

Natural Resources Conservation Service
Conservation Practice Standard

STREAMBANK AND SHORELINE PROTECTION
(Ft.)
CODE 580

DEFINITION

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

PURPOSE

- To prevent the loss of land or damage to land uses, or other facilities adjacent to the banks of streams or constructed channels, shoreline of lakes, reservoirs, or estuaries including the protection of known historical, archeological, and traditional cultural properties.
- To maintain the flow capacity of streams or channels.
- Reduce the offsite or downstream effects of sediment resulting from bank erosion.
- To improve or enhance the stream corridor for fish and wildlife habitat, aesthetics, recreation.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to streambanks of natural or constructed channels and shorelines of lakes, reservoirs, or estuaries where they are susceptible to erosion. It applies to controlling erosion where the problem can be solved with relatively simple structural measures, vegetation, or upland erosion control practices. It does not apply to erosion problems on main ocean fronts and similar areas of complexity not normally within the scope of NRCS authority or expertise.

CRITERIA

General Criteria Applicable to All Purposes

Treatments must be installed according to a site-specific plan and in accordance with all applicable local, state, and federal laws and regulations.

Treatments applied shall seek to avoid adverse effects to endangered, threatened, and candidate species and their habitats, whenever possible.

Treatments applied shall seek to avoid adverse effects to archaeological, historic, structural, and traditional cultural properties, whenever possible.

An assessment of unstable streambank or shoreline sites shall be conducted in sufficient detail to identify the causes contributing to the instability (e.g. livestock access, watershed alterations resulting in significant modifications of discharge or sediment production, in channel modifications such as gravel mining, head cutting, water level fluctuations, boat-generated waves, etc.).

Proposed protective treatments to be applied shall be compatible with improvements planned or being carried out by others.

Protective treatments shall be compatible with the bank or shoreline materials, water chemistry, channel or lake hydraulics, and slope characteristics both above and below the water line.

End sections of treatment areas shall be adequately bonded to existing treatments, terminate in stable areas, or be otherwise stabilized to prevent flanking of the treatment.

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

Protective treatments shall be installed on stable slopes. Bank or shoreline materials and type of measure installed shall determine maximum slopes.

Designs will provide for protection of installed treatments from overbank flows resulting from upslope runoff and flood return flows.

Internal drainage for bank seepage shall be provided when needed. Geotextiles or properly designed filter bedding shall be used on structural measures where there is the potential for migration of material from behind the measure.

Treatments shall be designed for anticipated ice action, fluctuating water levels, and wave protection.

All disturbed areas around protective measures shall be protected from erosion. Disturbed areas that are not to be cultivated shall be protected as soon as practical after construction. Vegetation shall be selected that is best suited for the site conditions and achieves the intended purpose(s).

In order to ensure plant community establishment and integrity, a vegetative management plan shall be prepared in accordance with NRCS conservation practice standard Critical Area Planting, Code 342.

Additional Criteria for Streambanks

A site assessment shall be performed to determine if the causes of instability are local (e.g. poor soils, high water table in banks, alignment, obstructions deflecting flows into bank, etc.) or systemic in nature (e.g. aggradation due to increased sediment from the watershed, increased runoff due to urban development in the watershed, degradation due to channel modifications, etc.). The assessment need only be of the extent and detail necessary to provide a basis for design of the bank treatments and reasonable confidence that the treatments will perform adequately for the design life of the measure.

If the failure mechanism is a result of the degradation or removal of riparian vegetation, stream corridor restoration shall be implemented, where feasible, (see Additional Criteria for Stream Corridor Improvement) as well as treating the banks.

The channel grade shall be stable based on a field assessment before any permanent type of bank protection can be considered feasible, unless the protection can be constructed to a depth below the anticipated lowest depth of streambed scour.

A protective toe shall be provided based on an evaluation of stream bed and bank stability. Toe erosion shall be stabilized by treatments that redirect the stream flow away from the toe or by structural treatments that armor the toe. Additional design guidance is found in the EFH Part 650, Chapter 16, Streambank and Shoreline Protection.

Where toe protection alone is inadequate to stabilize the bank, the upper bank shall be shaped to a stable slope and vegetated, or shall be stabilized with structural or soil-bioengineering treatments.

Channel clearing to remove stumps, fallen trees, debris, and bars shall only be done when they are causing or could cause detrimental bank erosion or structural failure. Habitat forming elements that provide cover, food, and pools, and water turbulence shall be retained or replaced to the extent possible.

