STREAM INVENTORY REPORT

LOW GAP CREEK

INTRODUCTION

A stream inventory was conducted during the fall of 1993 on Low Gap 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 Low Gap 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 Low Gap 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

Low Gap Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Low Gap Creek's legal description at the confluence with the South Fork Eel River is T5S R3E S24. Its location is 39°59'55" N. latitude and 123°46'47" W. longitude. Low Gap Creek is a second order stream and has approximately 4.1 miles of blue line stream, according to USGS Piercy, Noble Butte, Harris, and Garberville 7.5 minute quadrangles. Low Gap Creek drains a watershed of approximately 3.6 square miles. Summer base runoff is approximately 0.4 cfs at the mouth. Elevations range from about 480 feet at the mouth of the creek to 2,000 feet in the headwater areas. Grass, oak and Douglas fir forests dominate the watershed. The watershed is privately owned and is managed for rangeland. Vehicle access exists from Highway 101 via Highway 271 at the Humboldt/Mendocino county line.

METHODS

The habitat inventory conducted in Low Gap Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) and technical advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Low Gap Creek personnel were trained in June, 1993, 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 Low Gap 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 measured 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". Low Gap 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 Low Gap 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 Low Gap 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 Low Gap 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 Low Gap 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.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85mm).

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. This program processes and summarizes the data, and produces the following six 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 Low Gap 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 October 25 and November 8, 1993, was conducted by Ruth Goodfield, Warren Mitchell, and Chris Coyle (contract seasonals and CCC). The total length of the stream surveyed was 10,174 feet, with an additional 543 feet of side channel.

Flow was measured at the beginning of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.4 cfs on Nov. 9, 1993.

Low Gap Creek has two channel types: from the mouth to 7,687 feet is a C3 channel and the remaining 2,487 feet of the survey a B2 channel type. C3 channel types are meandering, low gradient (0.5-1.0%), reaches with gravel beds and noncohesive banks. B2 types are moderate gradient (1.0-2.5%), moderately entrenched channels with coarse gravel channels and stable stream banks.

Water temperatures ranged from 49 to 61 degrees Fahrenheit. Air temperatures ranged from 48 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 41.4%, flatwater types 34.1%, and pools 20.7% (Graph 1). Riffles habitat types made up 46.6% of the total survey **length**, flatwater 39.2%, and pools 7.7% (Graph 2).

Thirteen 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%; step runs, 20.3%; and runs, 13.8% (Graph 3). By percent total **length**, low gradient riffles made up 45.6%, step runs 31.9%, and runs 7.3%.

Forty-eight pools were identified (Table 3). Main-channel pools were most often encountered at 58.3%, and comprised 58.7% 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. Two of the 48 pools (4.0%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 48 pool tail-outs measured, nine had a value of 1 (18.8%); 19 had a value of 2 (39.6%); 17 had a value of 3 (35.4%); and 3 had a value of 4 (6.3%). 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 32.0. Flatwater habitats followed with a rating of 18.1 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 60.0, and scour pools rated 34.7 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Low Gap Creek and are extensive. Large and small woody debris also contribute some cover in all habitat types. Graph 7 describes the pool cover in Low Gap Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 69 of the 92 low gradient riffles (75.0%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 21.7% of the low gradient riffles (Graph 8).

Forty percent of the survey reach lacked shade canopy. Of the 60% of the stream covered with canopy, 90% was composed of deciduous trees, and 10% was composed of coniferous trees. Graph 9 describes the canopy in Low Gap 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 44.4%. The mean percent left bank vegetated was 48.8%. The dominant elements composing the structure of the stream banks consisted of 11.0% bedrock, 2.4% boulder, 36.9% cobble/gravel, 13.6% bare soil, 2.4% brush. Additionally, 33.4% of the banks were covered with deciduous trees, and 0.4% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Low Gap Creek

Two sites were electrofished on Nov. 9, 1993 in Low Gap Creek. The units were sampled by Chris Coyle and Warren Mitchell (CCC and contract seasonal). All measurements are fork lengths unless noted otherwise.

