

Practice: 580 - Streambank and Shoreline Protection

Scenario: #2 - Bioengineered

Scenario Description: Protection of streambanks consisting of a bioengineered technique comprised of non-structural measures such as earth revetments and benches with vegetative measures to stabilize and protect the streambank against scour and erosion. Soil bioengineering is a system of living plant materials used as structural components. Adapted types of woody vegetation (shrubs and trees) are initially installed in specified configurations that offer immediate soil protection and reinforcement. 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 woody vegetation include diverse and productive riparian habitats, shade, organic additions to the stream, cover for fish, and improvements in aesthetic value and water quality. Under certain conditions, soil bioengineering installations work well in conjunction with structures 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. 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, critical area vegetation, livestock, rootwads and revetments: a 6-foot high bank at 3(H):1(V) slope for 1000 linear feet (0.46 acres) is used for estimation purposes. 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; 382 - Fence; 391 - Riparian Forest Buffer; 390 - Riparian Herbaceous Cover; 395 - Stream Habitat Improvement and Management; 614 - Watering Facility, 570 Stormwater 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 moderately 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: Square Foot of Streambank/Shoreline Protected

Scenario Unit: Square Foot

Scenario Typical Size: 20000

Total Scenario Cost: \$43,157.30

Scenario Cost/Unit: \$2.16

Cost Details

| Component Name | Id | Description | Unit | Cost | Qty | Total |
|----------------|----|-------------|------|------|-----|-------|
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Equipment Installation

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| Dozer, 80 HP | 929 | Track mounted Dozer with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$65.63 | 16 | \$1,050.05 |
| Earthfill, Roller Compacted | 49 | Earthfill, roller or machine compacted, includes equipment and labor | Cubic Yard | \$3.57 | 2500 | \$8,933.93 |
| Excavation, Common Earth, side cast, small equipment | 48 | Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor. | Cubic Yard | \$1.89 | 2500 | \$4,727.28 |
| Hydraulic Excavator, 2 CY | 932 | Track mounted hydraulic excavator with bucket capacity range of 1.5 to 2.5 CY. Equipment and power unit costs. Labor not included. | Hour | \$163.20 | 75 | \$12,240.11 |
| Seeding Operation, Broadcast, Ground | 959 | Broadcast seed via ground operation. May require post tillage operation to incorporate seed. Includes equipment, power unit and labor costs. | Acre | \$12.53 | 0.46 | \$5.76 |

Labor

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|----------------------------|-----|---|------|---------|-----|------------|
| 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 | \$24.21 | 75 | \$1,815.81 |
| Equipment Operators, Light | 232 | Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers | Hour | \$20.76 | 16 | \$332.16 |
| General Labor | 231 | Labor performed using basic tools such as power tool, shovels, and | Hour | \$20.07 | 370 | \$7,425.75 |

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| | | other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc. | | | | |
| 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 | \$39.78 | 80 | \$3,182.67 |

Materials

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|--|------|---|-------------|---------|------|------------|
| Erosion Control Blanket, biodegradable | 1213 | Biodegradable erosion control blanket, typically a composite of natural fibers with reinforcing polymer netting. Materials and shipping only. | Square Yard | \$1.24 | 2222 | \$2,756.72 |
| One Species, Cool Season, Annual Grass or Legume | 2311 | Cool season annual grass or legume. Includes material and shipping only. | Acre | \$39.29 | 0.46 | \$18.08 |
| Tree, willow | 1426 | Willow tree for planting, 18" to 36" seedling. Includes materials and shipping only. | Each | \$0.67 | 1000 | \$668.99 |

Practice: 580 - Streambank and Shoreline Protection

Scenario: #4 - Structural-J Hook, Cross Vane

Scenario Description: Protection of streambanks using bank stabilization measures to stabilize eroding stream bank, reduce near bank stress and prevent sediment from entering stream along banks of by constructing bankfull benches and using boulders and or log cluster (with boulders) to construct in-stream structures such as J-Hook, Vanes, Cross Vanes or Combo Root Wad/Log Vane and J-Hook structures. The purpose of this practice is to maintain, improve, and restore physical, chemical, and biological functions of a stream to provide diverse aquatic communities to improve habitat for desired aquatic species. Scenario: Install 2 J hooks on 500 ' section of 100 SM watershed channel, where the bankfull depth is 8.0' and the J hook is as high as 1/2 bankfull or 4.0'. Each J hook develops an average pool depth of 8.0'and have a arm length of 130' long with a 53' long (7' deep)hook. Boulders are an average dimension of 3'x 2.5'x 2' and weigh 1,800#s. 225 boulders are required for one structure (125 CY). 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; 382 - Fence; 391 - Riparian Forest Buffer; 390 - Riparian Herbaceous Cover; 395 - Stream Habitat Improvement and Management; 614 - Watering Facility, 570 Stormwater Runoff Control

Before Situation: A streambank is unstable, vertical and eroding in a meander and laterally moving yearly moving into a landowners field at an accelerated rate. 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: Tons of boulders installed

Scenario Unit: Ton

Scenario Typical Size: 412

Total Scenario Cost: \$25,602.88

Scenario Cost/Unit: \$62.14

Cost Details

| Component Name | Id | Description | Unit | Cost | Qty | Total |
|----------------|----|-------------|------|------|-----|-------|
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Equipment Installation

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|--------------------------------------|-----|--|------------|----------|-----|------------|
| Backhoe, 80 HP | 926 | Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$55.63 | 40 | \$2,225.05 |
| Earthfill, Dumped and Spread | 51 | Earthfill, dumped and spread without compaction effort, includes equipment and labor | Cubic Yard | \$2.93 | 260 | \$762.36 |
| Hydraulic Excavator, 2 CY | 932 | Track mounted hydraulic excavator with bucket capacity range of 1.5 to 2.5 CY. Equipment and power unit costs. Labor not included. | Hour | \$163.20 | 20 | \$3,264.03 |
| Seeding Operation, Broadcast, Ground | 959 | Broadcast seed via ground operation. May require post tillage operation to incorporate seed. Includes equipment, power unit and labor costs. | Acre | \$12.53 | 0.1 | \$1.25 |

Labor

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|----------------------------|-----|--|------|---------|----|------------|
| 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 | \$24.21 | 60 | \$1,452.65 |
| 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 | \$20.07 | 40 | \$802.78 |
| 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 | \$39.78 | 16 | \$636.53 |

Mobilization

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| Mobilization, large equipment | 1140 | Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits. | Each | \$484.73 | 1 | \$484.73 |
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| Mobilization, medium equipment | 1139 | Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds. | Each | \$253.88 | 1 | \$253.88 |
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Materials

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|--|------|---|-------------|---------|-----|-------------|
| Boulder | 1761 | Rock boulders (approximately 5 ft dia. 6.67 Tons) Includes materials and delivery (up to 100 miles) only. | Ton | \$34.32 | 412 | \$14,138.92 |
| Erosion Control Blanket, biodegradable | 1213 | Biodegradable erosion control blanket, typically a composite of natural fibers with reinforcing polymer netting. Materials and shipping only. | Square Yard | \$1.24 | 484 | \$600.47 |
| Geotextile, non-woven, heavy weight | 1210 | Non-woven greater than 8 ounce/square yard geotextile with staple anchoring. Materials and shipping only. | Square Yard | \$4.15 | 235 | \$976.30 |
| One Species, Cool Season, Annual Grass or Legume | 2311 | Cool season annual grass or legume. Includes material and shipping only. | Acre | \$39.29 | 0.1 | \$3.93 |