

# EVALUATION OF HABITATS RESULTING FROM STREAM BANK PROTECTION PROJECTS IN SISKIYOU AND MENDOCINO COUNTIES, CALIFORNIA

David W. Patterson  
Soil Conservation Service  
Red Bluff, California

Abstract. Streambank protection projects have received mixed acceptance by various resource agencies and the public. Responses have often been emotional and the reasons for needed protection overlooked. The U.S.D.A., Soil Conservation Service (SCS) is often caught in the middle of controversy when asked by private landowners to provide designs for proposed streambank protection projects on private lands.

SCS is aware of its responsibility to design conservation practices which are environmentally sound as well as economically feasible and sound from an engineering standpoint. Comments by the California Department of Fish and Game after their review of some existing projects and some SCS designs for planned projects caused SCS to propose that habitat conditions for both fish and wildlife be assessed on treated and untreated water courses.

During the summer of 1975 biologists representing both the California Department of Fish and Game and SCS assessed 7 projects in Siskiyou and Mendocino Counties. It was generally concluded that when riparian vegetation is established (3 to 5 years after construction) the streambank protection projects assessed had produced positive or beneficial effects on both fish and wildlife. The assessment also resulted in possible design modifications to improve fish habitat.

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## INTRODUCTION

Streambank protection projects undertaken on our nation's streams may result in controversy. Responses to projects from resource agencies are often mixed and reaction from the public charged with emotion because of diverse objectives and points of view. Streambank protection projects are, after all localized treatments of runoff problems which are symptomatic of larger overall watershed ills.

Nowadays, it is difficult to find a watershed which has not been influenced in some way by man. Typical activities in upper watersheds can include

logging, grazing, road building, mining and recreation to mention a few. At the same time lower portions of many watersheds are often highly developed to residential, industrial and agricultural land uses. As so many of us well know, man's upper watershed activities can result in accelerated runoff and erosion. These increased water flows, with their burden of suspended solids, gnaw and tear at the soil and riparian vegetation on streambanks and nearby land areas. As the heavy flows and sediments reach the lower watershed, flooding and deposition result in damage to resources, property, destruction of fish and wildlife habitat, and may result in loss of life.

Often, productive soils lie adjacent to waterways both in higher mountain valleys and in areas of alluvial deposition lower in the watershed. It is for these streambank areas along our nation's smaller streams that private landowners ask Resource Conservation Districts and the Soil Conservation Service to design structures for protection.

Streambank protection is defined by the SCS as the use of vegetation or structural measures to stabilize and protect banks of streams, lakes, estuaries or excavated channels against scour and erosion. SCS has designed protection projects for landowners along many miles of California's smaller waterways. Several protection methods have been tried in the past, but the placement of large riprap rock, or revetments, in combination with plantings of riparian vegetation have worked best.

SCS advises private landowners to obtain any permits required by other agencies prior to undertaking streambank protection projects. In addition, streambank protection plans prepared by SCS are reviewed by the California Department of Fish and Game for influence on wildlife and fisheries. SCS has the responsibility to design conservation practices which are environmentally sound as well as economically feasible and sound from an engineering standpoint. Comments received from California Fish and Game after their review of some existing projects caused SCS to propose that habitat conditions be assessed on completed streambank protection projects and untreated water courses. As a result biologists representing both California Fish and Game and SCS cooperated to assess habitat conditions on seven streambank protection projects in Siskiyou and Mendocino Counties. Appreciation is expressed to California Fish and Game biologists Dave Rogers and Alan Baracco and their assistants for their cooperation.

#### Assessment Locations

Siskiyou County - Treated and untreated sections were selected for assessment along Scott River, in the vicinity of Etna and Fort Jones. Scott River, located in the Scott River Valley west of Yreka, is a perennial stream which is a tributary of the Klamath River. Habitats for fish and wildlife were assessed on project sections located on the Horn, Hurliman and Tozier projects while fish populations were assessed on the Horn and Whipple sections.

