STREAM INVENTORY REPORT

DEAN CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Dean 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 Dean Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys having been conducted on Dean 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

Dean Creek is tributary to the Eel River, located in Humboldt County, California (Figure 1). Dean Creek's legal description at the confluence with the Eel River is T1N R1E S05. Its location is 40°29'30" N. latitude and 124°05'58" W. longitude. Dean Creek is a first order stream and has approximately 2.1 miles of blue line stream, according to the USGS Taylor Peak and Scotia 7.5 minute quadrangles. Dean Creek drains a watershed of approximately 2.4 square miles. Elevations range from about 80 feet at the mouth of the creek to 800 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned by the Pacific Lumber Company and other private owners and is managed for timber production in the upper reaches and residential use near its mouth. Vehicle access exists from U.S. Highway 101 at Rio Dell, via Monument Road.

METHODS

The habitat inventory conducted in Dean 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). Dean Creek personnel were trained in May, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by a two person team.

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 Dean 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 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". Dean 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. 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 Dean 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 Dean 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 Dean Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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 Dean 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.

Biological inventory was conducted in Dean Creek to document the fish species composition and distribution. Three sites were electrofished in Dean Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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 Dean 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 REPORT *

The habitat inventory of August 17 and 18, 1992, was conducted by Chris Coyle and Craig Mesman (CCC). The total length of the stream surveyed was 5,091 feet.

Flows were not measured on Dean Creek.

Dean Creek is a B6 channel type for the entire 5,091 feet of stream reach surveyed. B6 channels are narrow and deep, meandering fine-grained channels.

Water temperatures ranged from 57 to 63 degrees fahrenheit. Air temperatures ranged from 55 to 67 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 38.4%, pools 27.4%, and flatwater 26.8% (Graph 1). Riffle habitat types made up 44.3% of the total survey **length**, flatwater 31.2%, and pools 18.7% (Graph 2).

Fifteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 35.8%; mid-channel pools, 14.2%; step runs, 11.1%; and runs, 11.1% (Graph 3). By percent total **length**, low gradient riffles made up 40.7%, step runs 18.5%, mid-channel pools 10.6%, and runs 8.1%.

Fifty-two pools were identified (Table 3). Main channel pools were most often encountered at 51.9%, and comprised 56.9% 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. Forty-five of the 52 pools (87%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 51 pool tail-outs measured, zero had a value of 1; 8 had a value of 2 (15.7%); 26 had a value of 3 (50.9%); and 17 had a value of 4 (33.3%). 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. Pool habitat types had the highest shelter rating at 44.6. Riffle habitats followed with a rating of 35.8 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 52.7, main channel pools had a rating of 38.7, and backwater pools rated 38.3 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Dean Creek and is extensive. Small woody debris is the next most common cover type. Graph 7 describes the pool cover in Dean Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 51 of the 68 low gradient riffles (75.0%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 14.7% of the low gradient riffles (Graph 8).

Six percent of the survey reach lacked shade canopy. Of the 94% of the stream covered with canopy, 71% was composed of deciduous trees, and 29% was composed of coniferous trees. Graph 9 describes the canopy in Dean 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 66.9%. The mean percent left bank vegetated was 67.9%. The dominant elements composing the structure of the stream banks consisted of 4.7% bedrock, 0.8% boulder, 2.4% cobble/gravel, 9.8% bare soil, 2.9% grass, 68.8% brush. Additionally, 0.8% of the banks were covered with deciduous trees, and 9.8% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on August 25, 1992 in Dean Creek. The units were sampled by Chris Coyle and John Crittenden (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 002, a plunge pool, approximately 129 feet from the confluence with the Eel River. This site had an area of 197.6 sq ft, and a volume of 138.3 cu ft. The unit yielded 8 steelhead, ranging from 87 to 120 mm FL.

The second site was habitat units 046-055, a series of riffles and runs, located approximately 1,591 feet above the creek mouth. This site had an area of 1272.5 sq ft, and a volume of 265.5 cu ft. There were several dry units in the sample area.

No fish were found.

The third site sampled was habitat units 117-122, a pool/riffle/run sequence, located approximately 3,585 feet above the creek mouth. The site had an area of 935.9 sq ft, and a volume of 490 cu ft. Three steelhead were sampled, ranging from 82 to 160 mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Dean Creek.

DISCUSSION

The B6 channel type is generally not suitable for fish habitat improvement structures. B6 channels are found in narrow and deep, meandering stream reaches. They have channels dominated by fine grained substrates and are highly susceptible to stream bank disturbances.

The water temperatures recorded on the survey days August 17 and 18, 1992, ranged from 57° F to 63° F. Air temperatures ranged from 55° F to 67° F. This is a very good water temperature regime for salmonids. However, to make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Riffle habitat types comprised 44.3% of the total **length** of this survey, flatwater 31.2%, and pools 18.7%. The pools are relatively shallow with only 7 of the 52 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 interfere with the unstable stream banks of the B6 channel type.

