STREAM INVENTORY REPORT

HELY CREEK, 1991

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Hely 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 Hely 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.

According to Department of Fish and Game field data, adult carcass surveys have been conducted on Hely Creek from 1987 through 1990. The three surveys conducted in December, 1987 found 42 live chinook salmon, 15 carcasses, and 34 redds. Four surveys were conducted in December, 1988 and January, 1989. They documented a total of 47 live chinook salmon, 48 chinook carcasses and 67 redds. One carcass in 1987, and one in 1988 were missing adipose fins, but the snouts had no coded wire tags (CWT). In January, 1990 two surveys found no fish, carcasses, or redds. No winter surveys were conducted in 1991 due to continuing low flows. However, steelhead fry were sampled during 1991 summer electrofishing. A survey in March, 1992 documented only two live steelhead adults. 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

Hely Creek is tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). Hely Creek's legal description at the confluence with the Van Duzen River is T01N R02E S05. Its location is 40°29'57" N. latitude and 123°58'34" W. longitude. Hely Creek is a second order stream. The total length of blue line stream, according to the USGS Owl Creek and Redcrest quadrangles is 2.3 miles.

Hely Creek drains a watershed of approximately 3.5 square miles. Elevations range from about 300 feet at the mouth of the creek to 2,000 feet in the headwater areas. Redwood, Douglas fir, and

hardwood forest dominates the watershed. The lower section of the watershed is owned by Humboldt Redwood State Parks; Pacific Lumber Company owns the balance. The basin is managed for recreation and timber production. Vehicle access exists via State Highway 36, approximately 10 miles east of Alton and U.S. Highway 101.

METHODS

The habitat inventory conducted in Hely 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). Hely Creek personnel were trained in May and June, 1991, 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 Hely Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Discharge is measured in cubic feet per second using a current flow meter. Measurements are taken at the downstream end of the stream or reach being inventoried. Flows should also be measured 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". Hely 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 Hely 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 Hely 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 Hely 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 Hely 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 Hely Creek to document the salmonid species composition and distribution. Three sites were electrofished using a Smith Root Model 12 electrofisher. 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 Hely 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
- Fish species by length

HABITAT INVENTORY RESULTS:

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE RESULTS *

The habitat inventory of June 12, 13, 14, 17, and 18, 1991, was conducted by Craig Mesman and Chris Coyle (CCC). The total length of the stream surveyed was 8,220 feet, with an additional 138 feet of side channel.

Flow was not measured on Hely Creek.

Hely Creek is an B4 channel type for the entire 8,220 feet of stream reach surveyed. B4 channels are moderate (1.5-4.0%) gradient, well confined streams, with unstable stream banks.

Water temperatures ranged from 49 to 55 degrees fahrenheit. Air temperatures ranged from 52 to 70 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 39.3%; pool types were 31.1%; and flatwater 29.6% (Graph 1). Riffle habitat types made up 55.3% of the total survey **length**, flatwater were 28.8%, and pools 15.9% (Graph 2).

Fourteen 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, 36.2%; runs, 20.4%; and mid-channel pools, 17.9% (Graph 3). By percent total

length, low gradient riffles made up 51.1%, runs 15.9%, and mid-channel pools 9.9% (Table 2).

Sixty-one pools were identified (Table 3). Main-channel pools were most often encountered at 62.3%, and comprised 69.6% 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. Twenty-four of the 61 pools (39.3%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 61 pool tail-outs measured, 8 had a value of 1 (13.1%); 32 had a value of 2 (52.5%); 18 had a value of 3 (29.5%); and 3 had a value of 4 (4.9%). 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 85.4. Riffle habitats followed with a rating of 39.2 (Table 1). Of the pool types, the main-channel pools had the highest mean shelter rating at 86.8, and scour pools rated 86.0 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 49 of the 71 low gradient riffles (69.0%). Gravel was the next most frequently observed dominant substrate type, and occurred in 29.6% of the low gradient riffles (Graph 8).

Twelve percent of the survey reach lacked shade canopy. Of the 88% of the stream covered with canopy, 93% was composed of deciduous trees, and 7% was composed of coniferous trees. Graph 9 describes the canopy in Hely 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 69.8%. The mean percent left bank vegetated was 68.5%. The dominant elements composing the structure of the stream banks consisted of 1.0% bedrock, 2.0% boulder, 14.7% cobble/gravel, 1.5% bare soil, 1.5% grass, 0.0% brush. Additionally, 56.3% of the banks were covered with deciduous trees, and 22.8% with

coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Hely Creek. The objective was to identify fish species and distribution. The units were sampled on August 16 and 19, 1991 by Craig Mesman, Jerry Suissa, and Jay Miller (CCC). Each unit was end-blocked with nets to contain the fish within the sample reach. Two passes were conducted at each site, fork lengths measured and recorded, and the fish returned to the stream.

The first site sampled was composed of habitat units 021-023, a mid-channel pool, a low gradient riffle, and a plunge pool, approximately 677-737 feet from the confluence with the Van Duzen River. These sites had a cumulative area of 721 sq ft, and a volume of 587.6 cubic feet. These units yielded 31 steelhead, ranging from 53 to 155 mm FL.

The second sample site was habitat unit 167, a mid-channel pool, located approximately 6,843 feet above the creek mouth. This site had an area of 480 sq ft, and a volume of 336 cu ft. Seventeen steelhead were sampled. They ranged from 48 to 157 mm FL.

