STREAM INVENTORY REPORT

Shaw Creek

INTRODUCTION

Adult carcass surveys were conducted on Shaw Creek by the California Department of Fish and Game (DFG) from 1987 through 1995. The table below describes the results of those surveys:

Shaw Creek Carcass Surveys 1987-1995

		Chinook Salmon				Other	
Year	# of Surveys	Live Fish	# of Carcass	AdiposeClipCWT	Redds seen	Coho seen	SH/RT seen
1987-88	3	18	4	0	3	3	0
1988-89	2	5	5	1	11	0	0
1989-90	1	0	0	0	0	0	0
1991-92	2	0	0	0	15	1	3
1992-93	5	67	12	0	112	4	7
1993-94	3	9	0	0	70	1	0
1994-95	4	75	7	0	53	0	0

One carcass in 1989 was found in Shaw Creek with an adipose fin clip, but no coded wire tag (CWT) was found in the snout. The objective of this report is to document the current habitat conditions in Shaw Creek, and recommend options for the improvement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Shaw Creek is tributary to Lawrence Creek, tributary to Yager Creek, tributary to the Van Duzen River, located in Humboldt County, California. Shaw Creek's legal description at the confluence with Lawrence Creek is T3N R2E S30. Its location is 40°37'12" North latitude and 123°59'26" West longitude. Shaw Creek is a second order stream and has approximately six miles of blue line stream according to the USGS Owl Creek and Iaqua Buttes 7.5 minute quadrangles. Shaw Creek drains a watershed of approximately 5.4 square miles. Summer base flow is approximately one cubic feet per second (cfs) at the mouth, but over 15 cfs is not unusual during winter storms. Elevations range from about 580 feet at the mouth of the creek to 2,400 feet in

the headwater areas. Redwood and Douglas fir forest dominates the watershed with some grasslands in the upper regions. Most of the watershed is privately owned by the Pacific Lumber Company (PALCO) and is managed for timber production. Vehicle access exists from State Highway 36 near Carlotta, via Fisher Road, to Pacific Lumber Company's Yager Camp. The main Yager-Lawrence Haul Road leads to Road Nine and Shaw Creek, nine miles from Yager Camp.

METHODS

The habitat inventory conducted in Shaw 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). Shaw 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 Shaw 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". Shaw 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. 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 Shaw 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" (value 5) 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 Shaw 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 (1) and sub-dominant (2) substrate elements were ocularly estimated from a list of seven size classes.

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 Shaw 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 Shaw 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 Shaw 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 Quattro Pro. Graphics developed 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 May 28, 29, 30 and June 10, 11, and 12, 1996, was conducted by Paul Ouradnik and Kelley Garrett (WSP/AmeriCorps). The total length of the stream surveyed was 9,590 feet with an additional 469 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 4.48 cfs on May 30, 1996.

Shaw Creek is an F4 channel type for the entire 9,590 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 56 degrees Fahrenheit. Air temperatures ranged from 54 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 47% pool units, 32% flatwater units, and 21% riffle units (Graph 1).

Flatwater habitat types made up 42% of the total survey **length**, pools 40%, and riffles 18% (Graph 2).

Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 28%; runs, 27%; and low gradient riffles, 19% (Graph 3). Based on percent total **length**, runs made up 31%, pools 26%, and low gradient riffles 17%.

One hundred and forty pools were identified (Table 3). Main channel pools were most frequently encountered at 60% and comprised 67% 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. Ninety-two of the 140 pools (68%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 140 pool tail-outs measured, 43 had a value of 1 (30%); 61 had a value of 2 (44%); 22 had a value of 3 (16%); zero had a value of 4 (0%); and 14 had a value of 5 (10%) (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. Riffle habitat types had a mean shelter rating of 16, and flatwater habitats had a mean shelter rating of 14 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 42. Backwater pools had a mean shelter rating of 41 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders provide the dominant cover in Shaw Creek. However in pools, large and small woody debris provide 53% of the cover present. Graph 7 describes the pool cover in Shaw Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 34 of the 56 low gradient riffles measured (71%). Small cobble was the next most frequently observed dominant substrate type and occurred in 26% 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 87% and 13%, respectively (Graph 9).

For the stream reach surveyed, the mean percent right bank vegetated was 89.9%. The mean percent left bank vegetated was 89.2%. The dominant elements composing the structure of the stream banks consisted of 1% bedrock, 1% boulder, 43% cobble/gravel, and 55% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 80% of the units surveyed. Additionally, 13% of the units surveyed had coniferous trees as the dominant vegetation type, and 4% had brush as the dominant vegetation (Graph 11).

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Shaw Creek.

DISCUSSION

Shaw Creek is a F4 channel type for the entire 9,590 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is good for bank-placed boulders; fair for low-stage weir, single and opposing wing-deflectors, channel constrictors, and log cover; and poor for medium-stage weir and boulder clusters.

The water temperatures recorded on the survey days May 28, 29, 30 and June 10, 11, and 12, 1996, ranged from 50 to 56 degrees Fahrenheit. Air temperatures ranged from 54 to 72 degrees Fahrenheit. This is a very 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 42% of the total **length** of this survey, pools 40%, and riffles 18%. The pools are relatively deep, with 92 of the 140 (68%) 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.

Twenty-two of the 140 pool tail-outs measured had embeddedness ratings of 3 or 4. Forty-three 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 Shaw 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 39. The shelter rating in the flatwater habitats was slightly lower at 14. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in nearly all habitat types. Additionally, large woody debris contributes a fair amount, especially in pools, which is a product of extensive LWD placement in recent years. 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.

Thirty-four of the 56 low gradient riffles measured had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density was 90%. This is a relatively high 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 high at 89.9% and 89.2%, 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) Shaw Creek should be managed as an anadromous, natural production stream.

2) Continue to increase woody cover in the pools and flatwater habitat units. Adding high quality complexity with woody cover is desirable and in some areas the material is nearby.

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 4488', should then be treated to reduce the amount of fine sediments entering the stream.

4) Spawning gravel on Shaw Creek are somewhat limited to relatively few reaches. Crowding and/or 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.

5) 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.

6) There are several log debris accumulations present on Shaw 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 measured from the beginning of the survey reach.

0' Begin survey at confluence with Lawrence Creek. Channel type is F4 for the 9,590' survey reach.

193' Right bank (RB) trail leads to Road 9.

466' Numerous young-of-the-year (YOY) and one 2+ salmonid, and a possible redd observed from the streambank.

966' Road enters stream on RB.

2380' RB trail leads to Road 9 (marked with flag).

2632' Large debris accumulation (LDA) 23 feet long x 16 feet wide x 6 feet high.

2793' YOY observed from the streambank by surveyors.

3287' RB failure 39 feet long x 10 feet high.

4488' Left bank (LB) slide 50 feet long x 100 feet high.

5556' LDA 75 feet long x 30 feet wide x 15 feet high retaining gravel for 30 feet.

5631' RB slide 40 feet wide x 100 feet high.

5772' LDA 30 feet long x 40 feet wide x 10 feet high.

5807' LB armored with rip-rap for next nine units.

6850' RB failure 50 feet long x 10 feet high.

7747' LB slide 50 feet long x 60 feet high.

7864' LB slide 60 feet long x 40 feet high.

9294' Tributary entering from RB. One 1+ salmonid observed from streambank.

9481' Tributary entering from LB.

9590' This is a resurvey of Shaw Creek. The last survey was during the summer of 1993. **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