Mendocino County - Both fish and wildlife habitats and fish populations were evaluated on treated and untreated sections of three different streams:

1. The Bolce Ranch rail and wire revetment on Forsythe Creek, an intermittent stream and Russian River tributary which crosses U.S. Highway 101 about 5 miles north of Ukiah.
2. The Anderson Valley School District project on Anderson Creek, an intermittent stream and tributary of Navarro River. The project is located on the northwest side of Boonville--19 miles west of Ukiah on State Route 253.
3. The Galbreath Ranch Project on Rancharia Creek, a perennial stream and tributary of Navarro River. Galbreath Ranch is located about 10 miles south of Boonville on State Route 128.

## MATERIALS AND METHODS

### Habitat Assessment

Measurements were either by ocular estimate or actual measurement with 100' steel tape and 10' pocket tape. Dissolved oxygen and temperatures were measured with a Yellow Springs Instrument Company Model 51A oxygen meter and a Texadyne Mark IV oxygen meter.

Treated and untreated sections evaluated were up to 120 feet long on perennial streams and 25 to 100 feet long on intermittent streams, depending upon size of remaining pools. Distances between observation stations were from 10 to 50 feet apart, again depending on the size of the water area in the section. Assessments were made by two or three-men teams. Several 4 x 5 black and white photos and 35 mm color slides were taken to document observations.

Information on the following habitat elements were recorded at each station:

1. Identity of riparian vegetation.
2. Height of riparian vegetation above water surface.
3. Distance that riparian vegetation overhung water.
4. Estimated percent of shade during A.M. or P.M.
5. Stream width.
6. Maximum water depth and location.
7. Estimated rate of flow.
8. Stream bottom material.
9. Dissolved oxygen.
10. Water temperature.
11. Availability of large rocks (Donickers).

### Fish Population Study

A Smith-Root Mark V backpack electro shocker was operated on 100' stream sections and isolated pools. Sampling was difficult on Scott River due to large amounts of water relative to the capacity of the shocking gear. An attempt was made to determine population, size and species diversity for each section.

## RESULTS

### Fish and Wildlife Habitat

To determine any physical differences in fish and wildlife habitat values, measurements for the following habitat elements were compared. The measurements recorded at each observation station were averaged and presented in Table 1. Habitat conditions along the treated section of Anderson Creek are not presented as the project had been constructed only one year ago and riparian vegetation had not yet become established.

Willow and alders growing alone or in mixed stands dominated where riparian vegetation occurred. Some treated sections also contained dead brush and limbs which are attractive to some wildlife species.

### Fish Population Study

Scott River Sections (Horn and Whipple projects): Relatively large shallow water areas in untreated sections and wide, deep pools in treated sections combined with large numbers of fish, especially non-game species, made accurate fish sample counts and realistic population estimates impossible. Due to the sampling problem encountered on Scott River sections only the actual number of fish collected in each section are presented with no attempt to estimate population numbers.

Table 1. Comparison of habitat element values on Scott River sections.  
(Horn, Tozier and Hurliman)<sup>1</sup>

	Treated (30 stations)	Untreated (30 stations)
1. Stations with riparian vegetation	94%	37%
2. Average height of riparian vegetation	15'	3'
3. Stations with vegetation overhanging water	81%	22%
4. Average width of overhanging vegetation	9'	2'
5. Average percent of stream shaded	40%	17%
6. Stations with water deeper than 2'	63%	26%
7. Average stream width	53'	48'

<sup>1</sup>The Whipple project was not included, as a habitat assessment was not made on the untreated section. The Whipple untreated section is quite similar to the Horn untreated section which was evaluated.

Table 2. Comparison of habitat element values on Ukiah area stream sections. (Bolce and Galbreath)<sup>1</sup>

	Treated (10 stations)	Untreated (10 stations)
1. Stations with riparian vegetation	90%	30%
2. Average height of riparian vegetation	19'	17' <sup>2</sup>
3. Stations with vegetation overhanging water	70%	40%
4. Average width of overhanging vegetation	7' <sup>3</sup>	1'
5. Stream stations shaded by vegetation	60% <sup>3</sup>	40%
6. Stations with water deeper than 2'	40%	20%
7. Average stream width	12'	14'

<sup>1</sup>Anderson Creek assessment was excluded since construction was completed only a year ago and existing habitat does not represent a matured project.

