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 South Fork Eel River, tributary to the Eel River, located in Humboldt County, California (Figure 1). Dean Creek's legal description at the confluence with South Fork Eel River is T4S R3E S2. Its location is 40°08'32" N. latitude and 123°48'36" W. longitude. Dean Creek is a second order stream and has approximately 6.3 miles of blue line stream, according to the USGS Miranda, Fort Seward, and Harris 7.5 minute quadrangles. Dean Creek drains a watershed of approximately 15.0 square miles. Elevations range from about 260 feet at the mouth of the creek to 3,400 feet in the headwater areas. Redwood, Douglas fir and oak forests dominate the watershed. The watershed is in mixed private ownership. A portion is managed for grazing with the remainder subdivided into residential parcels. Vehicle access exists via Highway 101 to the Redway Exit.

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) and contract seasonal 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. Two 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 July 21-23, and August 3-6, 1992, was conducted by Chris Coyle and Craig Mesman (CCC). The total length of the stream surveyed was 28,458 feet, with an additional 1,573 feet of side channel.

Flows were not measured on Dean Creek.

Dean Creek is a F3 channel type for the first 1,417 feet; D1 for the next 6,555 feet; B2 for the next 17,607 feet, A2 for the next 1,009 feet, and B3 for the last 3,443 feet. F3 channel types are flat, totally confined, highly meandering boulder streams with a high sediment supply. D1 types have a gradient of >1%, with coarse grained, braided channels. B2 streams are moderate gradient (1-2.5%), stable, large cobble and coarse gravel channels. A2 channels are steep (4-10% gradient), very well confined streams, with stable stream banks. B3 streams are moderate gradient (1.5-4%), cobble/gravel channels with unstable rejuvenating stream banks.

Water temperatures ranged from 63 to 84 degrees fahrenheit. Air temperatures ranged from 64 to 84 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 38.6%, flatwater types 34.2%, pools 23.6%, and dry 3.6% (Graph 1). Flatwater habitat types made up 44.1% of the total survey **length**, riffles 23.8%, pools 18.9%, and dry 13.2% (Graph 2).

Twenty Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were step runs, 20.5%; low gradient riffles, 20.2%; and mid-channel pools, 20.2% (Graph 3). By percent total **length**, step runs made up 36.1%, low gradient riffles 21.9%, and dry 13.2%.

One-hundred-sixty pools were identified (Table 3). Main-channel pools were most often encountered at 55.0%, and comprised 55.8%

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. Eighty of the 160 pools (50%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 154 pool tail-outs measured, none had a value of 1 (0.0%); 13 had a value of 2 (8.4%); 89 had a value of 3 (57.8%); and 52 had a value of 4 (33.8%). 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. Riffle habitat types had the highest shelter rating at 29.2. Flatwater habitat types followed with a rating of 23.9 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 36.0, and scour pools rated 25.2 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Dean Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. 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 58 of the 84 low gradient riffles (69.0%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 27.4% of the low gradient riffles (Graph 8).

Ninety-two percent of the survey reach lacked shade canopy. Of the 8% of the stream covered with canopy, 87.5% was composed of deciduous trees, and 12.5% 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 44.6%. The mean percent left bank vegetated was 46.6%. The dominant elements composing the structure of the stream banks consisted of 13.1% bedrock, 8.9% boulder, 22.9% cobble/gravel, 5.7% bare soil, 27.6% grass, 7.6% brush. Additionally, 13.6% of the banks were covered with deciduous trees, and 0.6% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on September 16, 1992 in Dean Creek. The units were sampled by John Crittenden and Chris Coyle (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat units 22-24, a low gradient riffle, boulder formed lateral scour pool, and a confluence pool approximately 1,647 feet from the confluence with the South Fork Eel River. This site had an area of 3,863 sq ft, and a volume of 1,680 cu ft. The unit yielded 65 roach, ranging from 41 to 105mm, 14 squawfish, ranging from 64 to 140mm, and 1 stickleback 36mm.

The second site was habitat unit 275, a mid-channel pool, approximately 24,178 feet above the creek mouth. This site had an area of 700 sq ft, and a volume of 840 cu ft. Twenty-seven steelhead were sampled. They ranged from 46 to 240mm. Also, 65 roach were sampled, ranging from 35 to 116mm.

DISCUSSION

Dean Creek has five channel types: F3, D1, B2, A2, and B3. The A2, B3, D1, and F3 channel types are generally not suitable for fish habitat improvement structures. The high energy and steep gradient of the A2 channel type is generally not suitable for instream enhancement structures. B3 channels have unstable rejuvenating stream banks that are an endless source of sediment. D1 channels are braided, unstable streams, and F3 channels are highly meandering, totally confined streams with unstable stream banks.

The B2 channel type is excellent for many types of low stage plunge weirs, in-channel and bank boulder placement, single and double wing deflectors, channel constrictors, and bank cover to name only a few. In Dean Creek there are 17,607 feet of this channel type.

