

NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA CONSERVATION PRACTICE STANDARD
STREAMBANK & SHORELINE PROTECTION

(Feet)

CODE 580

DEFINITION

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

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

Sites with drainage areas that are 25 square miles or greater require approval from the State Conservation Engineer.

PURPOSES

- To prevent, control, or minimize the loss of land or damage to landuses, or other facilities adjacent to the banks, including the protection of known cultural resources.
- To maintain the flow or storage capacity of the water body or to 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.
- To reduce livestock-induced streambank erosion.

CRITERIA

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

Measures must be installed according to a site-specific plan and in accordance with all applicable local, state, and federal laws and regulations. **All required permits must be obtained prior to construction.**

Livestock exclusion is required for sites with vegetative measures. The Virginia Conservation Practice Standard *Fence (Code 382)* shall be used for all fences. Wildlife may 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. Vehicles and/or people shall be excluded during vegetative establishment, as appropriate.

Protective measures to be applied shall be compatible with improvements planned or being carried out by others.

Protective measures shall be compatible with the bank or shoreline materials, water chemistry, channel or lake hydraulics, and

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, livestock exclusion, or upland erosion control

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

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slope characteristics both above and below the water line.

End sections shall be adequately bonded to existing measures, terminate in stable areas, or be otherwise stabilized.

Banks will be graded and shaped before protective measures are installed. Bank or shoreline materials and type of measure installed shall determine maximum slopes.

Where possible, streambank and shoreline protection measures shall be designed such that construction activities can be performed from the bank.

Designs will provide for protection from upslope runoff.

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

Measures applied shall not adversely affect threatened and endangered species nor species of special concern as defined by the appropriate state and federal agencies.

Measures shall be designed for anticipated ice action and fluctuating water levels.

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. The Virginia Conservation Practice Standard *Critical Area Planting* (Code 342) should be used.

The *Plant Establishment Guide for Virginia* shall be used to select the vegetation that is best suited for the soil/moisture regime.

ADDITIONAL CRITERIA FOR STREAMBANKS

The channel grade shall be stable, as determined by a field assessment, before any permanent type of bank protection can be considered feasible.

A protective toe shall be provided, as needed, based on an evaluation of streambed and bank stability.

Structural measures used to protect the toe shall extend to the elevation of the bankfull discharge.¹

Vegetation or bioengineering measures shall be installed from the top of the toe protection to the top of the bank.

Where rock riprap is used for bank or toe protection, undercutting by scour shall be prevented by one of the following methods of riprap placement:

- Key riprap into the bottom of the channel to a depth equal to the design riprap thickness or 2 feet (0.6m), whichever is greater, below the anticipated lowest scour line, or
- Place riprap as an apron with the design riprap thickness extending beyond the toe of the bank for a distance equal to at least five times the D_{50} size.

Riprap bank protection shall be keyed into the bank at both the upstream and downstream ends. The end keyway trenches shall extend from the toe keyway or end of the apron to the top of the protection. The end keyway trenches shall extend below the bottom of the riprap protection to a depth equal to the design riprap thickness or 2 feet (0.6m), whichever is greater.

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. Virginia Conservation Practice Standards *Clearing and Snagging* (Code 326) and *Obstruction Removal* (Code 500) should be used.

Habitat forming elements that provide cover, food, and pools, and water turbulence shall be retained or replaced to the extent possible.

¹ The bankfull discharge, also called the "channel-forming" discharge, is generally a 1.2 – to 1.5 – year event.

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.

The alignment of low-flow channels should not be changed more than necessary to accomplish a stable bank slope, and to establish and maintain vegetation. If significant realignment is proposed, those portions of the channel shall be designed in accordance with the Virginia Conservation Practice Standard *Open Channel (Code 582)*.

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

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

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

Stream segments to be protected shall be classified according to an appropriate system. 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.

When water surface elevations are a concern, the effects of protective measures shall not increase flow levels above those that existed prior to installation.

When bank sloping is used, the banks must be stable against sliding after construction and flat enough to maintain vegetation. Side slopes shall be 2:1 or flatter unless a slope stability analysis is conducted to support using a steeper slope.

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. (National Engineering Manual, Part 501).

