

# STREAMBANK AND SHORELINE PROTECTION

(Feet)  
Code 580

Natural Resources Conservation Service  
Conservation Practice Standard

## I. Definition

Treatment(s) used to stabilize and protect banks of streams or constructed channels, lakes, reservoirs, or estuaries.

## II. Purposes

This standard may be applied as part of a conservation management system to support one or more of the following concerns.

- preventing the loss of or damage to land, utilities, roads, buildings, or other facilities adjacent to the banks
- maintaining the capacity of the channel and floodplain
- maintaining or restoring channel meander and velocity that would not adversely affect downstream facilities
- reducing sediment loads that cause degradation of habitat and water quality
- improving or protecting recreation, fish and wildlife habitat, and biodiversity

## III. Conditions Where Practice Applies

This practice applies to natural or excavated channels where the streambanks are susceptible to erosion from the action of water, ice, or debris or to damage from livestock or vehicular traffic. It also applies to controlling erosion on shorelines where the problem can be solved with relatively simple structural measures, vegetation, or upland erosion control practices. Failure of structural measures shall not create a hazard to life or result in serious damage to property.

It does not apply to erosion problems on the Great Lakes and similar areas of complexity not normally within the scope of the NRCS authority or expertise.

## IV. Federal, State, and Local Laws

Users of this standard should be aware of potentially applicable federal, state, and local laws, rules, regulations, or permit requirements governing streambank and shoreline protection. This standard does not contain the text of federal, state, or local laws.

## V. Criteria

Because each reach of a channel, lake, or estuary is unique, measures for streambank and shoreline protection must be installed according to a plan and adapted to the specific site. Recommended design procedures are located in the NRCS National Engineering Handbook (NEH), Part 650, Engineering Field Handbook (EFH), Chapters 3, 16, and 18.

Seeding shall be done in accordance with NRCS Field Office Technical Guide (FOTG) Section IV, Standard 342, Critical Area Planting.

Design top elevation of the practices shall be referenced to the ordinary high-water mark. Ordinary high-water mark is the point on the bank or shore up to which the presence and action of the water is so continuous as to leave a distinct mark by one of the following: erosion, destruction of terrestrial vegetation, or other easily recognized characteristics.

## A. General Criteria

Several general criteria apply to this practice. They are as follows:

1. Protective measures are to be consistent with land use objectives and compatible with improvements planned or being carried out by others.
2. Stabilization practices using gabions and riprap revetments are particularly effective in the following situations: sharp bends, at bridges where velocities are increased, along the opposite bank where another stream junctions, on large streams, and on

shorelines with wave and ice action or slumping due to seepage. Areas to be protected by these measures shall be sloped to a 1½ horizontal to 1 vertical side slope or flatter. The equivalent rock diameter and gradation shall be determined by the procedure in the Wisconsin supplement to EFH Chapter 16.

3. Vegetative protection and other bioengineering practices in conjunction with revetments or other structural measures on eroding banks can be used if the following conditions apply:
  - a. Storm frequency flow elevation or wave protection height is protected and velocity limits are met as designated in EFH Chapter 16.
  - b. The upper edge of stabilizing material for the toe is as follows.
    - 1 foot or more above base flow conditions
    - 1 foot or more above the seep line of the bank slope
    - to the bank-full flow elevation
  - c. Banks have a slope of 2 horizontal to 1 vertical or flatter.
  - d. Areas are not susceptible to frequent inundation.
4. Banks to be treated only with vegetation that need shaping to be stable shall be sloped to a 2 horizontal to 1 vertical side slope or flatter.
5. Banks to be treated only with vegetation may remain unshaped if the existing slope is stable.
6. Needed bank clearing to remove stumps, trees, or debris shall be an element for stabilization. Only the minimum necessary to accomplish the work will be performed.
7. Protection measures shall start and end at a stabilized or controlled point.
8. Control of surface runoff and internal drainage shall be addressed in the design and installation of all protection measures.

9. Excavated material shall not be pushed into the stream or lake or form barriers which interfere with runoff entering the natural drainage channels.
10. Material excavated shall be properly placed or removed and stabilized to prevent erosion.
11. Treatment measure designs shall account for soil textures, slope characteristics above and below the waterline, and the watertable.
12. Where livestock watering places are provided, the ramps leading to the low water shall be on a slope of 4 horizontal to 1 vertical or flatter. Surface and base materials and their thickness shall be as described for channel crossings in FOTG, Standard 560, Access Road.
13. Materials such as discarded auto bodies or tires shall not be used for protection.
14. Proposed new methods or materials shall meet or exceed the level of protection expected from conventional practices. They shall, at a minimum, be designed and installed according to manufacturer's specification data.

