STREAM INVENTORY REPORT

SALT CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Salt 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 Salt 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 Salt 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

Salt Creek is tributary to the Middle Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Salt Creek's legal description at the confluence with M.F. Eel River is T21N R13W S11. Its location is 39°41'53" N. latitude and 123°16'04" W. longitude. Salt Creek is a second order stream and has approximately 6.9 miles of blue line stream, according to the USGS Dos Rios 7.5 minute quadrangle. Salt Creek drains a watershed of approximately 15.8 square miles. Elevations range from about 1,000 feet at the mouth of the creek to 3,600 feet in the headwater areas. Grass, oak and Douglas fir forest dominates the watershed. The watershed is privately owned and is managed for rangeland, timber harvest, and wildlife hunting reserve. Vehicle access exists via a private road at the Diamond H Ranch headquarters located approximately four mile west of Covelo, CA on the Dos Rios - Covelo Road.

METHODS

The habitat inventory conducted in Salt Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). 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). Salt Creek personnel were trained in May, 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 Salt 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 is 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 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 measured and recorded at each tenth unit typed. The time of the measurement is also recorded. Both 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 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". Salt 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 Salt 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 Salt 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 Salt 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 recorded.

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 Salt 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 Salt Creek to document the fish species composition and distribution. Two sites were electrofished in Salt Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 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 0.85mm).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the 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 Salt 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 REPORT *

The habitat inventory of September 7th through 19th, 1994, was conducted by Ruth Goodfield and Jason MacDonnell (CCC). The total length of the stream surveyed was 9,828 feet, with an additional 480 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.32 cfs on Sept. 7, 1994.

Salt Creek is an F4 channel type for the first 1,519 feet of stream reach surveyed. The remaining 8,309 feet of stream is classified as a B2 channel type. F4 channels are low gradient (<2%), well entrenched and meandering streams, with predominantly gravel substrate. B2 channels are moderate gradient (2-4%), moderately confined streams, with stable banks.

Water temperatures ranged from 55 to 74 degrees Fahrenheit. Air temperatures ranged from 48 to 92 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 30%,

flatwater types 32%, and pools 38% (Graph 1). Flatwater habitat types made up 47% of the total survey **length**, riffles 25%, and pools 28% (Graph 2).

Thirteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were mid-channel pools, 24%; low gradient riffles, 24%; and runs, 19% (Graph 3). By percent total **length**, runs made up 18%, low gradient riffles 21%, and mid-channel pools 20%.

Ninety-eight pools were identified (Table 3). Main-channel pools were most often encountered at 65%, and comprised 73% 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. Forty-nine of the 98 pools (50%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 98 pool tail-outs measured, One had a value of 1 (0.5%); 37 had a value of 2 (38%); 54 had a value of 3 (55%); and 6 had a value of 4 (6.5%). 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. Pool habitat types had the highest shelter ratings, with a rating of 37 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 49, and main-channel pools rated 34 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Salt Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Salt Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 35 of the 62 low gradient riffles (56%). Gravel was the next most frequently observed dominant substrate type, and occurred in 19% of the low gradient riffles (Graph 8).

Fifty percent of the survey reach lacked shade canopy. Of the 50% of the stream covered with canopy, 96.4% was composed of deciduous trees, and 3.6% was composed of coniferous trees.
Graph 9 describes the canopy in Salt 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 48.6%. The mean percent left bank vegetated was 57.5%. The dominant elements composing the structure of the stream banks consisted of 86.5% boulder, 6.4% cobble/gravel, 2.1% bare soil, 10.2% grass, 15% brush. Additionally, 74.8% of the banks were covered with deciduous trees (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on Sept. 8, 1994 in Salt Creek. The units were sampled by Ruth Goodfield and Jason MacDonnell (CCC). All measurements are fork lengths (FL) unless noted otherwise.

The first site sampled was habitat unit 010, a step run, approximately 670 feet from the confluence with the M.F. Eel River. This site had an area of 280 sq ft, and a volume of 252 cu ft. The unit yielded 25 steelhead, ranging from 37 to 144mm FL.

The second site was habitat units 049, 050, and 051, a riffle-pool-run sequence, located approximately 3,520 feet above the creek mouth. This site had an area of 429 sq ft, and a volume of 215 cu ft. One hundred sixteen steelhead were sampled. They ranged from 47 to 124mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Salt Creek.

DISCUSSION

The F4 channel type is generally suitable for fish habitat improvement structures. They are good for bank-placed boulders, low-stage weirs, and channel constrictors. F4 channels are poor for medium-stage weirs and boulder clusters. The B2 channel type is generally not suitable for fish habitat improvement structures. B2 channels are dominated by boulders and have unstable stream banks.

The water temperatures recorded on the survey days Sept. 7-19, 1994 ranged from 55° F to 74° F. Air temperatures ranged from 48° F to 92° F. The warmer water temperatures were recorded in the lower half mile of the survey reach. These warmer temperatures,

if sustained, are above the threshold stress level for salmonids. It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the higher, more canopied sample sites. 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 47% of the total **length** of this survey, riffles 25%, and pools 28%. The pools are relatively deep, with 49 of the 98 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.

Sixty of the 98 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one 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. In Salt 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 37. The shelter rating in the flatwater habitats was slightly lower at 26. However, 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, aquatic vegetation 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.

Forty-seven of the 62 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 50%. This is a relatively low percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

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

3)Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 695', should then be treated to reduce the amount of fine sediments entering the stream.

4)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.

5)Increase the canopy on Salt Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

6) 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.

7)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.

0'Begin survey at confluence with Middle Fork Eel River. Braided, high gradient delta at mouth. Not a barrier.

SAMPLE Creek

Reach #1 is an F4 channel type.

481'Small coal deposit on left bank.

562'Flow measured at 0.32 cfs.

681'Bioinventory site #1.

803'Unstable right bank - blue goo.

1157'Bluegoo slump/earthflow on right bank (RB) contributing fines.

1519'Channel change. Channel type is a B2 for remaining 8309' of survey.

1811'Coal deposit on RB.

1820'Spring on left bank (LB).

1907'Both banks unstable - blue goo.

2048'Bioinventory site #2.

2158'Dry tributary from RB.

3169'LB lateral erosion - 150'L x 45'H.

3861'LB lateral erosion - 20'L x 15'H.

5482'Dry tributary from the LB.

6651'Spring from RB.

7220'Springs from LB.

7355'Tributary from left bank which is flowing. Water temperature = 54° F.

9662'End of survey. Salt Creek is dry, all flow coming from Coal Creek. Fish observed throughout survey, no barriers.

9753'Walked 1000' up Coal Creek - high gradient (15%), few fish relative to Salt Creek. High canopy, many frogs.

SEE NEXT PAGE (PAGE DOWN) FOR HABITAT TYPE KEY

SAMPLE Creek

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