Changes in channel alignment shall not be made unless the changes are based on an evaluation that includes an assessment of both upstream and downstream fluvial geomorphology. The current and future discharge-sediment regime shall be based on an assessment of the watershed above the proposed channel alignment.

Treatments shall be functional for the design flow and sustainable for higher flow conditions based on acceptable risk.

Treatments shall be designed to avoid an increase in natural erosion downstream.

Treatments planned shall not limit stream flow access to the floodplain.

Stream segments to be protected shall be classified according to a system deemed appropriate by the state. Segments that are incised or contain the 5-year return period (20 percent probability) or greater flows shall be evaluated for further degradation or aggradation.

Where flooding is a concern, the effects of protective measures shall not increase flow levels above those that existed prior to installation.

Additional Criteria for Shorelines

All revetments, bulkheads, or groins are to be no higher than 3 feet (1 meter) above mean high tide, or mean high water in non-tidal areas

Structural shoreline protective measures shall be keyed to a depth to prevent scour during low water.

For the design of structural measures, the site characteristics below the waterline shall be evaluated for a minimum of 50 ft (15 meters) horizontal distance from the shoreline measured at the design water surface.

The height of the protection shall be based on the design water surface plus the computed wave height and freeboard. The design water surface in tidal areas shall be mean high tide.

When vegetation is selected as the protective treatment, a temporary breakwater shall be used during establishment when wave run up would damage the vegetation.

Additional Criteria for Stream Corridor Improvement

Stream corridor vegetative components shall be established as necessary for ecosystem functioning and stability. The appropriate

composition of vegetative components is a key element in preventing excess long-term channel migration in re-established stream corridors. The establishment of vegetation on channel banks and associated areas shall also be in accordance with conservation practice standard Channel Bank Vegetation, Code 322.

Treatments shall be designed to achieve any habitat and population objectives for fish and wildlife species or communities of concern as determined by a site-specific assessment or management plan. Objectives are based on the survival and reproductive needs of populations and communities, which include habitat diversity, habitat linkages, daily and seasonal habitat ranges, limiting factors and native plant communities. The type, amount, and distribution of vegetation shall be based on the requirements of the fish and wildlife species or communities of concern to the extent possible.

Treatments shall be designed to meet any aesthetic objectives as determined by a site-specific assessment or management plan. Aesthetic objectives are based on human needs, including visual quality, noise control, and microclimate control. Construction materials, grading practices, and other site development elements shall be selected and designed to be compatible with adjacent land uses.

Treatments shall be designed to achieve any recreation objectives as determined by a site-specific assessment or management plan. Recreation objectives are based on type of human use and safety requirements.

CONSIDERATIONS

An assessment of streambank or shoreline protection needs should be made by an interdisciplinary team due to the complexity of such an assessment.

When designing protective treatments, consideration should be given to the changes that may occur in the watershed hydrology and

sedimentation over the design life of the measure.

Consider utilizing debris removed from the channel or streambank into the treatment design when it is compatible with the intended purpose to improve benefits for fish, wildlife and aquatic systems.

Use construction materials, grading practices, vegetation, and other site development elements that minimize visual impacts and maintain or complement existing landscape uses such as pedestrian paths, climate controls, buffers, etc. Avoid excessive disturbance and compaction of the site during installation.

Utilize vegetative species that are native and/or compatible with local ecosystems. Avoid introduced or exotic species that could become nuisances. Consider species that have multiple values such as those suited for biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides. Avoid species that may be alternate hosts to disease or undesirable pests. Species diversity should be considered to avoid loss of function due to species-specific pests. Species on noxious plant lists should not be used.

Select plant materials that provide habitat requirements for desirable wildlife and pollinators. The addition of native forbs and legumes to grass mixes will increase the value of plantings for both wildlife and pollinators.

Livestock exclusion should be considered during establishment of vegetative measures and appropriate grazing practices applied after establishment to maintain plant community integrity. Wildlife may also need to be controlled during establishment of vegetative measures. Temporary and local population control methods should be used with caution and within state and local regulations.

Treatments that promote beneficial sediment deposition and the filtering of sediment,

sediment-attached, and dissolved substances should be considered.

Consider maintaining or improving the habitat value for fish and wildlife, including lowering or moderating water temperature, and improving water quality.

Consideration should be given to protecting side channel inlets and outlets and outlets of tributary streams from erosion.

Toe rock should be large enough to provide a stable base and graded to provide aquatic habitat.

Consider maximizing adjacent wetland functions and values with the project design and minimize adverse effects to existing wetland functions and values.