## **B. Streambank Design Criteria**

Several streambank criteria apply to this standard. They are as follows:

1. The channel grade must be controlled, either by natural or artificial means, before any permanent type of bank protection can be determined feasible. Protection shall be constructed to a depth well below the anticipated lowest depth of bottom scour.
2. Channel clearing to remove stumps, trees, debris, sand, and gravel bars or other hazards that cause turbulence or deflection of streamflow shall be an element of the work.
3. Changes in channel alignment or channel geometry shall be made only after an evaluation using current fluvial geomorphologic techniques. Effects on the land use, interdependent water disposal systems, hydraulic characteristics, wetlands, and existing structures, shall be investigated.

4. Structural measures must be effective for the design flow and be able to withstand greater flow events without serious damage. Structures shall also be designed to avoid an increase in erosion downstream.
5. Design criteria for livestock or equipment channel crossings are in FOTG, Standard 560, Access Road.
6. Fish habitat improvement or protection incorporated into streambank design shall be according to FOTG, Standard 395, Fish Stream Improvement. Information is provided in EFH Chapter 16.

### C. Shoreline Design Criteria

Shoreline criteria are as follows:

1. Improvements shall be designed to avoid or minimize the potential for increased erosion to an adjacent reach of shoreline.
2. Criteria for design rock sizing and gradation in EFH Chapter 16 shall be used.

## VI. Considerations

Additional recommendations relating to design that may enhance the use of, or avoid problems with, this practice but are not required to ensure its basic conservation functions are as follows.

### A. General Considerations

Several general considerations apply to this standard. They are as follows:

1. When protecting improvements such as utilities, roads, buildings, or other facilities, consideration will be given to items such as cost of stabilization compared to the value of the structure, the possibility of relocating the structure, the remaining service life of the structure, and the effect of the stabilization on the future management system of the landowner.
2. Consideration should be given to maintaining and increasing native vegetation.
3. Consideration should be given to minimal tree and brush removal to allow sunlight to pass through for the establishment of grasses or sod.

4. Bulkheads, including timber, concrete, concrete block, and other geotechnical material may be used for protective measures. They must be installed according to manufacturer's recommendations or as required in construction plans or specifications.
5. Revetments, including prefabricated slope protection blocks, riprap, gabions, soil cement, pilings, and other geotechnical material may be used for protective measures. They must be installed according to manufacturer's recommendations or as required in construction plans or specifications.
6. When planning streambank and shoreline protection, consider the following water quantity effects.
  - water budget, especially on volumes and rates of runoff, infiltration, deep percolation, and ground water recharge
  - downstream flows and aquifers that affect other uses and users
  - water table of near-by lands
  - interflow discharge into streams
7. When planning streambank and shoreline protection consider the following water quality effects.
  - vegetation filtering the movement of sediment, sediment attached and dissolved substances
  - erosion and movement of sediment and soluble sediment attached substances carried by runoff and streamflow
  - visual quality of on-site and downstream water resources
  - construction and vegetation establishment
  - changes in water temperatures
  - wetlands and water-related wildlife habitats for short and long-term periods

### B. Streambank Considerations

Several streambank considerations apply to this standard. They are as follows:

1. Classify the stream according to Rosgen's method to help determine its stage of erosion, and the degree or type of treatment to plan or design.
2. Deflectors, stream barbs, and jetties constructed of posts, pilings, fencing, rock, brush, or other materials that project into the stream may be used to protect the banks at the curves and reaches subjected to impingement by high velocity currents.
3. Pervious or impervious structures built on or parallel to the stream may be used to prevent scouring streamflow velocities adjacent to the streambank.
4. Artificial obstructions, such as fences or barriers, may be used to protect vegetation needed for streambank protection or to protect critical areas from damage by trail or vehicular traffic. Where needed, construct a permanent fence capable of excluding livestock from the streambanks. Refer to FOTG, Standard 382, Fence. Floodgates may be used at channel crossings, property fence lines, and at other fence lines. Refer to EFH Chapter 16 for an example of a floodgate.

### C. Shoreline Considerations

Shoreline considerations are as follows:

1. The following features of the site should be considered: along-shore currents, ice pressures, and water level fluctuations.
2. Observe adjacent stabilization resources and comparable sections of shoreline when available.

### VII. Plans and Specifications

Plans and specifications for streambank and shoreline protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

### VIII. Operation and Maintenance

An Operation and Maintenance Plan shall be developed with the landowner or operator that is consistent with the purposes of this practice, intended life of the components, and criteria for design.

### IX. References

USDA, NRCS Field Office Technical Guide, Section IV, Conservation Practice Standards and Specifications.

USDA, NRCS National Engineering Handbook, Part 650, Engineering Field Handbook.