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 feet (15 meters) horizontal distance from the shoreline measured at the design water surface.

The height of the shoreline protection shall be designed according to *TR-69: Riprap for Slope Protection Against Wave Action*, *TR-56: A Guide for Design and Layout of Vegetative Wave Protection for Earth Dam Embankments*, or other acceptable engineering practices. As a minimum, 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 the establishment when wave run up would damage the vegetation.

Existing tree vegetation may need to be cut in order to reduce the threat of soil mass movement should the tree become uprooted. Trees should be selected for cutting based on need and in accordance with local regulations.

ADDITIONAL CRITERIA FOR STREAM CORRIDOR IMPROVEMENT

Stream corridor vegetative components shall be established as necessary to maintain ecosystem function and stability. The appropriate composition of vegetative components is a key element in preventing excess long-term channel migration in re-established stream corridors.

Fences to exclude livestock from the streambank or shoreline shall be placed at a minimum of 25 feet from the top of the

streambank or shoreline to allow for natural regeneration of vegetation.

Measures shall be designed to achieve the habitat and population objectives for fish and wildlife species or communities of concern as determined by 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.

Measures 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.

Measures 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 in sufficient detail to identify the causes contributing to the instability (e.g. watershed alterations resulting in significant modifications of discharge or sediment production). Depending upon the complexity of the site, an interdisciplinary team may be utilized to conduct the assessment.

When designing protective measures, consider 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.

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. 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.

Consideration should be given to selecting vegetative species with the growth potential to quickly stabilize the site. The mature size of the vegetation and its potential for future problems should also be assessed.

Shrubs are encouraged over tree species. A zone of shrubs close to the bank with larger trees farther back from the bank is the preferred planting design.

Measures 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 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.

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

Protective measures 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 shall describe the requirements for applying the practice to achieve its intended purpose.

DESIGN DATA

1. Survey data for structural practices
2. Soil type/soil boring log
3. Plan view with location of treatment(s), including planting areas; location of borrow area(s) if on site; location of disposal area(s) if on site; and apparent property lines and owners
4. Cross sections
5. Description of type and size of each structural and/or vegetative treatment
6. For streambanks, include velocities, water surface profiles, and other geomorphic parameters as required for permit(s)
7. For shorelines, include fetch and wave height
8. Quantities and cost estimate

9. Utility notification
10. Classification of stream segment
11. Data for permits
12. Operation and Maintenance requirements
13. Environmental Evaluation Form VA-EE-1

CHECK DATA

1. As-built drawings
2. Certification of structural treatments
3. Plant material certifications and installation certifications
4. Final quantities

OPERATION AND MAINTENANCE

Operation and maintenance requirements shall be prepared for use by the owner or others responsible for operating and maintaining the system. The requirements shall include specific instructions for operation and maintaining the system to ensure that it functions properly. It shall also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

REFERENCES

1. NRCS, Virginia Field Office Technical Guide, Section IV.
2. NRCS Engineering Field Handbook, Chapter 16.
3. NRCS, *Stream Corridor Restoration: Principles, Processes, and Practices*.
4. NRCS, *Plant Establishment Guide for Virginia*.
5. Rosgen, Dave. *Applied River Morphology*. Wildland Hydrology, 1996.

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6. *TR-69: Riprap for Slope Protection Against Wave Action.*
7. *TR-56: A Guide for Design and Layout of Vegetative Wave Protection for Earth Dam Embankments.*
8. National Engineering Manual, Part 501.

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Approved Practice Narratives

(Feet)

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580 D1 Streambank and Shoreline Protection: Use natural plant regeneration to protect the streambank or shoreline from livestock. The vegetation shall extend 25 feet from the top of the bank.

580 D3 Streambank and Shoreline Protection: Use natural plant regeneration to protect the streambank or shoreline from erosion. The vegetation shall extend 25 feet from the top of the bank.

580 D2 Streambank and Shoreline Protection: Use structural and vegetative measures to protect the streambank or shoreline from livestock. The vegetation shall extend 25 feet from the top of the bank.

580 D4 Streambank and Shoreline Protection: Use structural and vegetative measures to protect the streambank or shoreline from erosion. The vegetation shall extend 25 feet from the top of the bank.

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