

**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, including the protection of known historical, archeological, and traditional cultural properties.
- To maintain the flow or storage capacity of the water body.
- To reduce the offsite or downstream effects of sediment resulting from bank erosion.
- To maintain or restore channel meanders that would enhance the stream conditions.
- To improve or enhance the stream corridor for fish and wildlife habitat, aesthetics, and recreation.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to streambanks of natural or constructed channels and shorelines of lakes, reservoirs, or estuaries that are susceptible to erosion, ice, debris accumulations, or wave action. It applies to controlling erosion where the problem can be solved with relatively simple structural measures, vegetation, or upland erosion control practices and where failure of structural measures will not create a hazard to life or result in serious damage to property. This standard does not apply to erosion problems on Lake Erie and its major bays and similar areas of complexity not normally within the scope of NRCS authority or expertise.

Technical assistance for bank erosion problems associated with stream flow or bank stability problems shall be limited to inventory and evaluations when the stream drainage area at the site exceeds 250,000 acres (391 square miles).

**CRITERIA**

**General Criteria Applicable to All Purposes**

Measures shall be installed according to a site-specific plan (inventory and evaluation, resource management system, etc.) based on a field site assessment. Streambank and shoreline protection shall be performed in compliance with the permits or approval as required from the Local, State, or Federal agencies. These permits may include, but are not limited to, State 401 Clean Water Certification from the Ohio EPA, nationwide or individual permits under Section 404 of the Clean Water Act from the U.S. Corps of Engineers, and local floodplain management permits.

NRCS, Ohio  
May 2002  
Standard 580 - 1

Section IV, FOTG  
Standard 580

Stream or riparian area restoration that is planned within 1000 feet of a state designated scenic river needs to be reviewed and approved by the director of the department of Natural Resources in accordance with ORC Section 1517.

Protective measures to be applied shall be compatible with land use objectives and 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 slope characteristics both above and below the water line.

Protective measures may be vegetative, soil bioengineering systems, structural measures, or any combination of the three. The selection of an alternative shall be based on identified problems, goals, and objectives of the project.

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

Protective measures shall be on stable slopes after installation is completed. Bank or shoreline materials, and the type of measure installed, shall determine maximum slopes.

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 on structural measures to prevent piping of soil.

Measures 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 fluctuating water levels.

Disturbed areas shall be protected from erosion as soon as practical after construction.

Vegetation shall be selected that is best suited for the site and shall be protected until established.

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

#### **Additional Criteria for Streambanks**

Stream reaches to be treated shall be classified using a recognized stream classification system to document the characteristics of the stream. The stream classification system recommended for use is the Rosgen Stream Classification System, developed by David Rosgen (1996). The Stream Channel Classification Jobsheet with this standard should be used to document the stream data collected and stream type. Streams typically undergo a sequence of adjustments after channel or watershed disturbances. Special consideration should be given to streams and their watersheds that have been significantly disturbed or modified within the last 20 years. A Channel Evolution Model (CEM) should be used to determine the current condition of a stream (i.e. -stable, aggrading, or degrading), and to help predict future stream change. Stream classification and CEM both provide insight as to

the type of stability problems occurring within the stream corridor and potential opportunities for restoration or correction.

Evaluations of stream and streambank problems should include an inventory of the site conditions. The problem should be identified along with the cause and extent of the problem. Alternatives should be developed that are based on suitability of the site, an analysis of bank stability, and be consistent with an appropriate bank stabilization technique. Rosgen's classification system characterizes physical characteristics of each stream type and can be used as a guide to develop relationships for stable geometry for the project.

Vegetative measures shall be considered first. Problems that cannot be controlled by vegetative measures should be considered for structural measures along with vegetative measures.

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 scour.

The bottom of structural measures shall be set at a stable elevation and be protected against undercutting.

Channel clearing to remove stumps, fallen trees, debris, and bars shall only be done when they are causing or would likely cause detrimental bank erosion, structural damage or failure. Important fish and wildlife habitat elements shall be retained or replaced to the extent possible.

