

**Practice:** 580 - Streambank and Shoreline Protection

**Scenario:** #1 - Riprap

**Scenario Description:** Protection of streambanks using riprap to stabilize and protect banks of streams against scour and erosion. The purpose of this practice is to maintain, improve, or restore physical, chemical, and biological functions of a stream to provide diverse aquatic communities to improve habitat for desired aquatic species. Payment cost include shaping bank, geotextile, and furnishing and placing rock rip rap. Typical scenario is a 2.0 feet thick blanket of rock riprap, placed on a 1.5 to 1 slope, installed on an eroded streambank which is 200 feet long. Streambank is typically 6 feet high. Riprap toe is excavated 3 feet into stream bottom. The bank above the riprap will be graded to a stable slope and revegetated. Resource Concerns: Soil Erosion - Excessive Bank Erosion from Streams, Shoreline and Water Conveyance Channels; Water Quality Degradation - Excessive Sediment in Surface Waters; Water Quality Degradation - Elevated Water Temperature; Excess/Insufficient Water - Excessive Sediment in Surface Waters; Inadequate Habitat for Fish and Wildlife- Habitat Degradation. Associated Practices include: 560 - Access Road; 342 - Critical Area Planting; 382 - Fence; 391 - Riparian Forest Buffer; 390 - Riparian Herbaceous Cover; 395 - Stream Habitat Improvement and Management; 614 - Watering Facility; 484-Mulching; 570-Stromwater Runoff Control.

**Before Situation:** A stream bisects the agricultural property and has had all of the woody vegetation removed due to overgrazing or human manipulation; the stream has severely degraded streambanks that are unstable and show signs of active erosion. Soil Erosion: The streambank is unstable. Water Quality Degradation: The sediment load has increased in the stream resulting in elevated water temperatures. Excess/Insufficient Water: The excessive sediment load has reduced the water conveyance capacity, storage capacity and flow within the stream. Inadequate Habitat for Fish and Wildlife: The deficiencies in the stream's habitat limit survival, growth, reproduction, and/or diversity of aquatic organisms within the stream.

**After Situation:** The streambank is stable against further erosion and encourages natural sediment transport and deposition. Loss of riparian areas and sediment load is reduced in the stream. For Soil Erosion: The streambank is stable. For Water Quality Degradation: The sediment load has decreased in the stream resulting in improved aquatic habitat. For Excess/Insufficient Water: The water conveyance capacity, storage capacity and flow within the stream has been stabilized. For Inadequate Habitat for Fish and Wildlife: The reduction in the sediment load promotes survival, growth, reproduction, and/or diversity of aquatic organisms within the stream's habitat.

**Scenario Feature Measure:** Volume of Riprap

**Scenario Unit:** Cubic Yard

**Scenario Typical Size:** 240

**Total Scenario Cost:** \$22,157.25

**Scenario Cost/Unit:** \$92.32

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Materials**

Rock Riprap, Placed with geotextile	44	Rock Riprap, placed with geotextile, includes materials, equipment and labor to transport and place	Cubic Yard	\$83.15	240	\$19,956.83
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**Labor**

Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$36.00	10	\$359.98
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$43.61	5	\$218.06

**Equipment Installation**

Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$113.50	10	\$1,134.99
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**Mobilization**

Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$487.39	1	\$487.39
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**Scenario:** #2 - Bioengineered

