mixes.

Note: Switchgrass / Redtop mix should be seeded only in the spring and only on waterways with drainage areas of 10 acres or less.

Mixes	lbs. of PLS*/acre	Comments
Tall Fescue	35	Fits most situations
Creeping Red Fescue	12	Shady sites, low velocity sites
Kentucky Bluegrass	10	
Kentucky Bluegrass	45	Low velocity sites
Orchardgrass Perennial Ryegrass	10	PRG** for quick establishment, Orchardgrass may take two years to establish.
	8	
Orchardgrass Redtop	8	Redtop for quick establishment. Best seeded in the spring
	3	
Switchgrass Redtop	8	Seed before June 30. 10 acre maximum watershed
	1.5	
Redtop	8	Quick establishment, low fertility sites.
Orchardgrass Timothy Perennial Ryegrass	6	PRG** for rapid growth. Best seeded in the fall.
	3	
	4	
Timothy Perennial Ryegrass Tall Fescue	4	Best seeded in the fall
	8	
	6	

The following species may be added for additional wildlife value.

Partridge pea	2 lb./ac.	
Annual Lespedeza	2 lb./ac.	South of I-70
Ladino Clover	0.25 lb./ac.	
Timothy	1 lb./ac.	

*Pure Live Seed **Perennial Rye Grass

Work the fertilizer and lime into the soil to a depth of 2 to 3 inches with a harrow or disk. Prepare a firm seedbed with a cultipacker or cultipacker type seeder.

Seeding Date Criteria

Species/Mix	IN seeding Dates*
Cool Season grasses	3/1-5/15 or 8/1-9/15
Legumes	3/1-5/15 or 8/1-9/15
Warm season grasses	4/1-6/15
Forbs	4/1-6/15

* Seeding which includes Tall Fescue and/or Perennial Ryegrass and a mulch cover may extend to 9/30 for fall seeding due to the reduced time for germination and range of cold tolerance.

Dormant Seeding is not an acceptable method.

Broadcasting of warm season grasses should only be done into a prepared seedbed with protection from erosion as a consideration.

Erosion Control Blanket

An erosion control blanket (ECB) shall be installed on all grassed waterway sections where either of the following exists:

1. The velocity at D retardance is 3.0 feet per second (fps) or greater.
2. Earthfill is used to fill in an eroded area.

The blanket shall be a minimum of 1-ply netting sewn to a straw, excelsior or other accepted mulch material. Severe conditions, such as high velocities coupled with greater depth and/or low likelihood of rapid vegetative establishment will require a heavier ECB. The blanket shall cover the waterway to at least half of the design depth. Installation shall be according to the manufacturer's recommendations.

After temporary seeding only, if the waterway is stable and needs no additional earthwork and the temporary seeding is adequate and the waterway

can be seeded with a no-till drill then the erosion control blanket requirement may be waived.

Temporary Seeding:

Waterways constructed between May 15th and August 1st shall be seeded with one of the following species :

Oats @ 2 bushel (64lb.) per acre PLS

Japanese or Pearl Millet @ 30 lb. per acre PLS

Sorghum – Sudan Grass @ 20 lb. per acre PLS

CONSIDERATIONS

Generally, the design velocity for capacity should be based on "C" retardance and the stability should be based on "D" retardance. For sites where Switchgrass / Redtop mixtures are desirable, "B" and "D" retardance should be used.

Special attention should be given to maintaining and improving visual resources and habitat for wildlife where applicable.

The soil loss from the watershed draining into the waterway should be evaluated when the sedimentation from upland erosion on land not controlled by the landowner/user will impair the proper functioning of the waterway.

The waterway should not be constructed until a consideration of upstream erosion control is in place or appropriate land use and/or management changes, have been made to reduce the erosion to an acceptable level.

If possible, consider constructing all waterways with 1 foot of depth as a minimum.

Reducing the amount of trickle flow will enhance vegetative establishment and improve the stability of the waterway. Surface water inlets at the upper reaches of waterway systems may be used to accomplish this. Design drainage according to the "CSM" method in the Engineering Field Handbook Chapter 7.

Water-tolerant vegetation may be an alternative on some wet sites. Contact the NRCS State

Forester/Botanist for assistance in selecting appropriate species.

To reduce the risk of vegetative failure, consider using mulch or erosion control blankets on all waterways with velocities greater than 1.5 fps to protect the soil until vegetation is established. Refer to FOTG Standard 484, Mulching, for guidance on materials, quantities and techniques for mulching and erosion control blankets.

Consider increasing the seeding rates by at least 50% on sites considered to be at high risk due to soil type, velocity or other conditions.

An application of 150 lbs. of actual N per acre should be applied to waterways with high design velocity and low in organic matter and fertility, 6 to 8 weeks after seeding. Nitrogen should only be applied to grass during periods of active growth.

Use irrigation in dry regions or supplemental irrigation as necessary to promote germination and vegetation establishment.

Establish filter strips on each side of the waterway to improve water quality since any chemicals applied to the waterway in the course of treatment of adjacent cropland may move directly into the surface waters in the case where there is a runoff even shortly after spraying.

Add 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).

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.

Grazing shall not be permitted in the grassed waterway unless a controlled grazing system is being implemented. Grazing will be permitted under a controlled grazing system only when soil moisture conditions support livestock traffic without excessive compaction. Warm season grasses should not be grazed closer than 10 inches and cool season grasses should not be grazed closer than 6 inches.

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

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. Mowing may be appropriate to enhance wildlife values, but must be conducted at a time to avoid peak nesting seasons and reduced winter cover.

Mow or periodically graze vegetation to maintain a healthy, vigorous sod and to maintain capacity and reduce sediment deposition. Time the first mowing after ground nesting birds have hatched (about July 15).

Control noxious weeds.

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

Fertilize waterways according to soil tests (not to exceed 500 lbs./acre of 12-12-12, or equivalent) the first spring or fall after seeding and thereafter as necessary to maintain a vigorous stand of grass. Caution should be used during fertilization to maintain water quality.

Repair all broken subsurface drain lines adjacent to or in the waterway.

Re-establish vegetative cover immediately where scour erosion has removed established seeding.

Maintain effective erosion control of the contributing watershed to prevent siltation in the waterway and the resulting loss of capacity.

Velocities that are less than 1.5 feet per second require special attention. The waterway shall be mowed to maintain a maximum grass height of 6 inches. Sediment deposits shall be removed as quickly as possible to maintain the capacity and integrity of the waterway.

REFERENCES

NRCS Engineering Field Handbook Part 650, Chapter 2. Estimating Runoff and Peak Discharges, 1990

NRCS Engineering Field Handbook Part 650, Chapter 7. Grassed Waterways, 1986

Agricultural Research Service, Agricultural Handbook 667, Stability Design of Grass-lined Open Channels.

Minnesota NRCS Field Office Technical Guide, Practice Standard, Grassed Waterway Code 412.

Missouri NRCS Field Office Technical Guide, Practice Standard, Grassed Waterway Code 412.

Indiana NRCS Field Office Technical Guide, Practice Standard, Filter Strips Code 393.