<sup>2</sup>Includes one large California bay-tree on Rancharia Creek untreated section.

<sup>3</sup>Willows had been cut back just prior to assessment along Rancharia Creek revetment.

Table 3. Results from electro fishing Scott River sections.

Section	Run No.	Steelhead	Sculpin	Dace	Lamprey	Sucker
Horn treated	No. 1	18	7	76	19	0
Horn treated	No. 2	7	2	70	9	0
Horn untreated	No. 1	0	(213 non-game fish, primarily suckers)			
Horn untreated	No. 2	0	(92 non-game fish, primarily suckers)			
Whipple treated	(1 run only)	2	(Hundreds of non-game fish)			
Whipple untreated	(1 run only)	1	(Hundreds of non-game fish)			

Three or four King Salmon (spring run) weighing from three to five pounds each were observed in the Horn treated section. About 12 large suckers around 12 inches in length were also observed. At least six salmonids were observed besides the 2 collected in the Whipple treated section. Three smolted salmon were collected from a small pool located along the Whipple treated section which was isolated from running water. Hundreds of non-game fish were also in the isolated pool.

Ukiah Area Streams (Forsythe, Anderson and Rancharia Creeks): Only the diversity of fish species present in sampled sections are indicated for these intermittent streams. Populations in these sections were influenced by fish concentrating as the streams became dry and fish stacked up in pools, which occurred in the treated and untreated sections.

Table 4. Results of electro fishing - Ukiah area intermittent streams (Forsythe and Anderson)

<u>Section</u>	<u>Salmon</u>	<u>Stickle- back</u>	<u>Lamprey</u>	<u>Roach</u>	<u>Western Sucker</u>	<u>Green Sunfish</u>	<u>Squaw- fish</u>	<u>SM Bass</u>
Forsythe treated			X	X	X	X	X	X
Forsythe untreated		X	X	X	X	X	X	X
Anderson treated				X	X			
Anderson untreated	X	X		X	X			

Fish were readily collected from Rancharia Creek. An estimate of the total fish populations was made by Alan Baracco of the Department of Fish and Game, for both the treated and untreated sections. The estimated total fish populations for the treated section was 276 fish and for the untreated section 188 fish. Eighteen percent of the total fish population, in the treated section, was made up of salmonids and 20 percent in the untreated section. The remaining fish were Navarro roach and a few Sacramento western suckers.

#### DISCUSSION

Construction of treated sections on which habitat conditions were assessed had been completed for from 6 to 15 years and riparian vegetation was well established and protected. I do not consider newly constructed streambank protection projects to be completed until riparian vegetation has been established. Establishment generally requires one year for grasses and other herbaceous plants and from 3 to 5 years for shrubs and trees, such as willow and alder.

When the observed values for the habitat elements presented in Tables 1 and 2 are compared for treated and untreated sections, it is evident that habitat values along the treated sections assessed are at least as good for fish and wildlife as on corresponding untreated sections. In fact, treated sections on the average provide deeper water, more shade and more cover benefiting both fish and wildlife. The placement of streambank protection structures has also greatly increased the permanency of riparian vegetation along treated sections. No differences were observed in dissolved oxygen and temperatures in running water for treated or untreated sections on Scott River or Rancharia Creek.

Difficult conditions were encountered for assessing fish populations by electro fishing, especially on Scott River sections. Assessed sections contained either large shallow water areas or wide, deep pools and large numbers of fish. Assessments were made on Scott River on August 19th and 20th

and September 15th and 16th, 1975, during the period when habitat conditions are most critical for fish.

No attempt was made to estimate the total fish populations in the assessed sections on Scott River. However, the results of electro fishing and visual observations do indicate that there are more salmonids and as many non-game fish species on treated sections assessed as on the untreated sections. Three smolted salmon collected in mid-September in an isolated pool along the Whipple treated section demonstrated that treated sections promote survival of salmonids during low water conditions. No pools isolated from running water containing salmonids were observed along the untreated sections assessed.