**Scenario Description:** Bioengineering consist of non-structural measures such as facines, wattles, woody cuttings, revetments and other non-structural measures to stabilize and protect the streambank against scour and erosion. Soil bioengineering is a system of living plant materials that are installed to provide immediate protection and reinforcement of the soil along the streambank. Bioengineering is generally installed on the streambank above structural measures or toe protection such as rock riprap. Vegetation in the form of trees, bushes, grass re-establishment is covered under 342 - Critical Area Planting. In addition, soil bioengineering systems create resistance to sliding or shear displacement in a streambank as they develop roots or fibrous inclusions. Environmental benefits derived from bioengineering materials include diverse and productive riparian habitats, shade, organic additions to the stream, cover for fish, and improvements in aesthetic value and water quality. Soil bioengineering installations work best in conjunction with structural measures such as rock riprap to provide more permanent protection and healthy function, enhance aesthetics, and create a more environmentally acceptable product. Soil bioengineering systems normally use unrooted plant parts in the form of cut branches and rooted plants. For streambanks, living systems include brushmattresses, live stakes, joint plantings, vegetated geogrids, branchpacking, and live fascines. Typical bioengineering scenario is a plot of land which is 200' long by 10' wide (2000 sf) installed on the upper part of the streambank. Resource Concerns: Soil Erosion - Excessive Bank Erosion from Streams, Shoreline and Water Conveyance Channels; Water Quality Degradation - Excessive Sediment in Surface Waters; Water Quality Degradation - Elevated Water Temperature; Excess/Insufficient Water - Excessive Sediment in Surface Waters; Inadequate Habitat for Fish and Wildlife- Habitat Degradation. Associated Practices include: 560 - Access Road; 342 - Critical Area Planting; 382 - Fence; 391 - Riparian Forest Buffer; 390 - Riparian Herbaceous Cover; 395 - Stream Habitat Improvement and Management; 614 - Watering Facility; 484-Mulching; 570-Stromwater Runoff Control.

**Before Situation:** A stream bisects the agricultural property and has had all of the woody vegetation removed due to overgrazing or human manipulation; the upper part of the streambank is degraded, unstable and show signs of active erosion. Generally installed above more permanent structural measures such as rock riprap. Soil Erosion: The streambank is unstable. Water Quality Degradation: The sediment load has increased in the stream resulting in elevated water temperatures. Excess/Insufficient Water: The excessive sediment load has reduced the water conveyance capacity, storage capacity and flow within the stream. Inadequate Habitat for Fish and Wildlife: The deficiencies in the stream's habitat limit survival, growth, reproduction, and/or diversity of aquatic organisms within the stream.

**After Situation:** The streambank is stable against further erosion and encourages natural sediment transport and deposition. Loss of riparian areas and sediment load is reduced in the stream. For Soil Erosion: The streambank is stable. For Water Quality Degradation: The sediment load has decreased in the stream resulting in improved aquatic habitat. For Excess/Insufficient Water: The water conveyance capacity, storage capacity and flow within the stream has been stabilized. For Inadequate Habitat for Fish and Wildlife: The reduction in the sediment load promotes survival, growth, reproduction, and/or diversity of aquatic organisms within the stream's habitat.

**Scenario Feature Measure:** Area of Bio-Engineering Applied

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 2000

**Total Scenario Cost:** \$7,922.38

**Scenario Cost/Unit:** \$3.96

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Labor**

Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$25.96	10	\$259.58
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$26.15	20	\$523.04
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$43.61	10	\$436.12

**Equipment Installation**

Backhoe, 80 HP	926	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$55.93	10	\$559.32
Tractor, agricultural, 120 HP	962	Agricultural tractor with horsepower range of 90 to 140. Equipment and power unit costs. Labor not included.	Hour	\$57.58	10	\$575.77

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$255.27	2	\$510.55
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**Materials**

Cuttings, woody, medium size	1308	Woody cuttings, live stakes or whips typically 1/4" to 1" diameter and 24" to 48" long. Includes materials and shipping only.	Each	\$0.49	200	\$98.49
Wattles or facines, 4 to 5 inch diameter	1903	Facines, or wattles: bundles of live tree stems of species that sprout roots, bound together. 4"-5" diameter. Includes materials and shipping only.	Foot	\$5.22	200	\$1,044.49
Wattles or facines, 6 to 8 inch diameter	1904	Facines, or wattles: bundles of live tree stems of species that sprout roots, bound together. 6"-8" diameter. Includes materials and shipping only.	Foot	\$7.25	200	\$1,450.16
Wattles or facines, 9 to 12 inch diameter	1905	Facines, or wattles: bundles of live tree stems of species that sprout roots, bound together. 9"- 12" diameter. Includes materials and shipping only.	Foot	\$12.32	200	\$2,464.86