Changes in channel alignment, or channel geometry, shall not be made unless the changes are based on a geomorphic assessment of the site that includes upstream and downstream reaches of the stream. Channel width to depth ratio, slope, meander pattern, and bed features, shall be modeled according to a stable reference reach. Reference reaches are stream segments that represent a stable or desired channel in the region. The current and future discharge-sediment regime shall be based on an assessment of the watershed above the proposed channel alignment.

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 downstream or upstream natural erosion or deposition in the main channel or side channels in the work area.

Measures shall not limit stream flow access to the floodplain, or cause the stream to become more entrenched, unless the change is based on a geomorphic assessment of the site.

Measures shall not reduce the capacity of the low flow channel below the bankfull or stream forming flow. Bankfull flow corresponds to a discharge that just fills the low flow channel and begins to flow onto the floodplain. Bankfull discharge is generally associated with a 1-2 year frequency flow.

Planning, design, and construction of streambank stabilization systems shall be according to governing policies.

### **Additional Criteria for Shorelines**

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

Design and installation of structural measures extending below water level shall be based on an evaluation of the lake bottom for a minimum of 50 feet out from the shoreline.

The height of structural shoreline protection measures shall be based on the design water surface plus the computed wave height and freeboard.

Additional guidance for evaluation, planning, and design of stream corridor improvement is given in the Reference section at the end of this standard.

### **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 consideration in preventing excess long-term channel migration in re-established stream corridors.

Measures 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.

Measures shall be designed to meet any aesthetic objectives as determined by a site-specific assessment or management plan.

Measures shall be designed to achieve any recreation objectives as determined by a site-specific assessment or management plan.

Additional guidance for evaluation, planning, and design of stream corridor improvement is given in the Reference section at the end of this standard.

## **CONSIDERATIONS**

### **Assessments**

Assess streambank or shoreline protection needs in detail to identify the causes contributing to the instability. An interdisciplinary team is recommended to evaluate causes of instability and to assist with planning and design of potential solutions. Future changes that may occur in the watershed hydrology and sediment transport should be considered.

### **Aesthetics**

Aesthetic objectives are based on human needs, including visual quality, noise control, and microclimate control.

Construction materials, grading practices, and other site development elements should be selected and designed to be compatible with adjacent land uses and anticipated future conditions.

### **Vegetative Species Selection**

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 pests. Species diversity should be considered to avoid loss of function due to species-specific pests. Species on noxious plant lists shall not be used. Guidance for selecting vegetative species is given in:

Appendix A – Grasses and Legume Seedings, Section IV, Field Office Technical Guide

Appendix B – Tree and Shrub Planting, Section IV, Field Office Technical Guide

Domestic livestock and wildlife may also need to be controlled during establishment of vegetative measures. Appropriate grazing practices and livestock exclusion may be needed after establishment to maintain plant community integrity.

### **Habitat**

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

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.

Consider maximizing adjacent wetland functions and values with the project design.

Guidance on maintaining and enhancing fish and wildlife is given in applicable sections of the Field Office Technical Guide.

### **Other Considerations**

Where possible, establish a buffer area of grasses or woody plants along the top of the bank. Guidance on establishing riparian or grass is found in Practice Standard 391, Riparian Forest Buffer, and Practice Standard 393, Filter Strip.

When appropriate, establish a diversion at the top of the bank or shoreline protection zone to help maintain and protect installed measures and to improve their function.

Conservation and stabilization of archeological, historic, structural and traditional cultural properties must be considered, when applicable.

Measures should consider anticipated ice action.

Measures installed along or within streams should help the stream achieve its best potential state of equilibrium.

Woody debris or other natural materials removed from the channel or streambank may be used as part of the protective measures.

Section IV, FOTG  
Standard 580

Measures that promote beneficial sediment deposition and the filtering of sediment, sediment-attached, and dissolved substances should be considered.

Recreation objectives are based on type of expected human use and safety requirements. Measures must be designed to minimize safety hazards to boaters, swimmers, or people using the shoreline or streambank.

