STREAM INVENTORY REPORT

LEGGETT CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Leggett 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 Leggett 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 Leggett Creek. On June 18, 1990, 5,188 steelhead yearlings were planted in Leggett Creek by the California Department of Fish and Game (DFG). The fish were of neighboring Redwood Creek origin. 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

Leggett Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Humboldt County, California. Leggett Creek's legal description at the confluence with the South Fork Eel River is T4S R3E S11. Its location is 40°07'48" N. latitude and 123°49'16" W. longitude. Leggett Creek is a second order stream and has approximately 8.5 miles of blue line stream, according to the USGS Miranda 7.5 minute quadrangle. Leggett Creek drains a watershed of approximately 5.0 square miles. Elevations range from about 280 feet at the mouth of the creek to 1,600 feet in the headwater areas. Redwood, Douglas fir, and hardwood forest dominates the watershed. The lower 1/2 mile of the creek is owned by the Eel River Conservation Camp and the Redway Water District and is managed for special district use. The remaining 8 miles of the creek is in private ownership and has been subdivided into 21 parcels. Vehicle access exists from U.S. Highway 101 at Redway, via Redwood Drive to Holbrook Grove. The mouth of Leggett Creek is on the west side of the South Fork Eel River.

METHODS

The habitat inventory conducted in Leggett 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 DFG. Leggett Creek personnel were trained in May, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by two person teams.

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 Leggett 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". Leggett 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 Leggett 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 Leggett 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 Leggett 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 Leggett 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 Leggett Creek to document the fish species composition and distribution. Two sites were electrofished in Leggett 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 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 Leggett 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 September 25, 28-30, and October 1, 2, and 5, 1992 was conducted by Chris Coyle, John Cleckler, Russ Irvin, and Ed Davis (CCC and contract seasonals). The total length of the stream surveyed was 16,835 feet, with an additional 654 feet of side channel.

Flows were not measured on Leggett Creek.

Leggett Creek is a C3 channel type for the first 12,345 feet of stream reach surveyed, then it changes to a B3 channel type for the remaining 4,490 feet of the survey. C3 channels are low gradient streams (0.5-1.0%), with gravel beds and unstable stream banks. B3 channels have moderate gradients (1.5-4.0%), with cobble/gravel channels and unstable stream banks. Leggett Creek has a very well confined channel throughout the entire survey reach.

Water temperatures ranged from 55 to 67 degrees fahrenheit. Air temperatures ranged from 57 to 80 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 41.8%, flatwater types 29.5%, and pools 27.9% (Graph 1). Riffle habitat types made up 59.8% of the total survey **length**, flatwater 23.2%, and pools 16.3% (Graph 2).

Sixteen 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, 39.7%; runs, 12.9%; glides, 10.8%; and mid-channel pools, 10.5% (Graph 3). By percent total **length**, low gradient riffles made up 58.5%, glides 10.3%, step runs 6.8%, and runs 6.1%.

One hundred-six pools were identified (Table 3). Scour pools

were most often encountered at 50.9%, and comprised 59.3% 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-five of the 106 pools (80%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 104 pool tail-outs measured, 13 had a value of 1 (12.5%); 42 had a value of 2 (40.4%); 41 had a value of 3 (39.4%); and 8 had a value of 4 (7.7%). 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 32.4. Riffle habitats followed with a rating of 13.5 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 74.1, main channel pools had a rating of 28.6, and scour pools rated 26.8 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 142 of the 151 low gradient riffles (94.0%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 3.3% of the low gradient riffles (Graph 8).

Thirty-five percent of the survey reach lacked shade canopy. Of the 65% of the stream covered with canopy, 59% was composed of deciduous trees, and 41% was composed of coniferous trees. Graph 9 describes the canopy in Leggett 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 78.4%. The mean percent left bank vegetated was 77.4%. The dominant elements composing the structure of the stream banks consisted of 22.4% bedrock, 0.9% boulder, 6.7% cobble/gravel, 4.2% bare soil, 15.8% grass, 7.8% brush. Additionally, 34.3% of the banks were covered with deciduous trees, and 7.8% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on Sept. 29, 1992 in Leggett Creek. The units were sampled by Chris Coyle and Russ Irvin (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 027, a mid-channel pool, approximately 762 feet from the confluence with the South Fork Eel River. This site had an area of 408 sq ft, and a volume of 286 cu ft. The unit yielded 5 steelhead, ranging from 74 to 175 mm FL. There were also 3 coho salmon ranging from 73-78 mm FL. Additionally, 8 juvenile Sacramento Squawfish and 72 California Roach were sampled.

