STREAM INVENTORY REPORT

ALLEN CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Allen 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 Allen 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 Allen 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

Allen Creek is tributary to the Eel River, located in Humboldt County, California. Allen Creek's legal description at the confluence with the Eel River is T1S R2E S11. Its location is 40°23'15" N. latitude and 123°55'21" W. longitude. Allen Creek is a second order stream and has approximately 2.3 miles of blue line stream, according to the USGS Redcrest 7.5 minute quadrangle. Allen Creek drains a watershed of approximately 1.0 square mile. Elevations range from about 120 feet at the mouth of the creek to 1,400 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned primarily by the Pacific Lumber Company and is managed for timber production. Vehicle access exists from U.S. Highway 101 north of the town of Redcrest via Holmes Road. Follow Holmes Road to its end at Larabee, and walk approximately one mile south along the railroad tracks to the mouth of Allen Creek.

METHODS

The habitat inventory conducted in Allen Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The contract seasonals that conducted the inventory were trained in

standardized habitat inventory methods by the California Department of Fish and Game (DFG). Allen Creek personnel were trained in May and June, 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 Allen 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". Allen 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 Allen 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 Allen 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 Allen 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 Allen 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 Allen Creek to document the fish species composition and distribution. Two sites were electrofished in Allen 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 Runtime, a dBASE 4.1 data entry program developed by the Department of Fish and Game. This program processes and summarizes the data.

The Runtime 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 Allen 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 1 and 3, 1992, was conducted by Russ Irvin and Aaron Nadig (contract seasonals). The total length of the stream surveyed was 1,898 feet, with an additional 38 feet of side channel.

Flow was not measured in Allen Creek.

Allen Creek is an A3 channel type for the entire 1,898 feet of stream reach surveyed. A3 channels are steep (4-10% gradient), well confined streams, with unstable stream banks.

Water temperatures ranged from 57 to 60 degrees fahrenheit. Air temperatures ranged from 64 to 70 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 36.9%, flatwater types 35.4%, and pools 27.7% (Graph 1). Flatwater habitat types made up 58.6% of the total survey **length**, riffles 28.0%, and pools 13.4% (Graph 2).

Eight 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, 32.3%; step runs, 29.2%; and mid-channel pools, 16.9% (Graph 3). By percent total **length**, step runs made up 55.5%, low gradient riffles 24.7%, and mid-channel pools 7.7% (Table 2).

Eighteen pools were identified (Table 3). Main channel pools were most often encountered at 77.8%, and comprised 81.5% 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. Sixteen of the 18 pools (89%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 18 pool tail-outs measured, 11 had a value of 1 (61.1%); 6 had a value of 2 (33.3%); 1 had a value of 3 (5.6%); and zero had a value of 4. 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 62.5. Flatwater habitats followed with a rating of 34.6 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 75.0, and main channel pools rated 58.9 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Allen Creek and are extensive. Large and small woody debris are the next most common cover types. Graph 7 describes the pool cover in Allen Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 17 of the 21 low gradient riffles (81.0%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 9.5% of the low gradient riffles (Graph 8).

Ninety-nine percent of the survey reach was covered with shade canopy. This canopy was composed of 70% coniferous trees, and 30% deciduous trees. Graph 9 describes the canopy in Allen 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 35.2%. The mean percent left bank vegetated was 35.1%. The dominant elements composing the structure of the stream banks consisted of 21.5% boulder, 26.9% cobble/gravel, 10.8% bare soil, 23.1% grass, 0.8% brush. Additionally, 1.5% of the banks were covered with deciduous trees, and 15.4% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two electrofishing sites were sampled on Allen Creek. The objective was to identify fish species and distribution. The units were sampled on July 14, 1992, by Shea Monroe and Russ Irvin (CCC and contract seasonal). Each unit was end-blocked with nets to contain the fish within the sample reach. Three passes were conducted at each site, fork lengths (FL) measured and recorded, and the fish returned to the stream.

The first site sampled was habitat unit 007, a step pool, approximately 160 feet from the confluence with the Eel River. This site had an area of 75.0 sq ft, and a volume of 37.5 cu ft. No fish were found.

The second site was habitat units 016-018, a plunge pool/step

run/plunge pool sequence, located approximately 410 feet above the creek mouth. This site had an area of 643.7 sq ft, and a volume of 337.1 cu ft. No fish were found.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Allen Creek.

DISCUSSION

The A3 channel type is generally not suitable for fish habitat improvement structures. A3 channels are found in high energy, steep gradient stream reaches. They have channels dominated by coarse-grained substrates, do not retain gravels very well, and have unstable stream banks. Usually within the A3 channel there are zones of lower gradient where structures designed to trap gravels can be constructed. This seems to be the case in Allen Creek, but any structure sites must be selected with care because of the high stream energy which can create problems with stream bank erosion and structure stability.

The water temperatures recorded on the survey days July 1 and 3, 1992, ranged from 57° F to 60° F. Air temperatures ranged from 64° F to 70° F. This is a 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.

Flatwater habitat types comprised 58.6% of the total **length** of this survey, riffles 28.0%, and pools 13.4%. The pools are relatively shallow with only 2 of the 18 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.

Eleven of the 18 pool tail-outs measured had an embeddedness rating of 1. Only one had a rating of 3 or 4. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. These measurements indicate relatively good substrate conditions in Allen Creek.

The mean shelter rating for pools was moderate with a rating of 62.5. The shelter rating in the flatwater habitats was lower at 34.6. 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 and small woody debris contribute a moderate amount.

Nineteen of the 21 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 99%. This is a very high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

RECOMMENDATIONS

1) Allen Creek should be managed as an anadromous, natural production stream.

2) The culverts at the mouth of Allen Creek are a probable barrier to anadromous fish. These should be modified to improve fish passage.

3) 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.

4) There are several log debris accumulations present on Allen Creek that are retaining 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.

5) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Fish passage should be monitored, and improved where possible.

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 an A3 for the entire survey reach.

160' Two 3' diameter culverts (CMP) are beneath the railroad bed. They are c. 70' long and are placed

6.5' and 7.5' above the stream gradient at the discharge end. The maximum depth in the small pool created by the outflow cascades at the time of the survey was only 1.1'. The CMPs have no baffles in them. Water is flowing out of both CMPs, but only one CMP inlet is visible on the upstream side. No fish were observed in entire survey. Probable barrier to anadromous fish.

410' Bank erosion 10' high x 10' long.

1349' Log and debris accumulation (LDA) 15' wide x 20' long x 4' high.

1380' LDA 8' wide x 12' long x 7' high; possible barrier.

1511' Boulder jam 4' wide x 15' long x 4' high; possible low flow barrier.

1540' LDA 25' wide x 25' long x 11' high.

1583' Two plunges, 3' and 4' high.

1647' LDA 29' wide x 29' long x 6' high. Right bank erosion 20' high x 45' long.

1699' LDA 4' wide x 12' long x 3' high, retaining gravel 8' wide x 10' long.

1898' End of survey. No fish were observed in the survey.