

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**GRASSED WATERWAY**

(Ac.)  
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**

This practice applies in areas where:

- added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff
- such control can be achieved by using this practice alone or combined with other conservation practices, and
- there is sufficient depth of suitable soil material to maintain an adequate stand of vegetation.

**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. Drainage area shall have adequate land treatment measures applied to minimize soil erosion.

**Utilities and Permits.** The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including the US Army Corps of Engineers, US Environmental Protection Agency, and Illinois Department of Natural Resources – Office of Water Resources, or document that no permits are required.

**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 waterway capacity in such cases shall be equal to or greater than the Q obtained from the “B” Drainage Curve in Chapter 14 of Part 650 of the National Engineering Handbook.

The vegetal retardance used to determine capacity shall be the maximum expected for the appropriate vegetation and condition.

The minimum velocity shall be 1.5 feet per second. If minimum velocities cannot be maintained, consideration should be given to using NRCS Conservation Practice Standard 607, Surface Drainage, Field Ditch, or 608, Surface Drainage Main or Lateral.

**Stability.** 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, Grassed Waterways 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. Where planned to be crossed by farm equipment, trapezoidal waterways should have a minimum bottom width of 10 feet.

**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. Where planned to be crossed by farm equipment, trapezoidal waterways shall have side slopes of 8:1 or flatter, and parabolic waterways shall have top width to depth ratio (T/d) equal to at least 24.

**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 at maximum vegetative retardance shall be provided when flow must be contained to prevent damage.

**Drainage.** Designs for sites having prolonged flows, a high water table, or seepage problems shall include NRCS Conservation Practice Standards 606, Subsurface Drain; 620, Underground Outlet, stone center waterways or other suitable measures to avoid saturated conditions. Where tile is used along the waterway it should be located as close to 1/3 of the channel top width from the center of the waterway as is practical. The top of the tile should be at least 2.0 feet below the bottom of the waterway, except where soil or outlet conditions make this depth unpractical.

**Standard Waterway Design.** Small areas within cropland and areas upslope from a grassed waterway may need to be shaped and seeded to control minor gully and furrow sized ephemeral erosion.

Areas meeting the following criteria may be shaped to meet the Design Aide for Small Grass Waterways as shown in the Engineering Field Handbook, Chapter 7, pages IL 7-48, 49 and 50, in lieu of calculating the capacity and stability criteria:

1. Drainage area and waterway grade combination falls below the curve for the applicable Illinois zone on IL 7-49 and IL 7-50.
2. Waterway slope is greater than 1.0 percent and less than 10 percent.
3. Waterway will be seeded and maintained to a vegetative retardance of at least D and no more restrictive than B retardance.

4. Soil and vegetation will withstand a velocity of 4.0 feet per second.

**Alignment.** Minor changes may be made to improve alignment. Care must be taken to avoid exposing soil materials that are not conducive to the establishment and maintenance of adequate vegetative cover, and to avoid exposure of existing tile lines.

**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

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.

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.

Where flow outside of and parallel to the waterway is likely from sediment buildup or farming operations,

consider the installation of small “kicker dikes” at regular intervals to force water into the design portion of the waterway.

On steeper waterways, where flows may cause ephemeral erosion to occur prior to vegetative establishment, consider installation of rock or filter fabric “checks” at regular intervals.

## PLANS AND SPECIFICATIONS

Prepare plans and specifications for each specific field site where a waterway will be installed. A plan includes information about the location construction sequence, vegetation establishment, management, and maintenance requirements.

### Plans and Specifications shall include:

- Length, width, and slope of the waterway.
- Channel dimensions of the waterway.
- Species selection and seeding or sprigging rates.
- Planting dates, care and handling of the seed to ensure that planted materials have an acceptable rate of survival.
- A statement that only viable, high quality and regionally adapted seed will be used.
- Site preparation such as stabilizing crop, mulching, or mechanical means of stabilizing, fertilizer, and lime requirements sufficient to establish and grow selected species.

## OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be prepared for and reviewed with the landowner or operator. The plan shall include the following items and others as appropriate:

- An O&M 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.
- 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.
- Repair broken tile lines or blowouts adjacent to or in the waterway immediately.

## REFERENCES

Agricultural Research Service, Agriculture Handbook 667, Stability Design of Open Channels.

National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 7, Grassed Waterways.

National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water Management (Drainage).

**NATURAL RESOURCES CONSERVATION SERVICE  
ILLINOIS SPECIFICATION**

## GRASSED WATERWAY

### Site Preparation

All trees, stumps, brush and debris shall be removed from the site and disposed of so that they will not interfere with construction or proper functioning of the waterway. They shall not be deposited or buried in a draw.

### Salvaging Topsoil

Where establishment of vegetation is determined to be a serious problem on subsoil, the best available soil will be stockpiled for respreading uniformly over the waterway area after grading.

### Construction

The soil removed from the waterway or outlet shall be deposited where it will not interfere with the flow of water into the waterway. This material can normally be deposited in low areas. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the completed waterway.

### Tolerances

The waterway will be constructed to the specified width and depth. The center of the waterway shall be the lowest point. Additional top width within tolerance shall be maintained and vegetated.

#### **Construction Tolerances**

Depth at Quarter Points	Plus or minus 0.2 feet
Top Width	Up to 10% wider

### Finish and Cleanup

Incorporate lime and fertilizer to a minimum depth of 3 inches leaving a firm seedbed free of large clods, stones, or debris, immediately prior to seeding. Fertilizer and lime are not required for temporary seedings less than 90 days. The waterway shall be vegetated as soon as possible.

### Vegetative Establishment

Use mulch anchoring, nurse crop, rock, straw or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established. Use a temporary vegetative cover during midsummer or after the fall seeding period to stabilize the

waterway until a permanent grass mixture can be seeded. Remove the stabilizing crop prior to seeding permanent grasses.

***NOTE: It is the landuser's responsibility to locate any existing file that may be under, along, or crossing a waterway prior to construction. The NRCS is not responsible for any tile damaged during construction.***

### Permanent Seeding: Conventional Method

Spread lime and fertilizer uniformly and work it into the soil to a depth of 3-4 inches with a disk or suitable equipment. Apply seed uniformly at a depth of ¼ to ½ inch with a drill or cultipacker-type seeder or broadcast and cover with a cultipacker, harrow, or similar tool. Do seeding and seed covering operations perpendicular to (across) the direction of flow in the waterway.

### Hydroseeding

Seed, fertilizer, lime and mulch may be applied together. Hydrated lime may not be used in the slurry mix. Slurry mixes will have no more than 125 lb. solids per 100 gallons of water. Minimum pH shall be 6.0 when inoculated legumes are included.

### Mulch and Anchoring

If mulch is required, it shall be applied uniformly and shall be anchored. Hay or straw may be anchored by a straight disk (operated across the direction of flow in the waterway), or a 1"x2" mesh hold-down netting. Commercial mulch products such as erosion net, excelsior blankets, or jute will be anchored as specified by the manufacturer.