The water temperatures recorded on the survey days July 21-23, and August 3-6, 1992 ranged from 63° F to 84° F. Air temperatures ranged from 64° F to 84° F. This is a very poor water temperature regime for salmonids, since 66° F, is near the threshold stress level for salmonids. 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 44.1% of the total **length** of this survey, riffles 23.8%, and pools 18.9%. The pools are relatively shallow with 80 of the 160 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, and where the stream banks are stable.

One-hundred-forty-one of the 154 pool tail-outs measured had embeddedness ratings of 3 or 4. None 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 low with a rating of 23.6. The shelter rating in the flatwater habitats was only slightly better at 23.9. However, 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, bedrock ledges and aquatic vegetation 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.

Eighty-one of the 83 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 8%. This is a relatively 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) Temperatures in this section of Dean Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) The 6555' of D1 channel in Dean Creek should be realigned into a stable channel capable of transporting the stream flows and the sediment supply generated in the upper watershed.

4) Increase the canopy on Dean Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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 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.

8) 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.

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 South Fork Eel River. The first six units of the survey are on the South Fork's flood plain. Channel type is a F3.
910'	Old Highway 101 bridge.
1069'	Highway 101 bridge overhead.
1417'	Channel change from a F3 to a D1.

1196'	Dean Creek Highway 101 off ramp.
1723'	PG&E service road on right bank.
4625'	Dry tributary entering from left bank.
4667'	Old road crossing creek bed. Dry above this point.
7596'	Braided channel over habitat unit 71. Right bank side channel flowing into it.
7749'	Right bank slide 150' long x 100' high, contributing fines and gravel.
7972'	Channel type change from a D1 to a B2.
8830'	Large ravine on right bank.
9363'	Active slide on left bank 200' long x 100' high, contributing fines.
9614'	Active slide on right bank 150' long x 150' high contributing fines.
9957'	Large boulder ravine on left bank.
10712'	Ravine at top end on right bank.
11514'	Slide on left bank 100' long x 100' high contributing gravel and fines.
12285'	Boulder 10' to 15' diameter calving from right bank. Erosion 75' long x 100' high.
12442'	High flows scouring left bank 15' high x 20' long, contributing fines and gravel.
12504'	Large woody debris accumulation in channel. Left bank erosion 100' long x 150' high. Contributing cobble.
12681'	Active slide covering units 138-146. Approximate length 500', contributing gravel and fines.
13300'	Tributary entering from left bank.
13461'	Unstable right bank 200' long x 150' high, contributing fines.
14048'	Unstable right bank area 100' high x 100' long

contributing fines.

14325' Unstable right bank covering units 162-171. Approximate length 825'. Contributing fines.

14636' Tributary entering from left bank.

14956' Unstable right bank 200' high x 410' long covering units 176-183.

15160' Terraced left bank 10' high x 120' long contributing fines.

15710' Terraced left bank 6' high x 315' long contributing fines.

15986' Right bank slump 100' high x 275' long contributing fines.

16158' Unstable right bank 100' high x 620' long contributing fines and gravel.

16546' Terraced left bank 5' high x 300' long contributing fines.

17946' Active sliding on both banks but predominately the right bank. Slide approximately 200' long x 300' high. Contributing fines.

18307' Terraced left bank 8' high x 15' long.

18605' Terraced left bank 8' high x 150' long.

19549' Tributary entering from right bank, A1 channel type.

20324' Unstable right bank 200' high x 250' long contributing fines.

20556' Left bank erosion 150' high x 100' long contributing fines.

20694' Tributary entering from left bank.

20778' Right bank erosion 100' high x 150' long contributing fines.

22008' Right bank erosion 100' high x 100' long contributing fines and gravel.

22673' Left bank erosion 150' high x 200' long contributing fines.

23436' Right bank erosion 100' high x 150' long contributing fines.

24178' Tributary entering from left bank. Young-of-the-year observed in tributary.

24540' Right bank erosion 50' high x 75' long contributing fines.

24740' Left bank erosion 75' high x 20' long contributing fines.

25000' Left bank erosion 75' high x 150' long. Contributing fines.

25579' Channel type change from a B2 to an A2.

25598' Unstable left bank 150' high x 100' long contributing fines and gravel.

25638' Left bank ravine cutting through left bank.

25855' Right bank slumping 50' high x 150' long contributing fines.

25932' Active slide on left bank 150' high x 200' long contributing fines.

26728' Old slump on left bank 100' high x 100' long contributing fines.

27101' Tributary entering from right bank.

27522' Unstable left bank 75' high x 150' long contributing fines.

27746' Unstable right bank 100' high x 150' long contributing fines.

28427' Slide on both bank approximately 100' high x 175' long contributing fines.

28598' Left bank erosion 30' high x 50' long. Right bank erosion 100' high x 150' long.

28761' Tributary entering from right bank.

29401' Left bank erosion 40' high x 175' long contributing fines.

29951' Tributary entering from left bank.

30016' Massive land slide on left bank approximately 250' high x 400' long contributing boulders. Also rapid increase in gradient. END OF SURVEY.