TECHNICAL NOTES

U S Department of Agriculture Soil Conservation Service

BIOENGINEERED STREAMBANK STABILIZATION ON ANDERSON CREEK: A Case Study

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BIOENGINEERED STREAMBANK STABILIZATION ON ANDERSON CREEK: A Case Study

Many streams in California have been denuded of riparian vegetation resulting in eroded streambanks, channel scour, habitat fragmentation, and significant alteration of nearby and downstream aquatic ecosystems. Bioengineered streambank treatments to restore impacted streams are becoming increasingly popular. They combine the strengths of engineered structures with the enduring bank stabilization live vegetation roots. In 1988, Anderson Creek in Mendocino County offered a laboratory to study the restoration effects of bioengineered streambank treatments.

Case Study Background

Anderson Creek lies in Anderson Valley, west of Boonville in Mendocino County, and has several reaches that have been unstable for many years. Riparian vegetation was absent. Every Fall accumulated bedload gravel in the channel was pushed up against the existing banks to allow unimpeded flows over winter. In most years after the first few major storm events, the gravel would wash away leaving the banks re-exposed. Over the years the stream became wider and shallower. In 1988, the stream channel had increased in width from about 50 feet to about 200 feet wide. The east bank was vertical and about 10 feet high. The west bank was unvegetated, but stable.

The Solution

Bioengineered streambank treatments were installed in November, 1988. The east bank was graded to a 6:1 slope, with the west bank retained at the existing 1:1 slope. Three jetties were constructed into the creek from the east bank. The jetties were eight feet high and constructed of gravel from the site. The gravel was wrapped and anchored with a geotextile material to reinforce the jetties and keep the gravel in place (See Photo #1). The gravel was used to replace imported rock rip-rap to minimize cost. Some rock was used later, however, to armor the upstream side of the jetties (See Photo #3). Time to design the 1,000 foot project was 280 hours with construction time totaling 3.5 weeks.

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For the geotextile material to be effective, it was installed to totally cover the front, top and back sides of each jetty. If only a partial coverage is used, the effectiveness of the jetty is severely diminished.

The jetties were designed to divert high water away from the fill material along the east bank (See Photo #2), keeping the main channel along the stable west bank. Another objective of the design was to create eddys behind the jettys to facilitate deposition of silt over the gravel to produce a medium favorable to plant establishment (See Photo #4).

The vegetative portion of the treatment was an aggressive plant establishment program consisting of species of willow (*Salix spp.*) and poplar (Populus spp.). The success of this project is linked directly to the land owner's efforts in plant establishment. Specific species are not as important as the mix of brushy forms and arborescent forms of willow and poplar.

Vegetative establishment has consisted of an integrated program of planting seedlings, various sizes of cuttings, and natural (on-site) vegetative and seed propagation from willows and poplars. Pole-size cuttings of willow were planted to a depth of five feet with a tractor mounted auger at the edge of the re-established stream channel (See Photo #5). This has helped maintain the channel during peak flows. These large cuttings have been integrated with willow wattles placed horizontally in contact with the sediment trapped in the eddys (See Photo #6). This has allowed the wattles to also sprout (See Photos #8 through 10).
All methods of propagation have been successful. Initially, small cuttings and seedlings were planted to get cover established.

