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:

- To 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 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 does not apply to erosion problems on main ocean fronts, beaches or similar areas of complexity.

CRITERIA

General Criteria Applicable to All Purposes

Treatments shall be in accordance with all applicable local, state and federal laws and regulations.

Avoid adverse effects to endangered, threatened, and candidate species and their habitats, whenever possible.

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

Conduct 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.).

Apply protective treatments which are compatible with improvements being planned or installed by others.

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

Adequately anchor end sections of treatment areas to existing treatments, terminate in stable areas, or be otherwise stabilize to prevent flanking of the treatment.

Install protective treatments that result in stable slopes. Design limitations of the bank or shoreline materials and type of measure installed must determine steepest permissible slopes.

Designs will provide for 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 designed filter bedding with structural measures where there is the potential for migration of material from behind the measure.

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

Protect all disturbed areas around protective treatments from erosion. Protect disturbed areas that are not to be cultivated as soon as practical after construction.

Select vegetation that is best suited for the site conditions and achieves the intended purpose(s).

Prepare a vegetative management plan in order to ensure plant community establishment and integrity in accordance with Critical Area Planting (342).

Carry out all operations in a safe and skillful manner. Observe safety and health regulations and use appropriate safety measures.

Additional Criteria for Streambanks

Classify stream segments to be protected in accordance with Simon's 6-stage Channel Evolution Model described in NEH Part 654, Chapter 3, Site Assessment and Investigation. Evaluate segments that are incised or 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 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.

Changes in channel alignment must not be made without an assessment of both upstream and downstream fluvial geomorphology that evaluates the effects of the proposed alignment. Base the current and future discharge-sediment regime on an assessment of the watershed above the proposed channel alignment.

Bank protection treatment must not be installed in channel systems undergoing rapid and extensive changes in bottom grade and/or alignment unless the treatments are designed 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, (see Additional Criteria for Stream Corridor Improvement) as well as treating the banks.

Stabilize toe erosion 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 National Engineering Handbook (NEH) Part 650, [Engineering Field Handbook (EFH)] Chapter 16, and NEH Part 654, Stream Restoration Design.

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

Perform channel clearing to remove stumps, fallen trees, debris, and sediment bars only when they are causing or could cause unacceptable bank erosion, flow restriction, or damage to structures. Retain or replace habitat forming elements that provide cover, food, pools, and water turbulence to the extent possible.

Treatments must be functional and stable for the design flow and sustainable for higher flow conditions.

Treatments must not induce an increase in natural erosion.

Treatments must not limit stream flow access to the floodplain.

Where flooding is a concern, the effects of protective treatments must 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 above mean high tide, or mean high water in non-tidal areas

Key in 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.

When vegetation is selected 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 re-established stream corridors. Establishment of vegetation on channel banks and associated areas must also be in accordance with Critical Area Planting (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. Base 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. Base the type, amount, and distribution of vegetation on 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. Base aesthetic objectives on human needs, including visual quality, noise control, and microclimate control. Select and design construction materials, grading practices, and other site development elements to be compatible with adjacent land uses.

Design treatments to achieve recreation objectives as determined by a site-specific assessment or management plan. Base safety requirements on type of human use and recreation objectives.

CONSIDERATIONS

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

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, invasive, noxious 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.

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

Consider the need to stabilize side channel inlets and outlets and outlets of tributary streams from erosion.

Consider aquatic habitat when selecting the type of toe stabilization.

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

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

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 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.

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.

As a minimum, include the following items in the plans and specifications:

- Plan view of the layout of the work planned
- Location of disposal areas or location of areas off limits for disposal of debris
- Location and description of trees or woody vegetation to be left undisturbed
- Method of debris disposal
- Manner and sequence of construction operations so that impacts on the environment will be minimized
- Erosion control measures, as applicable
- Vegetative requirements for areas denuded and disturbed, as applicable

The following list of Construction Specifications is intended as a guide to selecting the appropriate specifications for each specific project. The list includes most, but may not contain all, of the specifications needed for a specific project:

IA-1 Site Preparation

IA-5 Pollution Control

IA-6 Seeding and Mulching for Protective Cover

IA-21 Excavation

IA-61 Loose Rock Riprap

IA-92 Fences

IA-95 Geotextile

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan must be prepared for use by the owner or others responsible for operating and maintaining the system. The plan must provide specific instructions for operating and maintaining the system to ensure that it functions properly. Specified actions must include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance). It must also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

REFERENCES

National Engineering Handbook (NEH) Part 650, [Engineering Field Handbook (EFH)] Chapter 16, Streambank and Shoreline Protection.

NEH Part 654. Stream Restoration Design.