

STREAM INVENTORY REPORT

Spooner Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Spooner Creek to assess habitat conditions for anadromous salmonids. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Spooner Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys having been conducted on Spooner Creek. The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Spooner Creek is tributary to Bottom Creek, tributary to the Little North Fork Navarro River, located in Mendocino County, California. Spooner Creek's legal description at the confluence with Bottom Creek is T16N R14W S31. Its location is 39°12'30" North latitude and 123°28'20" West longitude. Spooner Creek is an ephemeral stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Spooner Creek drains a watershed of approximately 1.5 square miles. Elevations range from about 520 feet at the mouth of the creek to 1,400 feet in the headwater areas. Redwood and fir forest dominates the watershed. The watershed is privately owned and is managed for timber production. Vehicle access exists via the Masonite Road.

METHODS

The habitat inventory conducted in Spooner Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Spooner Creek personnel were trained in June, 1994, by Gary Flosi and Scott Downie. This inventory was conducted by a two-person team.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Spooner Creek to record measurements and observations. There are nine components to

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the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Both water and air temperatures are measured and recorded at each tenth unit typed. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Spooner Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Spooner Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4).

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is

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calculated for each habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Spooner Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two respectively.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Spooner Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results were recorded.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Spooner Creek, the dominant composition type and the dominant vegetation type of both the right and left banks were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Spooner Creek to document the fish species composition and distribution. One site was electrofished in Spooner Creek using one Smith-Root Model 12 electrofisher. The site was end-blocked with nets to contain the fish within the sample reach. Fish from the site were counted by species, measured, and returned to the stream.

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DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Spooner Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of June 28, 1994, was conducted by Chris Bysshe and Jeff Strayer (CCC). The total length of the stream surveyed was 1,292 feet.

Flow was estimated to be 0.03 cfs during the survey period.

Spooner Creek is an F4 channel type for the entire 1,292 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel substrates.

Water temperatures ranged from 57 to 58 degrees Fahrenheit. Air temperatures ranged from 69 to 89 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 35%, pool types 32%, and flatwater 26% (Graph 1). Flatwater habitat types made up 36% of the total survey **length**, pools 28%, and riffles 27% (Graph 2).

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Four Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 35%; mid-channel pools, 32%; and step runs, 13% (Graph 3). By percent total **length**, step runs made up 29%, mid-channel pools 28%, and low gradient riffles 27%.

Ten pools were identified (Table 3). Main channel pools exclusively were encountered and comprised 100% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Four of the 10 pools (40%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 10 pool tail-outs measured, 4 had a value of 1 (40%); 6 had a value of 2 (60%); and none had a value of 3 or 4 (0% each). On this scale, a value of one is the best for fisheries (Graph 6).

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Flatwater habitat types had the highest shelter rating at 104. Pool habitats followed with a rating of 99 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Spooner Creek. Graph 7 describes the pool cover in Spooner Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 10 of the 11 low gradient riffles (91%). Small cobble was the next most frequently observed dominant substrate type and occurred in 9% of the low gradient riffles (Graph 8).

Twenty-three percent of the survey reach lacked shade canopy. Of the 77% of the stream covered with canopy, 32% was composed of deciduous trees, and 68% was composed of coniferous trees. Graph 9 describes the canopy in Spooner Creek.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 71%. The mean percent left bank vegetated was 67%. The dominant elements composing the structure of the stream banks consisted of 0% bedrock, 2% boulder, 50% cobble/gravel, and 48% sand/silt/clay (Graph 10). Coniferous trees, including down trees, logs, and root wads, were the dominant vegetation type observed in 73% of the units surveyed. Additionally, 24% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on July 28, 1994, in Spooner Creek. The unit was sampled by Weldon Jones (DFG) and Chris Bysshe and Jeff Strayer (CCC). All measurements are fork lengths unless noted otherwise.

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The site sampled was habitat units 002-004, a run / mid-channel pool / low gradient riffle combination approximately 26 feet from the confluence with Bottom Creek. This site had an area of 807 sq ft and a volume of 331 cu ft. The unit yielded 15 steelhead between 45 and 123 mm and 11 sculpin between 56 and 75 mm.

DISCUSSION

The F4 channel type is considered good for bank-placed boulders; fair for low-stage weirs, single and opposing wing deflectors, channel constrictors, bank cover, and log cover structures; and poor for medium-stage weirs and random boulder placement.

The water temperatures recorded on the survey day June 28, 1994, ranged from 57 to 58° Fahrenheit. Air temperatures ranged from 69 to 89° Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 36% of the total **length** of this survey, riffles 27%, and pools 28%. The pools are relatively shallow, with only 4 of the 10 pools having a maximum depth greater than 2 feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy

None of the 10 pool tail-outs measured had embeddedness ratings of 3 or 4. Four had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The mean shelter rating for pools was high with a rating of 99. The shelter rating in the flatwater habitats was slightly better at 104. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large and small woody debris and undercut banks contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

All of the 11 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 77%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

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The percentage of right and left bank covered with vegetation was moderate at 71% and 67%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

- 1) Spooner Creek should be managed as an anadromous, natural production stream.
- 2) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All the distances are approximate and taken from the beginning of the survey reach.

Position

(ft): Comments:

0' Begin survey at confluence with Bottom Creek. Channel type is F4.

1292' End of survey due to a log debris accumulation that is a probable barrier.

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LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5