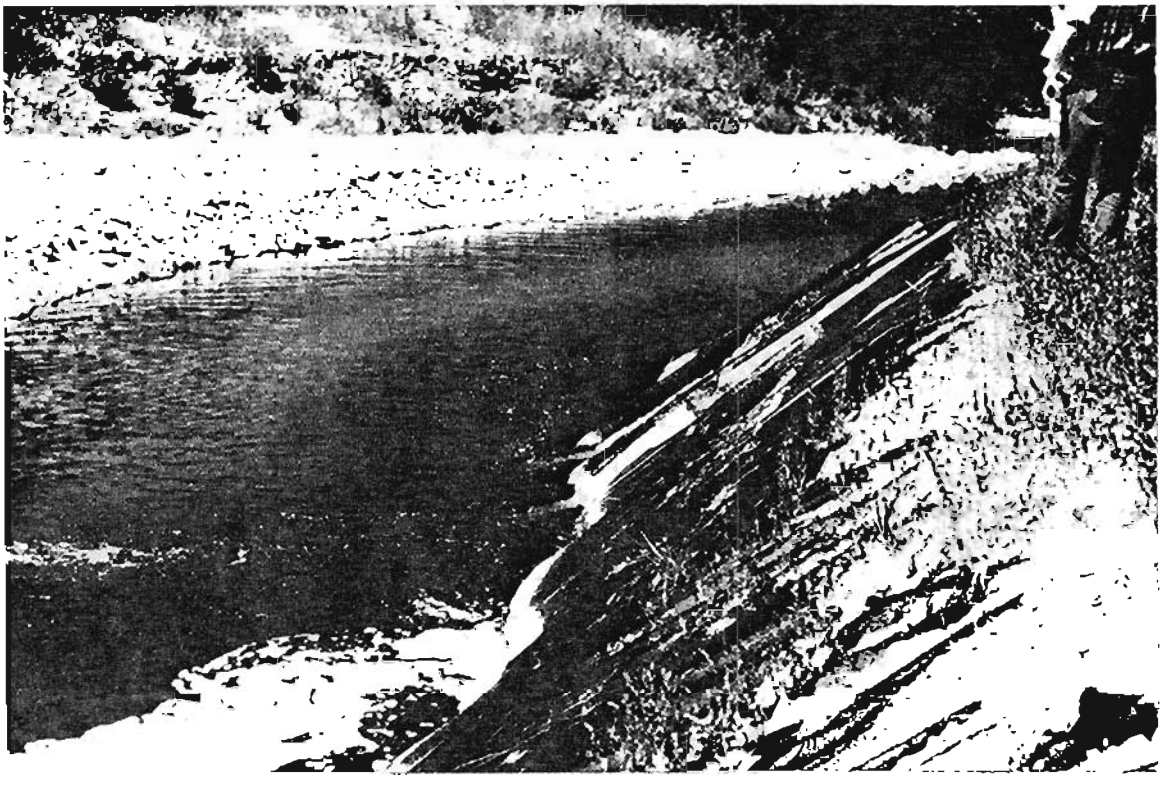
Results

The project has stabilized the stream channel and streambanks for a distance of approximately 1,000 feet. Width of the stream has been reduced to about 100 feet which has increased channel flow velocities. Willows, poplars, and grass have become successfully established along both banks, with a build up of sediment trapped by the jettys and vegetation. To date, the project has withstood floodwaters eight feet in height, moving at a velocity of 12 feet per second. Salmon have not moved back into the stream, but steelhead are present in limited numbers. The past six years of drought have caused low stream flows reducing fishery recovery. However narrowing and deepening the channel, and recruitment of riparian vegetation has improved to the fish access and habitat.

