STREAM INVENTORY REPORT

ROSE CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Rose Creek and on one of its unnamed tributaries. 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 Rose Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Rose 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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Rose Creek is tributary to the South Branch North Fork Navarro River, tributary to the North Fork Navarro River, located in Mendocino County, California (Figure 1). Rose Creek's legal description at the confluence with South Branch North Fork Navarro River is T15N R14W S23. Its location is 39°08′25″ north latitude and 123°22′32″ west longitude. Rose Creek is a second order stream and has approximately 1.7 miles of blue line stream according to the USGS Orrs Springs, Bailey Ridge, and Boonville 7.5 minute quadrangles. Rose Creek drains a watershed of approximately 1.8 square miles. Summer base runoff is approximately 0.4 cubic feet per second (cfs) at the mouth. Elevations range from about 900 feet at the mouth of the creek to 2,600 feet in the headwater areas. Redwood and Douglas fir forest dominates the watershed. The watershed is privately owned and is managed for timber production. Foot access is available via abandoned private road.

METHODS

The habitat inventory conducted in Rose 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 and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Rose Creek personnel were trained in May, 1995, by Gary Flosi. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Rose Creek to record measurements and observations.

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.

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 every tenth habitat unit. 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". Rose 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were 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 Rose 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). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

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 calculated for each fully-described 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 Rose 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 fully-described 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 density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Rose Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

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 Rose Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-described unit 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. In Rose Creek fish presence was observed from the stream banks, and two sites were electrofished using one Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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 Rose 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 following results and discussion are for mainstem Rose Creek. Results and discussion for Unnamed Rose Creek Tributary follow the main body of this report as a subsection.

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 27 and 28, 1995, was conducted by Shelly Dunn and Bettina Chimarios (WSP/AmeriCorps). The total length of the stream surveyed was 5,781 feet with an additional 26 feet of side channel.

Flow was estimated to be 0.36 cfs on July 20, 1995.

Rose Creek is a G4 channel type for the first 5,059 feet of stream reach surveyed and an A6 channel type for the remaining 722 feet. G4 channels are entrenched, gully-like, step/pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates. A6 channels are steep, narrow, cascading, step/pool streams with high energy, debris transport associated with depositional soils, and silt or clay-dominant substrates.

Water temperatures ranged from 59 to 63 degrees Fahrenheit. Air temperatures ranged from 68 to 83 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 47% riffle units, 33% pool units, and 20% flatwater units (Graph 1). Based on total **length** of Level II habitat types there were 71% riffle units, 15% flatwater units, and 15% pool units (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low-gradient riffles, 41%; mid-channel pools, 24%; and runs, 12% (Graph 3). Based on percent total **length**, low-gradient riffles made up 66%, mid-channel pools 11%, and step runs 8%.

A total of 62 pools were identified (Table 3). Main channel pools were most frequently encountered at 81% and comprised 82% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Twenty-one of the 62 pools (34%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 62 pool tail-outs measured, none had a value of 1 (0%); 1 had a value of 2 (1.6%); 20 had a value of 3 (32.3%); and 41 had a value of 4 (66.1%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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. Pool habitat types had a mean shelter rating

of 25, and flatwater habitats had a mean shelter rating of 7 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 30. Scour pools had a mean shelter rating of 17 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Boulders were the dominant substrate observed in 4 of the 11 low gradient riffles measured (36%). Silt was the next most frequently observed dominant substrate type and occurred in 27% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 90%. The mean percentages of deciduous and coniferous trees were 64% and 36%, respectively. Graph 9 describes the canopy in Rose Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 74%. The mean percent left bank vegetated was 76%. The dominant elements composing the structure of the stream banks consisted of 20% bedrock, 5% boulder, 47% cobble/gravel, and 28% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 55% of the units surveyed. Additionally, 18% of the units surveyed had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on July 20, 1995, in Rose Creek. The sites were sampled by Gary Flosi (DFG), Chris Coyle (CCC), and Shelly Dunn and Bettina Chimarios (WSP/AmeriCorps). The first site sampled was habitat unit 41, a trench pool approximately 1,193 feet from the confluence with South Branch North Fork Navarro River. This site had an area of 180 sq ft and a volume of 360 cu ft. The site yielded four 0+ steelhead.

