STREAM INVENTORY REPORT

RATTLESNAKE CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Rattlesnake 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 Rattlesnake 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 Rattlesnake Creek. The objective of this report is to document the current habitat conditions, and recommend options for the enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Rattlesnake Creek is tributary to the Upper North Fork Mattole River, tributary to the Mattole River, located in Humboldt County, California (Figure 1). Rattlesnake Creek's legal description at the confluence with the Upper North Fork Mattole River is T2S R1E S19. Its location is 40°17'27" N. latitude and 124°06'36" W. longitude. Rattlesnake Creek is a third order stream. The total length of blue line stream, according to the USGS Bull Creek quadrangle is 11.0 miles.

Rattlesnake Creek drains a watershed of approximately 8.6 square miles. Douglas fir forest and oak grassland dominate the watershed. The watershed is privately owned and is managed for timber production and livestock grazing. Vehicle access exists from U.S. Highway 101, via the Bull Creek/Mattole Road. Follow the Bull Creek Road for approximately 12 miles to the top of the ridge. At the ridge, Rim Road heads northwest for seven miles and leads to Rainbow Ranch. From Rainbow Ranch, a private road heads south and ends approximately 1/4 mile from the mouth of Rattlesnake Creek. Access from this point to the mouth is on foot.

METHODS

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

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

3. Temperatures:

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

4. Habitat Type:

Habitat typing used 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". Rattlesnake 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 measurements were accomplished using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Depth of the pool tail crest at each pool habitat unit was measured at 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 Rattlesnake 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 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 Rattlesnake 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.

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 Rattlesnake Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentages of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

9. Bank Composition:

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 Rattlesnake Creek, the dominant composition type in both the right and left banks was selected from a list of eight options on 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 Rattlesnake Creek to document the salmonid species composition and distribution. One site was electrofished in Rattlesnake Creek using one Smith Root Model 12 electrofisher. Fish from the site were counted by species, measured, and returned to the stream.

SUBSTRATE SAMPLING

Gravel sampling is conducted using either a 6 or 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream.

Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85 mm). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, then taken to the laboratory for final processing.

In the laboratory the samples are wet sieved using standard

Tyler screens. All particles greater than 0.85 mm diameter are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.85 mm is measured following one hour of settling in graduated cylinders or Imhoff cones. The fines measured in the field are added to these results.

Gravel sampling is conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles, at the tail-out of a pool, in the thalweg. The higher the percent of fine sediment, the lower the probability for eggs to survive to hatch. This is due to the reduced quantity of oxygenated water able to be percolated through the gravel, or because of the fine sediment capping the redd and preventing fry from emerging from the gravel.

DATA ANALYSIS

Data from the habitat inventory form is entered into Habtype, a dBASE 3+ data entry program developed by the Department and Fish and Game. From Habtype, the data is summarized by Habtab a dBASE 4.1 program in development by DFG.

The Habtab program produces the following summary 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 Rattlesnake 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 5-9, and 14, 1991, was conducted by Steve Liebhardt and John Crittenden (CCC). The total length of the stream surveyed was 22,452 feet, with an additional 982 feet of side channel.

Rattlesnake Creek is a B2 channel type for the first 2,126 feet from the confluence with the Upper North Fork Mattole River, then it changes to a B1 channel type for the next 7,524 feet, then it changes to an A2 channel type for the remaining 12,802 of stream reach surveyed. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with cobble and gravel streambeds. B1 channels are moderate gradient (2.5-4.0%), moderately confined, with boulder and large cobble streambeds. A2 channels are steep (4-10% gradient), very well confined, boulder channels.

Water temperatures ranged from 60 to 77 degrees fahrenheit. Air temperatures ranged from 65 to 86 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 37.5%, flatwater types 29.0%, pools 33.4% (Graph 1). Riffles made up 42.6% of the total survey **length**, flatwater habitats 41.9%, and pools 15.4% (Graph 2).

Nine Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were step runs, 22.5%; low gradient riffles, 17.8%; and high gradient riffles, 17.8% (Graph 3). By percent total **length**, step runs made up 37.8%, low gradient riffles made up 24.4%, and high gradient riffles made up 17.0%.

Table 3 summarizes the pool habitat types. By percent **occurrence**, 45.9% were main channel pools and 54.1% were scour pools. Main channel pools and scour pools comprised 53.5% and 46.5%, respectively, of the total pool **length** (Graph 4).

Table 4 (Graph 5) is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. The maximum depth for 96 of the 122 pools (78.7%) was two feet or deeper. This level indicates a good quality of pool habitat in Rattlesnake Creek.

The depth of cobble embeddedness was estimated at the pool tail-outs. Of the 117 pool tail-outs measured, zero had a value of 1; 29 had a value of 2 (25.0%); 59 had a value of 3 (50.9%); and 28 had a value of 4 (24.1%). On this scale, a value of one is best for fisheries. Graph 6 describes embeddedness.

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 types had the highest shelter rating at 19.1 (Table 1). For the pool types, the scour pools had the highest mean shelter rating at 25.0, and main channel pools had a mean shelter rating of 12.1 (Table 3).

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

Table 6 (Graph 8) describes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 38.5% of the low gradient riffles. Small cobble was the next most frequently observed dominant substrate type, and occurred in 30.8% of the 65 low gradient riffles.

