STREAM INVENTORY REPORT

Ham Canyon Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Ham Canyon 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 Ham Canyon Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for 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

Ham Canyon Creek is tributary to the Rancheria River, tributary to the Navarro River, located in Mendocino County, California (Map 1). Ham Canyon Creek's legal description at the confluence with Rancheria Creek is T14N R14W S30. Its location is 39°02'13" north latitude and 123°26'31" west longitude. Ham Canyon Creek is a first order stream and has approximately 2.6 miles of blue line stream according to the USGS Philo 7.5 minute quadrangle. Ham Canyon Creek drains a watershed of approximately 0.19 square miles. Elevations range from about 210 feet at the mouth of the creek to 1,600 feet in the headwater areas. Redwood/Douglas fir mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Mountain View Road, from State Route 128, near Boonville.

METHODS

The habitat inventory conducted in Ham Canyon 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). 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,

depth of pool tail crest, and embeddedness. 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 Ham Canyon 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". Ham Canyon 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 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 Ham Canyon 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) and 76 - 100% (value 4). Additionally, a value of 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 Ham Canyon 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*. Canopy density relates to the amount of stream shaded from the sun. In Ham Canyon 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 Ham Canyon Creek, the dominant composition type and the dominant vegetation type 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 Ham Canyon Creek fish presence was observed from the stream banks, and two sites were electrofished using a 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 Quattro Pro. Graphics developed for Ham Canyon 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 habitat inventory of August 22, 23, 27, 28, 30, and September 04, 1996, was conducted by Andrew MacMillan (WSP\AmeriCorps) and David Jones (CCC). The total length of the stream surveyed was 13,913 feet with an additional 193 feet of side channel.

Ham Canyon Creek

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.19 cfs on September 4, 1996.

Ham Canyon Creek is an F4 channel type for the entire 13,913 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and a gravel dominant substrate.

Water temperatures taken during the survey period ranged from 58 to 75 degrees Fahrenheit. Air temperatures ranged from 60 to 90 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 17% riffle units, 39% flatwater units, and 42% pool units (Graph 1). Based on total **length** of Level II habitat types there were 9% riffle units, 64% flatwater units, 20% pool units, and 7% was dry (Graph 2).

Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 35%; mid-channel pools, 24%; and low gradient riffles, 14% (Graph 3). Based on percent total **length**, step runs made up 62%, mid-channel pools 11%, and dry units 7%.

A total of 120 pools were identified (Table 3). Main channel pools were most frequently encountered at 69% and comprised 69% 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. Thirty -eight of the 120 pools (32%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 120 pool tail-outs measured, 22 had a value of 1 (18%); 45 had a value of 2 (38%); 33 had a value of 3 (28%); 8 had a value of 4 (7%) and 12 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 17, flatwater habitat types had a mean shelter rating of 19, and pool habitats had a mean shelter rating of 30 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 39. Main channel pools had a mean shelter rating of 22 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 2 of the 3 low gradient riffles measured (67%). Large cobble was the dominant substrate in the other low gradient riffle measured (Graph 8).

Ham Canyon Creek

The mean percent canopy density for the stream reach surveyed was 60%. The mean percentages of deciduous and coniferous trees were 44% and 56%, respectively. Graph 9 describes the canopy in Ham Canyon Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 51.9%. The mean percent left bank vegetated was 47.1%. The dominant elements composing the structure of the stream banks consisted of 21.2% bedrock, 7.1% boulder, 58.6% cobble/gravel, and 13.1% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 36.6% of the units surveyed. Additionally, 30.7% of the units had coniferous trees as the dominant vegetation, including down trees, logs, and root wads, and 9.9% had no vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on September 4, 1996, in Ham Canyon Creek. The sites were sampled by Andrew MacMillan and Paul Ouradnik (WSP/AmeriCorps).

The first site sampled included habitat units 49 through 54, a step run, mid-channel pool, step run, lateral scour pool - log enhanced, step run, and lateral scour pool - bedrock formed, approximately 2,446 feet from the confluence with Rancheria Creek. The site yielded 29 steelhead, four sculpin and one yellow-legged frog.

The second site included habitat units 212 through 220, a mid-channel pool, low gradient riffle, step run, step pool, step run, low gradient riffle, plunge pool, and step run, located approximately 11,180 feet above the creek mouth. The site yielded four steelhead.

