

# Grassed Waterway

**Definition:** A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.

**Purpose:** To convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding and to improve water quality.

**Conditions Where Practice Applies:** All sites where added capacity, vegetative protection, or both are required to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other water control practices.

## Planning Considerations

**Water Quantity:** Effects upon components of the water budget, especially effects on volumes and rates of runoff should be considered.

### Water Quality:

1. Filtering effects of vegetation on the movement of sediment, and dissolved and sediment attached substances will be evaluated. Suspended pollutants may move more quickly to a receiving water body.
2. Effects on the visual quality of the water resources will be evaluated. Concentrated erosion may be controlled or eliminated by the practice installation.
3. Short-term and construction-related effects on the quality of water resources will be considered.

## Design Criteria

**Capacity:** The minimum capacity for grassed waterways shall be that required to confine the peak runoff expected from the storm of 10-year frequency (24-hour duration), except that on slopes of less than 1 percent out-of-bank flow may be permitted where such flow will not cause erosion or flood damage.

In cases where the waterway is to convey flows from a structure that is designed for a greater capacity than the 10-year frequency, the waterway will be designed to handle the same peak runoff as the structure without causing damage by erosion or flooding.

**Velocity:** Design velocities shall not exceed those contained in Table 4.

**Width:** The channel will be parabolic or trapezoidal. The bottom width of trapezoidal channels shall not exceed 50 feet. The top width of parabolic section shall not exceed 60 feet. Side slopes shall not be steeper than 4:1.

**Depth:** Minimum depth of a waterway receiving water from terraces, diversions, or other tributary channels shall be that depth required to keep the design water surface elevation in the waterway 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:** Subsurface drains, underground outlets, stone center waterways, or other suitable measures shall be provided

in the design for sites having prolonged flows, a high water table, or seepage problems. Water-tolerant vegetation such as reed canarygrass may be an alternative on some wet sites.

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

**Protection:** Grassed waterways, including some natural draws, may need flow protection until the establishment of vegetation.

**Establishment of Vegetation:** Grassed waterways will be vegetated according to the attached specification guide.

## Design Aids

Appendix B may be used for estimating the runoff expected from a drainage area. Other guides which may be used include Chapter 2 of the Soil Conservation Service Engineering Field Handbook and SCS Technical Release 55.

The design for capacity and stability may be calculated by Manning's equation by taking into consideration the degrees of retardance of various vegetal covers. Designs will normally be based on retardance "D" for stability and permissible velocity and retardance "C" for capacity (top width and depth). Design procedures are outlined in detail in Chapter 7, Engineering Field Handbook.

**Table 4** — Permissible velocities for grassed waterways

Soil Texture	Permissible Velocity				
	Bare Channel	Retardance <sup>1</sup>	Channel Poor	Vegetation Fair	Condition Good
	ft/s			ft/s	
Sand, silt, sandy loam, & silty loam	1.5	B	2.0	3.0	4.0
		C	1.5	2.5	3.5
		D	1.5	2.0	3.0
Silty clay loam & sandy clay loam	2.0	B	3.0	4.0	5.0
		C	2.5	3.5	4.5
		D	2.0	3.0	4.0
Clay	2.5	B	3.5	5.0	6.0
		C	3.0	4.5	5.5
		D	2.5	4.0	5.0
Coarse gravel	5.0	B, C, or D	5.0	6.0	7.0
Cobbles & shale	6.0	B, C, or D	6.0	7.0	8.0

<sup>1</sup> See Table 2 - Diversions

## Operation and Maintenance

An O&M plan shall be developed to maintain waterway capacity, vegetative cover, and the outlet. The following items should be considered when developing the O&M plan:

- a. Avoid crossing with machinery when waterway is wet.
- b. Mow to control weeds and encourage development of a dense sod.
- c. Remove heavy growth that will smother grass-legume stand.
- d. Eroded areas should be reseeded or sodded promptly.
- e. Apply 400 to 500 lbs per acre of 10-20-20 fertilizer to newly seeded waterway during the second growing season. Apply fertilizer when needed thereafter to maintain a vigorous grass-legume cover.
- f. Do not permit spraying with herbicides that kill grass.

## Plans and Specifications

Plans and specifications for grassed waterways shall describe the requirements for applying the practice to achieve its intended purpose.

## Specifications

Areas to be excavated and areas to be occupied by spoil shall be cleared of trees, brush, and other debris as required for construction and maintenance.

Waterways shall be constructed to the line, grade, and section shown on the drawings. The excavated surfaces shall be reasonably uniform and smoothed in such a manner that normal seeding equipment can proceed with the establishment of vegetative cover without difficulty.

Spoil shall be placed or graded in such a manner that surface water may enter the waterway freely without scour. Spoil shall be used to fill depressions and shall be blended in with the surrounding topography.

All combustible refuse shall be burned or buried. When buried, all roots, brush, stumps, stones, and similar material shall be placed a minimum of 18-inches below finished grade. Runoff from diversions or other watersheds shall not be turned into the waterway until satisfactory vegetative cover or protection is established.

**Seeding and Mulching:** The following seed mixtures are the recommended combinations for vegetation of grassed waterways in pounds per acre:

a. Kentucky bluegrass	20
Redtop	3
White Clover or	2
Bird's-foot Trefoil	10

b. Ky 31 tall fescue	35
Creeping red fescue	30
Redtop	3
c. Reed canarygrass	25
Weeping love grass	1
d. Reed canarygrass	20
Bird's-foot trefoil	10
Redtop	3
e. Ky 31 tall fescue	40
Bird's-foot trefoil	10
Redtop	3
f. Orchard grass	10
Ladino clover	2
Redtop	3
g. Tall fescue	50

When using netting to anchor mulch, the strips should be placed parallel to the direction of flow of water. Waterways should be sloped so that netting will lay

evenly over the surface. Fasten ends of netting with wire staples 1 foot apart; fasten edges of netting with wire staples 3 feet apart. On steep waterways, wooden stakes 10 to 12 inches long should be used to replace one-fourth to one-third of the wire staples.

**General:** Construction shall be carried out in such a manner that erosion and air and water pollution will be minimized and held within legal limits. This shall be done by:

1. Placing spoil to prevent sloughing or washing into the ditch or watercourse.
2. Keeping chemicals, fuel, lubricant, sewage, and waste materials out of the ditch and drainage ways.
3. Establishing vegetation on all disturbed areas as soon as possible after exposure or disturbance, especially on ditch side slopes.