The first site sampled included habitat units 23 and 24, a low gradient riffle and a lateral scour pool, approximately 1,326 feet from the confluence with the South Fork Eel River. This site had an area of 505 sq ft, and a volume of 132 cu ft. The unit yielded 22 steelhead, 67 to 189mm FL; 23 Sacramento squawfish; 52mm to 89mm FL, and 17 California roach.

The second site included habitat units 114-115, a lateral scour pool and a low gradient riffle, located approximately 5,988 feet above the creek mouth. This site had an area of 144 sq ft, and a volume of 95 cu ft. Twenty-nine steelhead were sampled. They ranged from 54 to 118mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Low Gap Creek.

DISCUSSION

The surveyed reach for Low Gap Creek has two channel types: C3 and B2. C3 channels are meandering stream types with noncohesive gravel beds, and poorly consolidated, unstable stream banks. This channel type is generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover, and shelter 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 B2 channel type is excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume, and pool cover.

The water temperatures recorded on the survey days October 25 through November 8, 1993 ranged from 49° F to 61° F. Air temperatures ranged from 48° F to 66° F. This is a very good water temperature regime for salmonids. To make any further conclusions, however, temperatures would need to be monitored throughout the warm summer months, and more extensive biological

sampling conducted.

Flatwater habitat types comprised 39.2% of the total **length** of this survey, riffles 46.6%, and pools 7.7%. The pools are relatively shallow with only 2 of the 48 pools having a maximum depth greater than 2 feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. In first and second order streams a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not threatened unstable stream banks, or where their installation will not conflict with the modification of log debris accumulations (LDA's) in the stream.

Twenty of the 48 pool tail-outs measured had embeddedness ratings of 3 or 4. Nine had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In Low Gap 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 33.0. The shelter rating in the flatwater habitats was slightly less at 18.1. 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Eighty-nine of the 92 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 60%. This is a moderate 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)Low Gap 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)Temperatures in this section of Low Gap 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.

4)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.

5)Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 4,076, 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 the canopy on Low Gap Creek by planting willow, alder, 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.

8)There are several log debris accumulations present on Low Gap 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.

9)Spawning gravels on Low Gap Creek are limited to relatively few reaches. Crowding and/or superimposition of redds have been observed during winter surveys. Projects should be designed at suitable sites to trap and sort spawning gravels in order to expand redd site distribution in the stream.

Low Gap Creek

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. Stream is highly aggraded. Channel type is a C3 for the first 7687' of stream surveyed.

1326' Biological inventory site #1.

1721' Dry tributary from right bank (RB).

3291' Tributary entering from left bank (LB). No fish observed in tributary.

3763' Sacramento squawfish juveniles observed.

4076' LB failure 150' long x 130' high, completely constricting channel. Small log debris accumulation (LDA) 30' long x 10' high x 7' wide.

4975' Tributary entering from LB. No fish observed within the first 500'.

5234' Lateral LB erosion, 65' long x 25' high.

6553' LB failure 60' long x 125' high, contributing fines.

6859' Dry tributary from LB. Series of revegetating slides on LB.

6952' LDA 15' long x 10' wide x 6' high. Not a barrier.

7393' LDA 27' long x 20' wide x 5' high. Not a barrier.

7688' Channel type changes from a C3 to a B2 for the remaining 2487 feet of stream surveyed.

7892' Dry tributary entering from LB.

8697' Tributary entering from LB.

8823' LDA 30' long x 20' wide x 4' high recently opened, but still retaining gravel and fines.

8904' RB slide 65' long x 80' high, contributing fines.

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9311'Dry tributary from LB.

9449'Tributary entering from RB, gradient is very steep.

9799'LB failure 150' long x 60' high, contributing fines directly to stream.

9977'LB failure, contributing fines and gravel.

10014'Tributary entering from RB.

10174'Bedrock waterfall, approximately 20' high. Barrier to fish passage. END OF SURVEY.

LEVEL III and LEVEL IV HABITAT TYPE

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