



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
STREAMBANK AND SHORELINE PROTECTION

CODE 580

(ft)

DEFINITION

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

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Prevent the loss of land or damage to land uses or facilities adjacent to the banks of streams or constructed channels, shoreline of lakes, reservoirs, or estuaries. This includes the protection of known historical, archeological, and traditional cultural properties.
- 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 or shoreline 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 susceptible to erosion. It does not apply to erosion problems on main ocean fronts, beaches, or similar areas of complexity.

CRITERIA

General Criteria Applicable to All Purposes

Design and install treatments in accordance with all applicable local, State, Tribal, and Federal laws and regulations.

Design treatments to avoid adverse effects to endangered, threatened, and candidate species and their habitats, whenever possible.

Avoid adverse effects to archeological, historic, structural, and traditional cultural properties, whenever possible.

Minimize adverse effects to existing wetland functions and values.

Assess unstable streambank or shoreline sites 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.).

Design treatments compatible with planned improvements or improvements installed by others.

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.

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NRCS, NHCP
January 2020

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

Install protective treatments that result in stable slopes based on the bank or shoreline materials and the type of measure proposed.

Provide protection of installed treatments from overbank flows resulting from upslope runoff and flood return flows.

Provide internal drainage for bank seepage when needed. Incorporate geotextiles or properly design filter or bedding, as appropriate, with structural measures where there is the potential for piping or erosion of material from behind the measure.

Anchor end sections of treatment to existing treatments or stable areas to prevent flanking of the treatment.

Design treatments to account for any anticipated ice action, wave action, and fluctuating water levels.

Protect all disturbed areas around protective treatments from erosion.

Select appropriate vegetation for the site conditions and the intended purpose(s).

In order to ensure plant community establishment and integrity, prepare a vegetative management plan in accordance with NRCS Conservation Practice Standard (CPS) Critical Area Planting (Code 342). Do not use species on noxious plant lists.

Limit livestock traffic along treated streambanks and shorelines to stable access points, using applicable NRCS Conservation Practice Standards.

Additional Criteria for Streambanks

Classify stream segments requiring protection according to a system deemed appropriate by the State. Evaluate incised segments or segments that contain the 5-year return period (20-percent probability) or greater flows for further degradation or aggradation.

Perform a site assessment 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 provide the detail necessary for design of the bank treatments and reasonable confidence that the treatments will perform adequately for the design life of the measure.

Do not realign the channel without an assessment of upstream and downstream fluvial geomorphology that evaluates the impacts of the proposed alignment. Determine the current and future discharge-sediment regime using an assessment of the watershed upstream of the proposed channel alignment.

Do not install bank protection treatment in channel systems undergoing rapid and extensive changes in bottom grade and/or alignment unless designing the treatments to control or accommodate the changes. Construct bank treatment to a depth at or below the anticipated lowest depth of streambed scour.

If the failure mechanism is a result of the degradation or removal of riparian vegetation, implement stream corridor restoration, where feasible, as well as bank treatment.

Stabilize toe erosion by treatments that redirect the stream flow away from the toe or by structural treatments that armor the toe.

Where toe protection alone is inadequate to stabilize the bank, shape the upper bank to a stable slope and establish vegetation, or stabilize with structural or soil-bioengineering treatments.

Only remove stumps, fallen trees, debris, and sediment bars which could cause unacceptable bank erosion, flow restriction, or damage to structures. To the extent possible, retain or replace habitat-forming elements that provide cover, food, pools, and water turbulence.

Design treatments to remain functional and stable for the design flow, and sustainable for higher flow conditions.

Do not design treatments that result in negative offsite impacts or increase natural erosion.

Do not design treatments to limit stream flow access to the floodplain.

Evaluate the effects of changes to flow levels compared with the preinstallation flow levels, for low and high flow conditions. Mitigate negative impact as necessary.

Additional Criteria for Shorelines

Limit revetments, bulkheads, or groins to no higher than 3 feet above mean high tide, or mean high water in nontidal areas.

Key structural shoreline protective treatments to a depth to prevent scour during low water.

For the design of structural treatments, evaluate the site characteristics below the waterline for a minimum of 50 feet horizontal distance from the shoreline measured at the design water surface.

Base the height of the protection on the design water surface plus the computed wave height and freeboard. Use mean high tide as the design water surface in tidal areas.

When selecting vegetation as the protective treatment, use a temporary breakwater during establishment when wave run-up would damage the vegetation.

Additional Criteria for Stream Corridor Improvement

Establish stream corridor vegetative components 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 reestablished stream corridors. Establish vegetation on channel banks and associated areas according to CPS Critical Area Planting (Code 342).

Design treatments to achieve habitat and population objectives for fish and wildlife species or communities of concern as determined by a site-specific assessment or management plan. Establish objectives 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. Develop the requirements for the type, amount, and distribution of vegetation using the requirements of the fish and wildlife species or communities of concern to the extent possible.

Design treatments to meet aesthetic objectives as determined by a site-specific assessment or management plan. Establish aesthetic objectives based on human needs, including visual quality, noise control, and microclimate control. Use construction materials, grading practices, and other site development elements compatible with adjacent land uses.

CONSIDERATIONS

When designing protective treatments, consider changes that may occur in the watershed hydrology and sedimentation over the design life of the treatments.

Incorporate 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.

Use vegetative species that are native and/or compatible with local ecosystems. Avoid introduced 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. Consider species diversity to avoid loss of function due to species-specific pests.

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.

Use treatments that promote beneficial sediment deposition and the filtering of sediment, sediment-attached, and dissolved substances.

Maintain or improve fish and wildlife habitat by including treatments that provide aquatic habitat in the treatment design and that may lower or moderate water temperature and improve water quality.

Stabilize side channel inlets and outlets, and outlets of tributary streams from erosion.

Maximize adjacent wetland functions and values with the project design to the extent practicable.

To maintain plant community integrity, exclude livestock during establishment of vegetative treatments and apply appropriate grazing practices after establishment.

Control wildlife during establishment of vegetative treatments. Use temporary and local population control methods with caution and within applicable regulations.

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

Consider safety hazards to boaters, swimmers, or people using the shoreline or streambank when designing treatments. Place warning signs as necessary.

Consider installing self-sustaining or minimal maintenance treatments.

PLANS AND SPECIFICATIONS

Prepare plans and specifications that describe the requirements for applying the practice according to this standard. Include provisions 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. At a minimum, include the following items:

- A plan view of the layout of the streambank and shoreline protection.
- Typical profiles and cross sections of the streambank and shoreline protection.
- Structural drawings adequate to describe the construction requirements.
- Requirements for vegetative establishment and mulching, as needed.
- Safety features.
- Site-specific construction and material requirements.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the operator.

At a minimum, include—

- Instructions for operating and maintaining the system to insure that it functions properly.
- Periodic inspections and prompt repair or replacement of damaged components or erosion.
- Instructions for maintaining healthy vegetation, when required.
- Instructions for controlling undesirable vegetation.

REFERENCES

USDA NRCS. National Engineering Handbook (Title 210), Part 650, Chapter 16, Streambank and Shoreline Protection. Washington, D.C. <https://directives.sc.egov.usda.gov/>

USDA NRCS. National Engineering Handbook (Title 210), Part 653, Stream Corridor Restoration: Principles, Processes, and Practices. Washington, D.C.

USDA NRCS. National Engineering Handbook (Title 210), Part 654, Stream Restoration Design. Washington, D.C.

USDA NRCS. National Engineering Manual (Title 210). Washington, D.C.