The second site included habitat units 54-57, a series that included a run, low gradient riffle, run, mid channel pool sequence. The site was approximately 2,133 feet above the creek mouth. This site had an area of 369 sq ft, and a volume of 171 cu ft. Twelve juvenile steelhead were sampled, but not measured because of stressful 60° F water temperatures.

DISCUSSION

The surveyed reach of Leggett Creek has two channel types: B3 and C3. B3 channels are generally not suitable for instream enhancement structures due to their unstable stream banks. C3 channels are meandering steam types on noncohesive gravel beds which have poorly consolidated and unstable stream banks. They are generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover and shelter structures in straight reaches are often appropriate. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey days September 25-October 5, 1992 ranged from 57° F to 67° F. Air temperatures ranged from 57° F to 80° F. This is a very good water temperature regime for salmonids. However, 67° F, if sustained, is near the threshold stress level for salmonids. This does not seem to be the case here, and Leggett Creek seems to have temperatures favorable to salmonids. 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 59.8% of the total **length** of this survey, flatwater 23.2%, and pools 16.3%. The pools are relatively shallow with only 21 of the 106 pools having a maximum depth greater than two 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.

Forty-nine of the 104 pool tail-outs measured had embeddedness ratings of 3 or 4. Thirteen had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Leggett 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 32.4. The shelter rating in the flatwater habitats was lower at 12.6. 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, large and small woody debris 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.

One hundred forty-two of the 151 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 65%. 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) Leggett 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 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 South Fork Eel River. There is a low gravel delta between confined bedrock channel banks and boulders. Good fish access. Reach one is a C3 channel.
762'	Biological sampling site # 1.
1029'	There is an old bridge spanning the channel 15' high. The stream reach to this point has several small bank scour sites that are contributing small amounts of fine sediment to the stream. They are not a major concern, nor are they readily treatable.
2075'	A log debris accumulation 3' high, 15' wide, and 8' long is retaining a small amount of gravel. It is not a barrier to fish passage and does not need attention.
2148'	Biological sampling site # 2.
2536'	Right bank erosion 6' high, 40' long contributing fines.
4188'	Tributary enters from right bank. There is evidence of a high sediment load in this tributary. This tributary may have value to salmonids.
5121'	Right bank erosion 6' high, 25' long contributing fines.
6398'	CCC treatment site # 24.
6492'	Right bank erosion 6' high, 15' long contributing fines.
6990'	Dry tributary from the left bank.
8302'	Tributary from the left bank.

11657' Left bank erosion 20' high, and 30' long, contributing fines.

11961' The beginning of a 143' long reach where the left bank is producing sediment yield due to a road cut.

12345' Right bank erosion 6-20' high, and 75' long is contributing fines.

12345' Stream forks. Survey continues up the north fork. The west fork is intermittent, but young of the year (YOY) and 1+ salmonids were observed. Although the channel is heavily influenced with construction and restoration work at this point, the channel type changes to a B3 and is reach 2.

12702' Log debris accumulation (LDA) treatment site. Left bank erosion 30' high and 75' long.

14792' Tributary from the left bank.

15757' An old slide 150' long on the left bank is contributing "blue-goo" fines.

15797' LDA 11' high x 50' long x 30' long is retaining 11' x 50' of gravel. Flow percolates through debris. This is a barrier.

16233' Right and left banks have erosion points and both are contributing fines.

16727' Tributary enters from the left bank.

16813' Right bank erosion sloughing fines directly into the stream. Some trees have also fallen into the channel adding to the obstruction of the narrow channel.

16835' A log jam 8' high with no pool at the base obstructs the stream. Above the jam are bedrock outcroppings and unstable banks. Gradient increases and the stream is very unstable except for the debris jam holding the channel in place. Low value to salmonids, of which few have been seen above the forks. End of survey.

LEVEL III and LEVEL IV HABITAT TYPE KEY:

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5