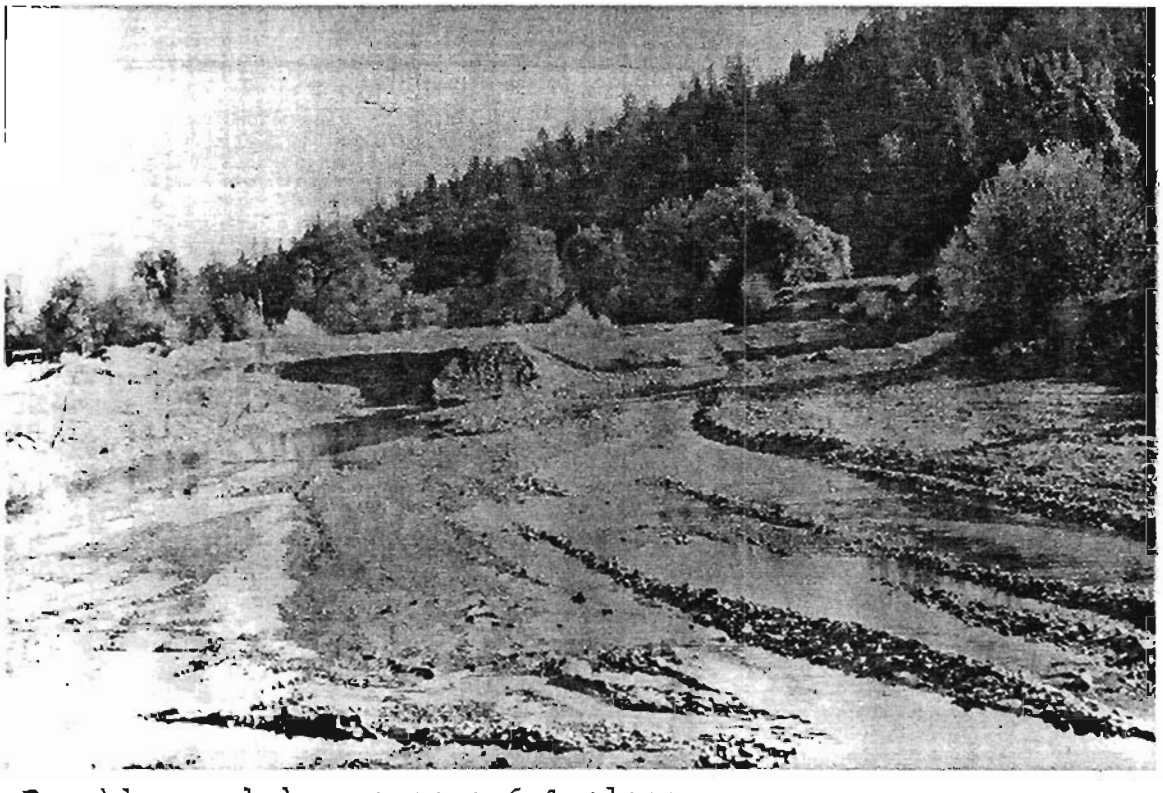
Technology Transfer

This technology is applicable to perennial streams throughout the state. SCS practices used for this technique are Streambank Protection (580), Critical Area Planting (342), Tree Planting (612), and Dike (356).

Photos



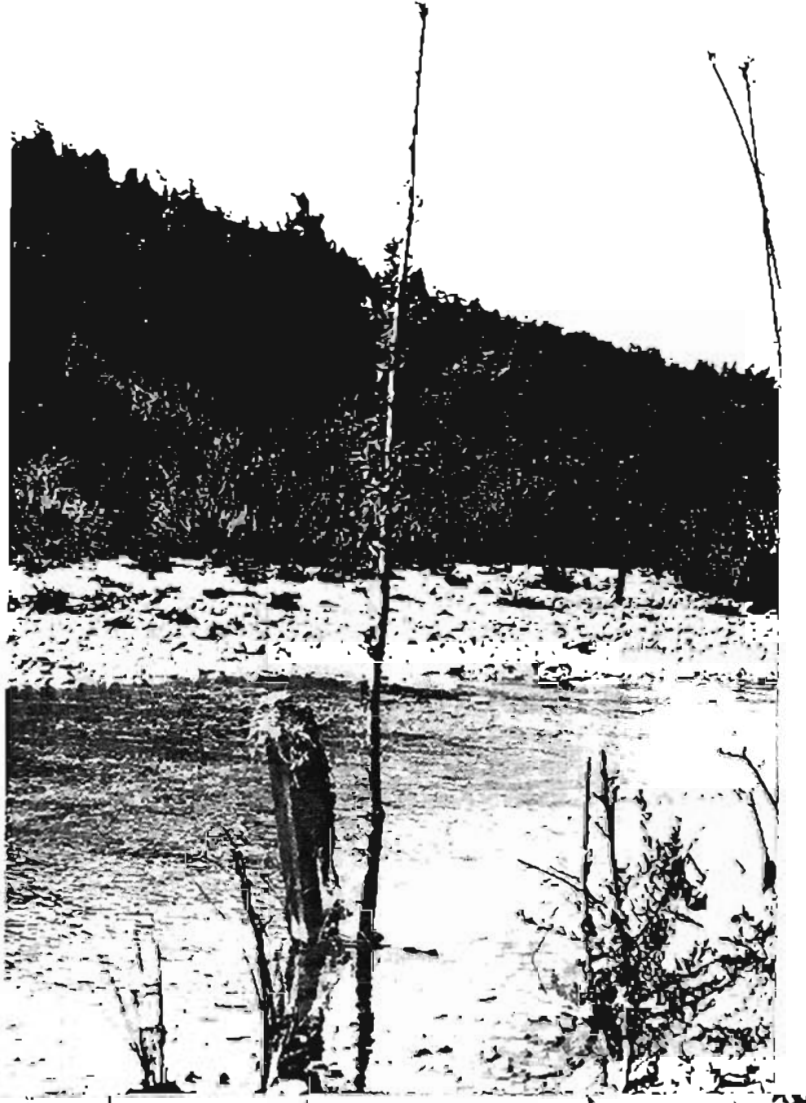
1. Newly constructed jetty with geotextile and gravel



2. Freshly graded area on a 6:1 slope

3. Vegetated and armored jetty April, 1994

4. Vegetated area in accumulated sediment behind jetty



5. Poles standing in stream soon after establishment

6. Poles with wattlings sprouting through the sediment

7. Established willows

8. Mixed arborescent and brushy willows showing diverse riparian habitat

9. Woven willow live revetment

10. Willow post live revetment