When appropriate, establish a buffer strip and/or diversion at the top of the bank or shoreline protection zone to help maintain and protect installed measures, improve their function, filter out sediments, nutrients, and pollutants from runoff, and provide additional wildlife habitat.

Consider conservation and stabilization of archeological, historic, structural and traditional cultural properties when applicable.

Treatments should be designed to minimize safety hazards to boaters, swimmers, or people using the shoreline or streambank.

Protective treatments should be self-sustaining or require minimum maintenance.

PLANS AND SPECIFICATIONS

Plans and specifications for streambank and shoreline protection shall be prepared for specific field sites and based on this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans shall include treatments to

minimize erosion and sediment production during construction and provisions necessary to comply with conditions of any environmental agreements, biological opinions or other terms of applicable permits.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be prepared for use by the owner or others responsible for operating and maintaining the system. The plan shall provide specific instructions for operating and maintaining the system to insure that it functions properly. It

shall also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

REFERENCES

NEH Part 650, Chapter 16, Streambank and Shoreline Protection

NRCS Practice Standard 342, Critical Area Planting

**Natural Resources Conservation Service
Construction Specifications**

STREAMBANK AND SHORELINE PROTECTION

1. SCOPE

Work shall consist of installing riprap, prefabricated slope protection blocks, fence, and vegetation at the location(s) and to the depths, heights, and slopes as shown on the drawings or as staked in the field.

2. SITE PREPARATION

Remove all stumps, trash, debris, fallen trees, silt, and sand bars that may cause local flow turbulence or deflect water against the bank. Remove any additional brush or trees that would inhibit or adversely affect the growth of desirable bank vegetation.

Restore the bank slope for surface protective measures (riprap, etc.) by placing silt bar or top of bank material along the toe of bank. Control of overbank surface water shall be provided.

All brush, logs, stumps, or other debris must be removed from the area to be protected and disposed of by burning, burying, or removing from the work site.

3. PROTECTION MATERIALS

Rock riprap shall be placed on slopes equal to or flatter than 2 horizontal to 1 vertical unless surface grouting is applied. Rock shall be 2 feet thick and has a base (footer) extending at least 2 feet below the existing stream bed. Where significant seepage occurs on the slope, a filter shall be used consisting of filter cloth over 6-inch layer of sand filter material. Filter cloth or filter cloth over sand filter material shall be considered under all rock riprap installations.

Slope paving blocks shall be installed on a shaped slope and consideration given to installing a filter cloth and a 6-inch layer of sand filter material. The blocks shall extend at least 2 feet below the existing stream bed.

Slotted board fencing shall begin at the toe of slope of a stream section, extend downstream in a uniform curve, and terminate at toe of slope in a stable area. Each end shall be tied into the bank to prevent flow behind the fence. Cross fences (behind and perpendicular to stream flow) should be placed at locations where the main fence is more than 10 feet from the eroded toe of slope.

Gabion installations should be considered on sites having steep side slope requirements or space limitations. Designs shall use the 1'x3' and 3'x3' nominal wire basket dimensions, have a base (footer) extending at least 2 feet below the existing stream bed, and consider a filter and filter cloth backing against the earth contact.

4. VEGETATION

Slopes above the rock or slope paving and all disturbed areas shall be disked, have lime and fertilizer incorporated into the seedbed, and be seeded to site adaptable vegetation for erosion control. Fencing shall be provided to control livestock access at erosion sensitive sites.

5. MEASUREMENT

Site preparation and slope preparation shall be paid in lump sum for the work required at each site or made a part (subsidiary item) of other items of work.

Rock riprap shall be paid by the cubic yard or ton. Measurement shall be to the design neat lines and volume calculated to the nearest cubic yard. The ton quantities shall be estimated by conversion of cubic yard volumes (1 cu yd = 1.5 ton) and paid for by accumulated weights of delivered truck loads.

Slope paving shall be paid by the square yard. Measurement shall be to the design neat lines and calculated to the nearest square yard.

Slotted board fencing shall be paid by the linear foot. Measurement shall be to the field installed length (including cross fences) to the nearest foot.

Gabions shall be paid by the cubic yard which will include wire basket cost. Measurement shall be to the design neat lines and calculated to the nearest cubic yard.

Filter material (sand) shall be paid by the cubic yard. Filter cloth shall be paid by the square yard. Measurements shall be to the design neat lines and calculations made to the nearest cubic yard or square yard, respectively.

Vegetation shall be paid by the acre. Measurement shall be of the field disturbed area (less any area in cultivated crops) to the nearest 0.1 acre.

6. CONSTRUCTION DETAILS