Forty-three of the 51 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Dean 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 moderate with a rating of 44.6. The shelter rating in the flatwater habitats was lower at 20.5. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided

primarily by large and small woody debris in all habitat types. Additionally, undercut banks and boulders contribute a small amount. Log and root wad cover structures in the 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. Sixty-one of the 68 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 94%. This is a high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Dean 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 flatwater habitat units. Most of the existing cover is from large and small woody debris, which is desirable. Increasing high quality complexity with woody cover is recommended and in some areas the material is at hand.

4) Inventory and map sources of stream bank erosion, and rate 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) 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 Dean 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.

7) The mouth of the stream has poor access for migrants. The access should be improved by modifying the concrete flume and bedrock substrate to facilitate passage.

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 the Eel River. Channel type is a B6 for the entire survey reach.
129'	Right bank erosion 10' high x 30' long, contributing fines into the channel. Left bank is concrete and boulder in association with old Highway 101 bridge. 7.5' high plunge; possible barrier.
303'	Earthquake rubble dumped down the left bank, upstream for 25'; creek percolates through this rubble.
341'	Left bank erosion 10-15' high x 75' long, contributing gravel and fines into the channel.
431'	Log and debris accumulation (LDA) 20' wide x 10' long x 3' high, retaining gravel 3' high.
727'	Left bank erosion 6' high x 20' long, contributing fines into the channel.
1117'	Narrow sandstone canyon with walls undercut 3-4' high.
1178'	Left bank erosion 8' high x 50' long, contributing fines into the channel.
1380'	Right bank erosion 20' high x 30' long, contributing fines into the channel.
1425'	Right bank erosion 10' high x 30' long, contributing fines into the channel.
1591'	Bridge crossing 15' wide x 25' high. Storm drain on the left bank.
1718'	Right bank erosion 10' high x 15' long, contributing fines into the channel.
1945'	Right cut bank 3' high, undercutting standing redwoods.

1968' Right bank erosion 6' high x 30' long, contributing fines into the channel.

2104' Right bank erosion 20' high x 30' long, contributing fines into the channel.

2125' Right bank slide 35' high x 20' long, contributing gravel into the channel.

2142' LDA 15' wide x 17' long x 5' high, retaining gravel 4' high. Possible barrier.

2239' Right bank erosion 30' high x 20' long. Left bank erosion 5' high x 50' long, contributing fines into the channel.

2393' Left bank erosion 4' high x 80' long, contributing fines into the channel.

2444' Numerous young-of-the-year steelhead (YOY) observed.

2485' Original left bank slumped into the channel, creating a mid-channel bar. Present stream flow is to the left of this bar.

2490' LDA 25' wide x 5' long x 5' high, retaining gravel 4.5' high. Possible barrier.

2609' LDA 15' wide x 3' long x 3' high, retaining gravel 2' high; low flow barrier.

2657' Tributary enters from the left bank.

2819' Narrow canyon cutting through fines.

2935' LDA 15' wide x 6' long x 5.5' high, retaining gravel 4.5' high.

3111' LDA 15' wide x 6' long x 3' high; no gravel retention. Probable low flow barrier.

3190' Stream is intermittent above this point, with some YOY in the pools.

3246' Plunge over logs 2.5' high, retaining sand and gravel. Low flow barrier.

3289' Right bank erosion 15' high x 30' long, contributing fines into the channel.

3585' High flows scouring left bank 10' high x 20' long, contributing fines into the channel.

3651' Redwood Drive bridge 50' long x 11' high.

3783' Left bank scour 10' high x 15' long, contributing fines into the channel.

3813' High flows scouring the left bank 6' high x 15' long behind standing maple, contributing fines and gravel into the channel.

3911' Logging activity on the left bank.

4000' Right bank erosion 8' high x 15' long, contributing fines into the channel.

4036' LDA 25' wide x 20' long x 5.5' high, retaining sand 4' high. Possible barrier.

4216' LDA 20' wide x 10' long x 4' high, retaining gravel 2' high. Low flow barrier.

4247' Area 180' long of numerous downed conifers, active and potential bank failures, and gravel retention. LDA 15' wide x 10' long x 3' high; possible barrier.

4487' Channel undercutting redwoods on left bank; failure imminent.

4626' LDA 40' wide x 14' long x 8' high, retaining gravel 3' high; probable barrier. Right bank erosion 40' high x 80' long, contributing fines into the channel.

4669' Left bank failure 45' long, contributing trees into the channel.

4732' Right bank erosion 30' high x 50' long, contributing fines into the channel and diverting flows into the left bank.

4744' LDA 45' wide x 8' long x 4' high, retaining sand 1' high. Low flow barrier.

4818' Both banks cut 4' high, contributing boulders and debris into the channel; no apparent barrier.

5091' End of survey due to numerous dry units and barriers.