Approximately 87% of Rattlesnake Creek lacked shade canopy. Of the 13% of the stream that was covered with canopy, 95% was composed of deciduous trees, and 5% was composed of coniferous trees. Graph 9 describes the canopy in Rattlesnake Creek.

Table 2 summarizes the mean percent of the right and left stream banks covered with vegetation by habitat unit type. For the stream reach surveyed, the mean percent right bank vegetated was 64.5%. The mean percent left bank vegetated was 67.8%. The stream bank composition consisted of 24.9% bedrock, 28.1% boulder, 6.3% cobble/gravel, 0.5% bare soil, 2.2% grass, 3.6% brush, 30.3% deciduous trees, and 4.1% coniferous trees (Graph 10).

BIOLOGICAL INVENTORY RESULTS

One electrofishing site was sampled on Rattlesnake Creek September 5, 1991. The unit sampled was a plunge pool, habitat unit 013, approximately 500 feet from the confluence of the Upper North Fork Mattole River. The combined total of fish was 272 steelhead, ranging from 40 to 175 mm fork length, and 4 sculpin, ranging from 92 to 160 mm.

GRAVEL SAMPLING RESULTS

McNeil sediment samples were taken by Greg Moody, Scott Downie, and Gary Flosi near the Quiggly Road crossing on August 27, 1991. The four samples taken from Rattlesnake Creek had a

combined mean of 33.0% for fine sediments < 4.7 mm. The combined mean of sediments < 0.86 mm in the samples was 13.0%. These are slightly below threshold levels for optimum salmonid egg and embryo incubation. Table 7 describes the percentage of fines in the McNeil sediment samples by sample and particle size. The last column describes the total percentage of all fines < 4.7 mm.

DISCUSSION

Rattlesnake Creek has three channel types: A2, B1, and B2. The A2 channel type is generally not suitable for fish habitat improvement structures. A2 channels are found in high energy, steep gradient stream reaches. They have channels dominated by boulders, do not retain gravels very well, but do have stable stream banks. Usually within the A2 channel there are zones of lower gradient where structures designed to trap gravels can be constructed. This seems to be the case in Rattlesnake Creek, but any structure sites must be selected with care because of the high stream energy which can create problems with stream bank erosion and structure stability.

Both the B1 and B2 channel types are suitable for many types of low and medium stage instream enhancement structures. There is 7,524 feet of B1 and 2,126 feet of B2 channel in Rattlesnake Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days August 5-14, 1991, ranged from 60° F to 77° F. Air temperatures ranged from 65° F to 86° F. These temperatures, if sustained, are above the threshold stress level for salmonids. It is unknown if this thermal regime is typical. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 41.9% of the total **length** of this survey, riffles 42.6%, and pools 15.4%. The pools are relatively shallow with 36 of the 122 pools having a maximum depth of three feet or greater. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not subject the structures to high stream energy.

Eighty-seven of the 116 pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Rattlesnake Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was low with a rating of 19.1. The shelter rating in the flatwater habitats was even lower at 16.2. A pool shelter rating of approximately 100 is desirable. The small amount of cover that now exists is being provided primarily by boulders in all habitat types. 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.

Only 29 of the 65 low gradient riffles had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy for the survey reach was only 13%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures are desirable in Rattlesnake Creek.

RECOMMENDATIONS

1) Rattlesnake Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Rattlesnake Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) 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.

4) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations.

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

6) Increase the canopy on Rattlesnake Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this inventory section must be treated as well, since the water being delivered here is being warmed above. In many cases, planting will need to coordinated to follow bank stabilization or upslope erosion control projects.

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.

0'	Survey begins at the confluence with the Upper North Fork Mattole River. Reach #1 is a B2 channel type.
1992'	Bare soil area on the right bank, 25' high.
2126'	Channel type changes from a B2 to a B1 (reach #2).
2697'	3' high plunge.
4307'	Tributary enters from the right bank.
4335'	Tributary enters from the left bank.
4498'	Left bank erosion, contributing gravel into the channel.
4677'	Left bank erosion, contributing gravel into the channel.
5144'	Log and debris accumulation (LDA) 30' wide x 25' long x 5' high.
5534'	Right bank erosion 40' long x 25' high, contributing gravel into the channel.
6319'	LDA 35' wide x 30' long x 12' high.
6807'	Left bank erosion, contributing broken shale into the

channel.

7255' Tributary enters from the left bank.

7895' Tributary enters from the right bank.

8406' Tributary enters from the right bank.

8619' Left bank shale slide.

9650' Channel type changes from a B1 to an A2 (reach #3).

9849' Right bank erosion 140' long x 50' high, contributing gravel into the channel.

10086' Tributary enters from the left bank.

11503' 4' high plunge.

12159' Tributary enters from the right bank.

12375' LDA 55' wide x 15' long x 12' high, created by boulders, is retaining gravel.

13079' Tributary enters from the left bank.

15124' Slide behind row of trees, 70' high x 100' long.

15745' Left bank erosion, 50' high x 30' long.

18253' Tributary enters from the right bank.

18675' Plunge from boulders 3.5' high.

19089' Plunge from bedrock 5' high.

19161' 2.5' high plunge.

20078' Left bank erosion, depositing logs and trees into the channel.

21473' LDA 25' wide x 40' long x 4' high, retaining gravel.

21550' LDA 27' wide x 15' long x 6' high, retaining gravel.

22308' LDA 40' wide x 20' long x 6' high, retaining gravel. Bank erosion 90' high x 20' long.

22452' End of survey.