Assessments were made on the Mendocino County streams on September 24th, 25th and 26th, 1975. The lower elevations and intermittent nature of the assessed section on Forsythe and Anderson Creeks in Mendocino County make them marginal or unsuited for salmonids during low water periods. Both the treated and untreated sections assessed on these streams were supporting non-game species, as indicated in Table 4. Juvenile steelhead were observed in the untreated section assessed on Anderson Creek; however, the steelhead had grown to a length (FL) of only 2-3 inches by September 25th, indicating marginal habitat for salmonids.

The stream sections assessed on Rancharia Creek, in Mendocino County, are perennial and in general provide adequate conditions for survival of salmonids in summer. Conditions on Rancharia Creek were satisfactory for examining the relative abundance of fish species in the populations of the treated and untreated sections. Again the relative abundance of salmonids and non-game species along the treated section indicates that habitat along the treated section is comparable in quality and quantity to the untreated section. A covey of California quail were also observed along the riparian vegetation of the treated section of Rancharia Creek during June of 1975 while none were observed along the untreated section.

During the assessment of treated sections on Scott River it was noted that several large riprap rocks or donickers with diameters of 5 to 6 feet placed on the streambanks during construction had dropped to the toe or rolled a few feet from the toe and into the stream. These donickers are now providing resting areas and cover for fish along the treated sections. Donickers providing resting areas and cover did not occur in assessed untreated sections. It was evident that these large rocks have been in place in the streambed for several years. It was also evident that the presence of the donickers adjacent to the toe of the streambank have not caused damage to the protected streambanks due to increased water velocity between the donickers and the streambank. Because of this observation we can now consider including in designs the placement of donickers at specified locations specifically for improvement of fish habitat along planned projects. Wildlife agencies, sportsmen, or other public agencies or organizations can provide funds for rock placed for enhancement of fish habitat on such projects on private lands. Project costs to ranchers and farmers, at present, run from \$60.00 to \$80.00 per linear foot for rail and wire revetments. The cost for rock riprapping streambanks is now \$30.00 or more per linear foot.

It was also noted during assessment that livestock generally have free access to the treated streambanks and established riparian vegetation on treated sections. Many of the treated streambanks have been damaged from livestock trampling. A browse line was evident on the riparian vegetation, especially on willow, along all of the treated sections except the Bolce project on Forsythe Creek. Fencing or better control of livestock use is needed to maintain the streambanks and quality riparian habitat.

The amount of riparian vegetation existing along the treated streambank sections assessed, the protection provided for riparian habitat along treated

sections, and the fish populations observed along the same treated sections indicate that SCS designed streambank protection projects are not necessarily detrimental to fish and wildlife resources. Protected streambanks can, in fact, provide better than average fish and wildlife habitat. The possibility of adding large rocks at selected locations on treated streambanks can further enhance fish habitat, if funding is available.

Streambank protection projects will never provide a cure-all for overall watershed runoff problems. However, properly protected streambanks can offer positive and beneficial solutions to common local problems of eroded streambanks and soil, and loss of unprotected riparian vegetation, benefiting both wildlife and man.

Check list of scientific names:

Birds

California quail (Lophortyx californica)

Fish

Scott River:

Rainbow trout/steelhead (Salmo gairdnerii)  
Sculpin (Cottus sp.)  
Klamath speckled dace (Rhinichthys osculus klamathensis)  
Brook lamprey (Lampetra planeri)  
Klamath small scale sucker (Catostomus rimiculus)  
King salmon (Oncorhynchus tshawytscha)

Forsythe Creek:

Venus roach (Hesperolencus venustus)  
Green sunfish (Lepomis cyanellus)  
Sacramento squawfish (Ptychocheilus grandis)  
Sacramento western sucker (Catostomus occidentalis)  
Smallmouth bass (Micropterus doiomieui)  
Brook lamprey (Lampetra planeri)

Rancharia Creek:

Rainbow trout/steelhead (Salmo gairdnerii)  
Navarro roach (Hesperoleucus navarroensis)  
Sacramento western sucker (Catostomus occidentalis)

Plants

Willow (Salix spp.)  
Alder (Alnus spp.)  
California bay (Umbellularia californica)