STREAM INVENTORY REPORT

PEAKED CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Peaked 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 Peaked 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 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

Peaked Creek is tributary to the Bear River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Peaked Creek's legal description at the confluence with Bear River is T01N R01W S28. Its location is 40°26′00″ north latitude and 124°11′40″ west longitude. Peaked Creek is a second order stream and has approximately 4.1 miles of blue line stream according to the USGS Capetown 7.5 minute quadrangle. Peaked Creek drains a watershed of approximately 2.9 square miles. Elevations range from about 500 feet at the mouth of the creek to 1,740 feet in the headwater areas. Conifers dominate the watershed. The watershed is entirely privately owned and is managed for timber production.

METHODS

The habitat inventory conducted in Peaked 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 the AmeriCorps Watershed Stewards Project (WSP\AmeriCorps) Members who 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. 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 Peaked 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. Additionally a recording thermograph was deployed in Peaked Creek from June 20 to October 21, 1996 to record temperatures on a 24 hour basis during warm summer months.

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". Peaked 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 Peaked 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 Peaked 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 Peaked Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the end of approximately every third unit in addition to every fully-described unit, giving approximately a 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 Peaked 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 Peaked Creek fish presence was observed from the stream banks, and one site was 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 Peaked 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 August 29 through September 11, 1996, was conducted by Bill Malinowski (WSP\AmeriCorps) and Craig Mesman (CCC). The total length of the stream surveyed was 9,606 feet, with an additional 1,380 feet of side channel.

Flow was measured with a Marsh-McBirney Model 2000 flowmeter, at 0.69 cfs on August 29, 1996.

Peaked Creek is an B3 channel type for the entire 9,606 feet of stream reach surveyed. B3 channels are moderately entrenched, moderate gradient, riffle dominated channels, with infrequently placed pools, very stable plan and profile, stable banks, and a cobble channel.

Water temperatures taken during the survey period ranged from 55 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 85 degrees Fahrenheit. Additionally a recording thermograph was deployed in Peaked Creek from June 20 to October 21, 1996, recorded temperatures ranged from 48 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 21% riffle units, 34% flatwater units, and 43% pool units (Graph 1). Based on total **length** of Level II habitat types, there were 11% riffle units, 67% flatwater units, and 20% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 33%; mid-channel pools, 31% and low gradient riffles, 9% (Graph 3). Based on percent total **length**, step runs made up 65%, mid-channel pools 14%, and low gradient riffles 5%.

A total of one-hundred-eleven pools were identified (Table 3). Main channel pools were most frequently encountered at 84% and comprised 89% 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. Twenty-seven of the 111 pools (24.0%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 111 pool tail-outs measured, 45 had a value of 1 (40.6%); 24 had a value of 2 (21.6%); 15 had a value of 3 (13.5%); 7 had a value of 4 (6.3%) and 20 had a value of 5 (18.0%) (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 4, flatwater habitats had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 13 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 21. Main channel pools had a mean shelter rating of 9 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in

Peaked Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Peaked Creek.

Table 6 summarizes the dominant substrate by habitat type. In the two low gradient riffles measured, the dominant substrate in one was small cobble, the other was large cobble (Graph 8). In the seven step runs measured, gravel was the dominant substrate in one; small cobble was dominant in two; large cobble was dominant in three; and bedrock was dominant in one.

The mean percent canopy density for the stream reach surveyed was 75%. The mean percentages of deciduous and coniferous trees were 48% and 52%, respectively. Graph 9 describes the canopy in Peaked Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 62.7%. The mean percent left bank vegetated was 61.5%. The dominant elements composing the structure of the stream banks consisted of 6.06% bedrock, 16.67% boulder, 72.73% cobble/gravel, and 1.52% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 54.55% of the units surveyed and 19.70% had coniferous trees as the dominant vegetation, including downed trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on August 30, 1996, in Peaked Creek. The site was sampled by Bill Malinowski and Dave Jones (CCC).

The site sampled was habitat unit 2, a glide approximately 62 feet from the confluence with Bear River. This site had an area of 620 sq ft and a volume of 310 cu ft. The site yielded 52 steelhead.

DISCUSSION

Peaked Creek is a B3 channel type for the entire 9,606 feet of stream surveyed. The suitability of B3 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs, boulder clusters and bank placed boulders, log cover, and single and opposing wing deflectors and good for medium-stage plunge weirs.

The water temperatures recorded on the survey days August 29 through September 11, 1996, ranged from 55 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 85 degrees Fahrenheit. Additionally a recording thermograph was deployed in Peaked Creek from June 20 to October 21, 1996, recorded temperatures ranged from 48 to 64 degrees Fahrenheit. This is a good water temperature range for salmonids.

Flatwater habitat types comprised 67% of the total **length** of this survey, riffles 11%, and pools 20%. The pools are relatively shallow, with only 27 of the 111 (24.0%) 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 three 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.

Forty-two of the 111 pool tail-outs measured had embeddedness ratings of 3, 4 or 5. Forty-five 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 Peaked 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 13. The shelter rating in the flatwater habitats was slightly lower at 11. 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. Log and root wad cover structure in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and divides territorial units to reduce density related competition.

In the two low gradient riffles measured, the dominant substrate in one was small cobble (2.5" to 5"), the other was large cobble (5" to 10"). In the seven step runs measured, gravel (0.08" to 2.5") was the dominant substrate in one; small cobble was dominant in two; large cobble was dominant in three; and bedrock was dominant in one. Gravel and small cobble are the preferred substrate for spawning steelhead and coho salmon. Projects should be designed to trap and sort suitable spawning substrate in Peaked Creek.

The mean percent canopy density for the stream was 75%. This is a relatively high 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 moderate at 62.7% and 61.5%, 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) Peaked Creek should be managed as an anadromous, natural production stream.

2) Where feasible, design and engineer pool enhancement structures to increase the number of pools or deepen existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

3) 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.

4) 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.

5) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.

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.

0'	Begin survey at confluence with Bear River. Channel type is a B3.
206'	Recently opened road crosses the channel.
358'	Log debris accumulation (LDA), possible barrier, 60' long x 50' wide x 7' high.
1,042'	Left bank erosion, 55' long x 60' high.
2,178'	LDA, 60' long x 50' wide, not a barrier.
5,162'	LDA, 20' long x 40' wide x 14' high, with associated left bank erosion, 30' wide x 100' high.
5,634'	Left bank tributary with 10% of the flow of Peaked Creek.
6,605'	LDA with associated left bank erosion, 800' high x 200' long.
8,088'	Left bank erosion, 150' high x 70' long.
8,755'	Right bank tributary.
9,309'	0+ steelhead observed.
9,606'	End of survey, due to a LDA with a 12' jump. No fish were observed for 500' above this LDA.

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