### **PLANS AND SPECIFICATIONS**

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

### **OPERATION AND MAINTENANCE**

An operation and maintenance plan shall be prepared for use by the owner or others responsible for operating and maintaining the practices. The plan shall provide specific instructions for operating and maintaining the practices to ensure that they function properly. It shall also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

### **REFERENCES:**

Additional guidance for evaluation, planning, and design of streambank protection systems, shoreline protection systems, and stream corridor improvement is given in:

- NRCS, Engineering Field Handbook, Part 650, Chapter 16, "Streambank and Shoreline Protection.", 1996
- NRCS Technical Release 69, Riprap for Slope Protection Against Wave Action, 1983.
- NRCS Ohio Practice Standard 391, Riparian Forest Buffer, 1997.
- NRCS Ohio CADalog, collection of standard drawings and details in CAD format, can be found at: <http://www.oh.nrcs.usda.gov/engineering/cadd2.htm>
- "Stream Corridor Restoration: Principles, Processes, and Practices, 1998" can be found on-line at: [http://www.usda.gov/stream\\_restoration/](http://www.usda.gov/stream_restoration/)
- ODNR, Ohio Stream Management Guides, can be found on-line at: [http://www.dnr.state.oh.us/water/pubs/fs\\_st/streamfs.htm](http://www.dnr.state.oh.us/water/pubs/fs_st/streamfs.htm)
- ODNR, Ohio Rainwater and Land Development, 1996, contained in the Technical Guide Reference File.

Landowner: \_\_\_\_\_

Stream Name: \_\_\_\_\_

Location \_\_\_\_\_

Drainage Area \_\_\_\_\_ Ac. \_\_\_\_\_ Sq. Mi. \_\_\_\_\_

Recorded By \_\_\_\_\_ Date \_\_\_\_\_

**Purpose:** To classify a stream using a system developed by David Rosgen that separates streams into categories based on entrenchment, shape, sinuosity, and slope.

<b>Bankfull Width (W<sub>bf</sub>)</b>	Width of a stream channel, at bankfull stage, in a riffle section	_____ Ft.
<b>Mean Depth (d<sub>bf</sub>)</b>	Mean depth of the stream channel cross section, at bankfull stage, in a riffle section	_____ Ft.
<b>Bankfull Cross Sectional Area (A<sub>bf</sub>)</b>	Area of the stream channel cross section, at bankfull stage, in a riffle section	_____ Sq. Ft.
<b>Width / Depth Ratio (W<sub>bf</sub> / d<sub>bf</sub>)</b>	Bankfull width divided by bankfull mean depth, in a riffle section	_____
<b>Maximum Depth (d<sub>mbf</sub>)</b>	Maximum depth of the bankfull channel cross section, or vertical distance between the bankfull stage and bottom of thalweg, in a riffle section	_____ Ft.
<b>Width of Flood-Prone Area (W<sub>mbf</sub>)</b>	Width at twice maximum depth (d <sub>mbf</sub> ), or (2 x d <sub>mbf</sub> ), as measured in a riffle section	_____ Ft.
<b>Entrenchment Ratio (ER)</b>	The ratio of flood-prone area width divided by bankfull channel width (= W <sub>mbf</sub> / W <sub>bf</sub> ), as measured in a riffle section	_____ Ft.
<b>Channel Materials (bedrock, boulders, cobble, gravel, sand, silt/clay)</b>	The D <sub>50</sub> particle size (mean diameter) of channel materials, as sampled from the channel surface, from bankfull stage to the bottom of the thalweg	_____ mm (D <sub>50</sub> )
<b>Water Surface Slope (S)</b>	Channel slope for a reach approximately 20-30 bankfull widths in length, measured from riffle to riffle, represents channel grade at bankfull stage	_____ Ft./Ft.
<b>Channel Sinuosity (K)</b>	Index of channel pattern, determined from a ratio of stream length divided by valley length (SL/VL); or estimated from ratio of valley slope divided by channel slope (VS/S)	_____
<b>Stream Type</b>	_____	See Rosgen Classification Chart for key to stream types

Note: This worksheet patterned from "Reference Reach Field Book" by David Rosgen

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited basis apply to all programs.) Persons with disabilities who require alternative means for communication or program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.