STREAM INVENTORY REPORT

DEVILS CREEK, 1991

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Devils 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 Devils Creek. The objective of the biological inventory was to document the salmonid species present and their distribution in the stream. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys being conducted on Devils 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

Devils Creek is tributary to Oil Creek, tributary to the Mattole River, located in Humboldt County, California (Figure 1). The legal description at the confluence with Oil Creek is T02S R01W S02. Its location is 40°19'29' N. latitude, 124°08'25". Devils Creek is a second order stream. The total length of blue line stream, according to the USGS Bull Creek and Buckeye Mountain quadrangles is 1.9 miles.

Devils Creek drains a watershed of approximately 2.52 square miles. Redwood forest and grassland dominates the watershed. The watershed is privately owned and is managed for timber and livestock grazing. Portions of the Devils Creek watershed were subjected to extensive forest fires during the summer of 1990. Vehicle access exists from U.S. Highway 101, via the Bull Creek/Mattole Road. Follow the Bull Creek Road for approximately 12 miles to the top of the ridge. At the ridge, a private road heads northwest for seven miles and leads to Rainbow Ranch. From Rainbow Ranch, a private road heads west and leads to Devils Creek, four miles from Rainbow Ranch.

METHODS

The habitat inventory conducted in Devils 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). Devils Creek personnel were trained in May and June, 1991, by Gary Flosi and Scott Downie. This inventory was conducted by a two person team, Brian Humphrey and Shea Monroe.

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 Devils 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 operations 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 taken 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". Devils 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. Depth of the pool tail crest at each pool habitat unit was measured at 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 Devils 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 Devils 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 Devils Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentage of the total canopy area was then further

analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

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 Devils 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.

No biological inventory was conducted in Devils Creek to document the salmonid species composition and distribution.

DATA ANALYSIS:

Data from the habitat inventory form is entered into Habtype, a dBASE 3+ data entry program developed by the Department and Fish and Game. From Habtype, the data is summarized by Habtabs, a dBASE 4.1 program in development by DFG.

The Habtabs program produces the following summary 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 Devils 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 RESULTS *

The habitat inventory of August 7 and 8, 1991, was conducted by Shea Monroe and Brian Humphrey (CCC). The total length of the stream surveyed was 7,334 feet, with zero feet of side channel.

Devils Creek is an B2 channel type for the first 3,475 feet of stream reach surveyed. The remaining 3,859 feet is an A3 channel type. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with stable stream banks. A3 channels are steep gradient (4-10%), very well confined streams with erodible banks.

Water temperatures ranged from 64 to 74 degrees fahrenheit. Air temperatures ranged from 71 to 82 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, flatwater made up 40.8%; pool types were 39.5%; and riffles 19.7% (Graph 1). Flatwater habitat types made up 66.8% of the total survey **length**, riffles were 19.5%, and pools 13.7% (Graph 2).

Eleven Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were step runs, 34.2%; mid-channel pools, 15.8%, low gradient riffles, 11.8%; and step pools, 11.8% (Graph 3). By percent total **length**, step runs made up 64.2%, low gradient riffles 15.4%, step pools 7.1%, and mid-channel pools 4.2% (Table 2).

Thirty pools were identified (Table 3). Main-channel pools were most often encountered at 70.0%, and comprised 82.5% 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. Twelve of the 30 pools (40%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 22 pool tail-outs measured, 2 had a value of 1 (9.1%); 10 had a value of 2 (45.5%); 9 had a value of 3 (40.9%); and 1 had a value of 4 (4.5%). 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. Flatwater habitat types had the highest shelter rating at 37.1. Pool habitats followed with a rating of 34.5 (Table 1). Of the pool types, the main-channel pools had the highest mean shelter rating at 34.8, followed closely by scour pools which rated 34.4 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Devils Creek and are extensive. Undercut banks and root mass are lacking in nearly all habitat types. Graph 7 describes the pool cover in Devils Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 7 of the 9 low gradient riffles (77.8%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 22.2% of the low gradient riffles (Graph 8).

Nearly 98 percent of the survey reach lacked shade canopy. Of the 2.6% of the stream covered with canopy, 53.8% was composed of deciduous trees, and 46.2% was composed of coniferous trees. Graph 9 describes the canopy in Devils 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 43.4%. The mean percent left bank vegetated was 43.5%. The dominant elements composing the structure of the stream banks consisted of 18.4% bedrock, 21.1% boulder, 19.7% cobble/gravel, 5.3% bare soil, 23.7% grass, 2.6% brush. Additionally, 1.3% of the banks were covered with deciduous trees, and 7.9% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

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No electrofishing sites were sampled on Devils Creek.

DISCUSSION

Devils Creek has two channel types: A3 and B2. The high energy and unstable stream banks of the A3 channel type is generally not suitable for instream enhancement structures. The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 3,475 feet of this type of channel in Devils Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days August 7-8, 1991, ranged from 64° F to 74° F. Air temperatures ranged from 71° F to 82° F. These temperatures are above the threshold stress level for salmonids. The severe lack of cover (see Graph 9) in the area seems to be limiting the shading/cooling effect required to maintain viable summer salmonid temperature regimes. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 66.8% of the total **length** of this survey, riffles 19.5%, and pools 13.8%. The pools are relatively shallow with only 12 of the 30 pools having a maximum depth greater than 2 feet. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Ten of the 22 pool tail-outs measured had embeddedness ratings of 3 or 4. Only two had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Devils 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 34.5. The shelter rating in the flatwater habitats was slightly better at 37.1. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large woody debris and white water 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.

Seven of the 9 low gradient riffles had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 2.6%. This is an extremely low percentage of canopy, since 80 percent is generally considered desirable. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Devils 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. 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 and in some areas the material is at hand.

4) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 2837', should then be treated to reduce the amount of fine sediments entering the stream.

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 Oil Creek. Reach #1 is a B2 channel type.
1741'	Left bank (LB) slide of bare soil contributing clay, boulders and trees.

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1883'	Fallen log with root wad spanning stream, 6' above water.
2298'	LB slide 50' long x 20' high contributing fines and fallen trees.
2581'	Small spring from LB.
2837'	Semi-stable LB of bedrock 150' long x 70' high contributing large amounts of fines.
2979'	Forest boundary marker on LB. Small spring enter LB.
3053'	Dry tributary from right bank (RB).
3246'	Bedrock spring on RB.
3475'	Channel changes to an A3 channel type (reach #2).
3556'	RB slide, 100' long x 60', contributing fines, boulders and trees. Narrow channel combined with steep gradient and boulders causing log debris accumulation. A3 channel begins.
4193'	Dry tributary from RB.
4206'	Fallen log spanning stream, retaining cobble and gravel, while creating pool above.
4587'	RB slide, 120' long x 100' high contributing fines.
4911'	Tributary from LB.
4931'	Timber boundary flags along LB.
5415'	Dry tributary from RB; fire seared LB.
5782'	RB erosion, 100' long x 150' high, contributing fines.
6232'	Braided channel island, 60' long x 30' wide. Tributary from RB. Fire scarred area.
6420'	LB slide, 200' long x 80' high.
6521'	Fallen fir tree in channel. LB slide.
6768'	Fallen, shattered fir lying across channel, possible barrier.

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7334'	RB slide, 150' long x 150' high, with large 18' diameter boulders. LDA 20' long x 10' high x 20' wide, creating a 15' water plunge. No YOY observed above plunge. End of survey.