DISCUSSION

Ham Canyon Creek is a F4 channel type for the entire 13,913 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank placed boulders, fair for low stage weirs, single and opposing wing deflectors, channel constrictors and log cover, and poor for medium stage weirs and boulder clusters.

The water temperatures recorded on the survey days August 22, 23, 27, 28, 30, and September 4, 1996, ranged from 58 to 75 degrees Fahrenheit. Air temperatures ranged from 60 to 90 degrees Fahrenheit. This is a poor 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 64% of the total **length** of this survey, riffles 9%, and pools 20%. The pools are relatively shallow, with only 38 of the 120 (32%) 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.

Fifty-three of the 120 pool tail-outs measured had embeddedness ratings of 3, 4 or 5. Only twenty-two 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 Ham Canyon 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 30. The shelter rating in the flatwater habitats was 19. 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, terrestrial vegetation 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.

Two of the three low gradient riffles measured had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 60%. This is a moderate 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 low at 51.9% and 47.1%, 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)Ham Canyon Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are above 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) 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.

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) 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.

7) Increase the canopy on Ham Canyon Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

COMMENTS AND LANDMARKS

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

Position (ft):	Comments:
0'	Survey began at confluence with Rancheria Creek. Channel type is an F4. The mouth of Ham Canyon Creek is braided over the right bedrock bank of Rancheria Creek. Five foot high jump, no barrier.
148'	Stream has steep gradient overall with small cascades, bedrock sheets, and waterfalls. Accessible to fish.
180'	Log debris accumulation (LDA), 8' long x 20' high x 6' high.
664'	Right bank erosion, 212' long x 70' high. Left bank erosion, 193' long x 60' high. Both contribute fines to the stream. The two slides completely block the channel with substrate and woody debris, creating a LDA, 157' long x 52' wide x 16' high, retaining 7' of sediment.
2,446'	First electrofishing site.
2,516'	Flatcar bridge, 13' long x 40' wide x 11' high.
3,690'	Left bank tributary, dry.
3,822'	LDA, 15' wide x 20' wide x 5' high.
4,769'	Failed road crosses the creek several times, causing many slides and log debris accumulations.
5,721'	Left bank tributary (<0.1 cfs), not accessible to fish.

Ham Canyon Creek

8,050'	Right bank tributary, accessible to fish.
8,254'	LDA, 40' long x 8' high, retaining 5' of sediment. Not a barrier to fish.
8,295'	Four foot high jump over sill.
9,418'	Left bank tributary, not accessible to fish.
9,521'	LDA and boulder cascade, 120' long x 40' wide x 20' high, creating a 5'jump and retaining 7' of gravel.
9,591'	Left bank erosion, 90' long x 80' high associated with a downstream LDA.
9,683'	Four foot jump blocked by root wad is retaining 4' of sediment.
9,770'	Erosion associated with LDA. Retaining 10' of sediment.
10,650'	Young-of-the-year and 1+ salmonids observed.
11,180'	Second electrofishing site.
11,557'	Right bank tributary.
11,690'	Five foot jump retaining 4' of gravel.
11,745'	Iron bacteria present in this area.
12,000'	LDA, 30' long x 20' wide x 9' high, creating a 6' jump and retaining 6' of sediment. Possible barrier.
12,036'	LDA, 10' long x 20' wide x 6' high, creating 5' high jump and retaining 5' of gravel.
12,076'	Three foot jump retains 2' of gravel.
12,147'	Road crossing.
12,300'	LDA, 8' long x 20' wide x 4' high, creating a 4' jump and retaining 4' of sediment.
12,390'	LDA, 20' long x 20' wide x 10' high, retaining 3' of sediment.
12,460'	Four foot high jump.
12,590'	Eight foot high jump.

Ham Canyon Creek

12,612'	Road crossing.
12,786'	Right bank tributary with a boulder/bedrock cascade. Not accessible to fish.
12,855'	Four foot and three foot high jumps.
12,964'	Root wad creating a 4' high jump.
13,116'	Four foot high jump.
13,200'	LDA, 20' long x 30' wide x 10' high, retaining 10' of sediment.
13,250'	Road crossing.
13,812'	Right bank tributary, not accessible to fish.
13,913'	End of survey. Stream enters steep gradient boulder cascade (37' rise in 54'= 68.5%). No fish were observed since the LDA at 12,000 feet.

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