The second site was habitat unit 98, a low-gradient riffle located approximately 3,330 feet above the creek mouth. This site had an area of 176 sq ft and a volume of 123 cu ft. The site yielded one 0+ steelhead and one Pacific giant salamander.

DISCUSSION

Rose Creek is a G4 channel type for the first 5,059 feet of stream surveyed and an A6 for the remaining 722 feet. The suitability of G4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for low-stage weirs, opposing wing deflectors, and log cover; and poor for medium-stage weirs, boulder clusters, and single wing deflectors. A6 channels are considered: good for bank-placed boulders; fair for low- and medium-stage weirs, opposing wing deflectors, and log cover; and poor for boulder clusters, single wing

deflectors, and bank cover.

The water temperatures recorded on the survey days June 27 and 28, 1995, ranged from 59 to 63 degrees Fahrenheit. Air temperatures ranged from 68 to 83 degrees Fahrenheit. This is a fair 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 15% of the total **length** of this survey, riffles 71%, and pools 15%. The pools are relatively shallow, with only 21 of the 62 (34%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream 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, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Sixty-one of the 62 pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Rose Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 25. The shelter rating in the flatwater habitats was lower at 7. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large woody debris contributes 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.

Ten of the 11 low gradient riffles had silt, sand, large cobble, or boulders as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean percent canopy density for the stream was 90%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 74% and 76%, 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) Rose Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

4) Where feasible, design and engineer pool enhancement structures to increase the number of pools or deepen existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

5) 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 locally available.

6) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 150', should then be treated to reduce the amount of fine sediments entering the stream.

7) Spawning gravel on Rose Creek are limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel in order to expand redd site distribution in the stream.

8) There are several log debris accumulations present on Rose Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

PROBLEM SITES AND LANDMARKS

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

0' Begin survey at confluence with South Branch North Fork Navarro River. Channel type is G4.

143' Bridge 10' long x 35' wide x 15' clearance.

150' Right bank erosion 25' long.

359' Left bank tributary.

607' LDA 10' high x 40' wide x 20' long retaining gravel. Possible barrier.

2103' Right bank tributary.

2141' Left bank erosion.

2206' LDA 8' high x 30' wide x 26' long retaining gravel. Possible barrier.

2341' LDA 5' high x 10' wide x 8' long. Possible barrier.

2442' LDA 5' high x 13' wide x 17' long. Possible barrier. Right bank erosion.

3377' LDA 5' high x 20' wide x 10' long. Possible barrier.

3393' Unnamed Rose Creek Tributary enters left bank (see subsection).

3459' Left bank erosion 3' high x 35' long.

3478' Right bank erosion 30' long.

3605' Left and right bank erosion 186' long contributing silt at former bridge site.

3827' LDA 6' high x 9' wide x 7' long. Possible barrier.

3917' Left and right bank erosion 64' long.

3948' LDA 7' high x 6' wide x 4' long. Possible barrier.

4397' Left and right bank erosion 169' long.

4577' LDA 6' high x 4' wide x 4' long retaining gravel.

4683' LDA 9' high x 12' wide x 17' long. Possible barrier.

4962' Right bank erosion. LDA 4' high x 8' wide x 5' long retaining gravel.

5165' Left bank erosion 7' high x 260' long.

5240' LDA 4' high x 11' wide x 6' long retaining gravel.

5350' Right bank erosion.

5372' LDA 4' high x 7' wide x 35' long retaining gravel. Not a barrier.

5533' Left and right bank erosion 195' long.

5563' LDA 5' high x 4' wide x 26' long retaining gravel and silt. Possible barrier.

5674' LDA 6' high x 9' wide x 5' long. Possible barrier.

5746' LDA 6' high x 11' wide x 6' long retaining gravel. Possible barrier.

5781' LDA 12' high x 9' wide x 15' long. Barrier. End of survey.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

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