The third site sampled was habitat unit 194, a mid-channel pool, located approximately 8,256 feet above the creek mouth. The site had an area of 432 sq ft, and a volume of 648 cu ft. Fourteen steelhead were sampled, ranging from 46 to 195 mm FL.

DISCUSSION

The B4 channel type is generally unsuitable for fish habitat improvement structures. B4 channels are found in moderate gradient stream reaches. They have channels dominated by sand and gravel, and therefore have unstable stream banks. Usually within the B4 channel there are zones with stable streambanks where instream enhancement structures can be constructed. This seems to be the case in Hely Creek, but any structure sites must be selected with care because of the problems with stream bank erosion and structure stability.

The water temperatures recorded on the survey days June 12-18, 1991 ranged from 49° F to 55° F. Air temperatures ranged from 52° F to 70° 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 55.3% of the total **length** of this survey, flatwater 28.8%, and pools 16%. The pools are

relatively shallow with only 24 of the 61 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 jeopardize the unstable streambanks of the B4 channel type.

Twenty-one of the 61 pool tail-outs measured had embeddedness ratings of 3 or 4. Only eight had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Hely 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 high with a rating of 85.4. The shelter rating in the flatwater habitats was substantially lower at 33.5. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, small woody debris, white water, 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.

Seventy of the 71 low gradient riffles had small cobble or gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 87.8%. This is a very high 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) Hely 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 of the stream banks.

3) Increase woody cover in the flatwater habitat units. Most of the existing cover is from large woody debris, which is desirable. Adding high quality complexity with additional woody cover is desirable.

4) There are several log debris accumulations present on Hely Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done in a manner that will not release an overabundance of fine sediment into the system.

5) Inventory and map sources of stream bank erosion in further detail, 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.

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 Van Duzen River. Channel type is a B4 for the entire survey reach.
143'	Erosion on right bank (RB) 100' long x 15' high contributing fines and gravel.
235'	Footbridge 3' wide x 20' long across stream.
307'	Erosion on left bank (LB) 20' long x 8' high. Fallen redwood poised above pool.
469'	Highway 36 bridge.
660'	Old log abutment on RB & LB.
677'	Log debris accumulation (LDA) 12' wide x 8' long x 4' high causing sediment retention.
831'	Erosion on LB 20' long x 6' high, partially held by roots.
881'	CCC flag stream enhancement site # 1 (3-15-88).

946' Log jam over entire unit accumulating small woody debris (SWD).

1061' Buried log across channel has rendered hardware and erosion cloth ineffective at CCC enhancement site.

1226' Two cabled logs, one on LB, one in stream.

1521' Pool on LB scours under three live redwoods which are leaning and likely to fall in soon.

1778' Erosion on LB 20' high x 50' long, partially held by roots, contributing fines.

1820' Three cabled 1.5' diameter logs on LB have blown out.

2000' RB pool caused by scour under blown out log structure.

2080' Several logs embedded in LB, one log has attached cables.

2120' Roots of 15' high x 10' diameter stump holding LB.

2206' Pool caused by installed cabled log K-dam with rip rap.

2853' LDA retaining silt and gravel.

2947' LDA armoring LB. Pool caused by scouring in front of and under fallen log across stream.

3040' RB protected by 10' diameter root wad.

3082' CCC flag site # 5 (3-15-88). Unit covered by debris jam 25' x 15' x 6' behind blown out CCC structure.

3113' RB contributing sediments, LB armored, by embedded log which is creating an accumulation of SWD.

3282' Both banks armored by root wads. Pool caused scour between wads.

3363' Erosion point on RB 160' long x 25' high.

3419' CCC flag site # 6 (4-19-86). RB erosion continues.

3502' Large woody debris (LWD) armors both banks. Unit covered by log jam.

3815' RB is a wall of sediment. Lower part of unit is covered by a 25' wide x 42' long log jam that extends into preceding unit.

3962' CCC flag site # 9 (4-18-88). RB consists of a 20' wall contributing fines and gravel.

4201' LDA covers entire unit.

4275' Fallen redwood creates bridge 5' above stream.

4725' CCC flag site # 15 (9-8-86).

4937' CCC flag site # 17 (9-8-86).

5323' CCC flag site # 13 (4-18-88). Pool caused by scour under LWD accumulation.

5846' Entire unit covered by LWD jam, may be impassable.

6024' LB erosion 10' high x 40' long contributing fines and gravel.

6089' Dry side channel on LB.

6114' LDA 40' wide x 12' long x 4' high retaining silt and gravel.

6264' LB erosion held by roots and LWD.

6361' RB erosion 20' high x 75' long contributing fines and gravel.

6558' LB erosion 10' high x 20' long contributing fines and gravel.

6701' LB erosion 15' high x 30' long contributing fines and gravel.

6843' Entire unit covered by LWD jam retaining 6' of sediment. May be impassable.

6984' RB erosion point 3' high x 50' long.

7104' RB erosion point 15' high x 50' long.

7175' RB erosion point 20' high x 50' long.

7371' Tributary enters RB.

7703' SWD dam 12' long x 25' wide x 4' high, may be impassable.

7856' LB of shale is eroding, contributing fines and sediment.

8001' DFG flag site # 4a (11-15-84). Impassable LDA 145' long x 40' wide x 10' high retaining fine sediments and creating a 6' high fall.

8220' LB is a shale peninsula at fork to left. This narrow shale channel may be a major contributor to the fines downstream. End of survey.