STREAM INVENTORY REPORT

Salt Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Salt Creek. 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 presence and distribution of juvenile salmonid species. 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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Salt Creek is tributary to the West Fork of the North Fork Eel River, tributary to the North Fork Eel River, tributary to the Main Stem Eel River, located in Trinity County, California. Salt Creek's legal description at the confluence with West Fork of the North Fork Eel River is T03S R07E S08. Its location is 40°31'23" N latitude and 123°24'59" W longitude. Salt Creek is a first order stream and has approximately 2.8 miles of blue line stream according to the USGS Zenia 7.5 minute quadrangle. Salt Creek drains a watershed of approximately 3.0 square miles. Elevations range from about 2,270 feet at the mouth of the creek to 3,800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily National Forest and is managed for timber production, rangeland and dispersed recreation. Vehicle access exists via Alderpoint Road. From Alderpoint Road take Route 12 to the Zenia Guard Station. At the station, the U.S. Forest Service will be able to provide more explicit directions.

METHODS

The habitat inventory conducted in Salt Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 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). Salt Creek personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. 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 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.

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". 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. 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 (Hopelain, 1995). 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). 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 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 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 Salt 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 Salt 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 Salt Creek fish presence was observed from the stream banks. This sampling technique is discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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 0.85 mm (Valentine, 1995).

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 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
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 31, and August 7, 1996, was conducted by Paul Ouradik and Dale Melton (WSP/AmeriCorps). The total length of the stream surveyed was 4,019 feet.

Flows were not measured on Salt Creek.

Salt Creek is an A2 channel type for the entire 4,019 feet of stream reach surveyed. A2 channels are steep, narrow, cascading, step-pool streams. They have high energy/debris transport associated with depositional soils. Typically they are boulder channels.

Salt Creek

Water temperatures taken during the survey period ranged from 60 to 63 degrees Fahrenheit. Air temperatures ranged from 72 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, pool, and dry habitat types. Based on frequency of **occurrence** there were 45% riffle units, 27% flatwater units, 25% pool units and 3% dry units (Graph 1). Based on total **length** of Level II habitat types there were 49% riffles units, 31% flatwater units, 18% pool units and 2% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were high gradient riffles, 33%; main channel pools, 17%; and step runs, 13% (Graph 3). Based on percent total **length**, high gradient riffles made up 38%, main channel pools 11%, and step runs 20%.

A total of thirty pools were identified (Table 3). Main pools were most frequently encountered at 93% and comprised 91% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. fourteen of the thirty pools (47%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the thirty pool tail-outs measured, 8 had a value of 1 (27%); 6 had a value of 2 (20%); 4 had a value of 3 (13%); 2 had a value of 4 (7%) and 10 had a value of 5 (33%) (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 39, and riffle habitats had a mean shelter rating of 26. (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 45. Main pools had a mean shelter rating of 37 (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. Large cobble was the dominant substrate observed in all of the low gradient riffles measured (100%) (Graph 8).

The mean percent canopy density for the stream reach surveyed was 76%. The mean percentages of deciduous and coniferous trees were 72% and 28%, respectively. Graph

9 describes the canopy in Salt Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 77%. The mean percent left bank vegetated was 77%. The dominant elements composing the structure of the stream banks consisted of 2.6% bedrock, 26.3% boulder, 50% cobble/gravel, and 21.1% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 2.6% of the units surveyed. Additionally, 73.7% of the units surveyed had deciduous trees as the dominant vegetation type, and 23.7% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Anadromous salmonids were observed from the streambanks by the surveyors for the first 226 feet of stream surveyed. Large boulders block the channel and appeared to be a probable barrier to anadromous fish. Surveyors observed what appeared to be native rainbow trout above the probable barrier, and observed fish throughout the entire length of stream surveyed.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Salt Creek.

DISCUSSION

Salt Creek is a A2 channel type for the entire 4,019 feet of stream surveyed. A2 channel types for fish habitat improvement structures are generally not suitable. A2 channels are found in high-energy, steep-gradient stream reaches. They have channels dominated by boulders, do not retain gravel very well, but do have stable stream banks.

The water temperatures recorded on the survey days July 31 and August 7, 1996, ranged from 60 to 63 degrees Fahrenheit. Air temperatures ranged from 72 to 80 degrees Fahrenheit. This is a acceptable water temperature range for salmonids. Salt Creek seems to have temperatures favorable to 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 31% of the total **length** of this survey, riffles 49%, and

pools 25%. The pools are relatively shallow/deep, with only 14 of the 30 (47%) 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.

Six of the 30 pool tail-outs measured had embeddedness ratings of 3 or 4. Only eight 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 salmonids. In Salt Creek, sediment sources should be mapped and rated according to their potential yields, and control measures taken.

The mean shelter rating for pools was low with a rating of 39. The shelter rating in the flatwater habitats was slightly lower at 16. 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, small woody debris 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 low gradient riffles had silt or sand/large cobble or boulders as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy density for the stream was 76%. This is a relatively moderate percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 76.6% and 76.8%, 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)Salt Creek should be managed as an anadromous, natural production stream.

2)There are several log debris accumulations present on Salt 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.

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)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.

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)Spawning gravel on Salt Creek are limited to relatively few reaches. Superimposition of redds have been observed during winter surveys. Projects should be designed at suitable sites to trap and sort spawning gravel in order to expand redd site distribution in the stream.

7)Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

PROBLEM SITES AND LANDMARKS

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

Salt Creek

0'Begin survey at confluence with West Fork of the North Fork Eel River.
Channel type is A2.

226'Channel filled with large boulders. It appears to be a probable barrier for anadromous fish.

268'Large boulders retaining large woody debris (LWD) 25 feet long x 25 feet wide x 10 feet high.

372'Five young-of-the year (YOY) observed.

1913'Large debris accumulation (LDA) 40 feet long x 25 feet wide x 15 feet high.
Boulders blocked by LDA are retaining sediment and creating sub-surface flows.

2680'LDA 15H X 20L X 20W is retaining gravel.

3045'LDA 5H X 20L X 35W

3071'Five YOY observed.

3876'LDA 25 feet long x 30 feet wide x 10 feet high is retaining gravel.

3899'Habitat unit 112 is a dry unit for 23 feet.

4019'One + salmonid observed. Two twenty foot in diameter boulders block stream.
End of anadromy.
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.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, 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