STREAM INVENTORY REPORT

JOHNSON CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Johnson 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 Johnson 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 Johnson 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

Johnson Creek is tributary to Gates Creek, tributary to Daugherty Creek, tributary to the South Fork Big River, located in Mendocino County, California. Johnson Creek's legal description at the confluence with Gates Creek is T16N R14W S33. Its location is 39°12'24" N. latitude and 123°24'36" W. longitude. Johnson Creek is a first order stream and has approximately 1.7 miles of blue line stream, according to the USGS Baily Ridge and Orrs Springs 7.5 minute quadrangles. Johnson Creek drains a watershed of approximately 1.7 square miles. Elevations range from about 750 feet at the mouth of the creek to 1,300 feet in the headwater areas. Redwood and Douglas fir forest dominate the watershed. The watershed is primarily owned by the Louisiana- Corporation and is managed for timber production. Vehicle access exists via Masonite Road.

METHODS

The habitat inventory conducted in Johnson 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). Johnson Creek personnel were trained in June, 1993, 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 Johnson Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Daugherty Creek report.

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 Johnson Creek to document the fish species composition and distribution. Three sites were electrofished in Johnson 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. 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 Johnson 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 August 17 and 18, 1993, was conducted by Brian Humphrey and Charles Patton (CCC). The total length of the stream surveyed was 6,164 feet, with an additional 23 feet of side channel.

Flows were not measured on Johnson Creek.

Johnson Creek is a B2 channel for the first 4,903 feet of the stream survey reach then changes to an A3 channel type for the remaining 1,261 feet. B2 channels are moderate gradient, stable large cobble/coarse gravel channels. A3 channels are steep, erodible, coarse grained channels.

Water temperatures ranged from 59 to 65 degrees fahrenheit. Air temperatures ranged from 71 to 81 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 40.0%, flatwater types 33.1%, and pools 21.5% (Graph 1). Flatwater habitat types made up 29.6% of the total survey **length**, riffles 49.2%, and pools 6.6% (Graph 2).

Ten 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, 37.7%; step run, 16.9% and runs, 15.4% (Graph 3). By percent total **length**, low gradient riffles 47.4%, and step runs 23.4%.

Twenty-eight pools were identified (Table 3). Main channel pools were most often encountered at 50%, and comprised 46.8% 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. One of the 28 pools (3.6%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 28 pool tail-outs measured, none had a value of 1; 4 had a value of 2 (14.3%); 10 had a value of 3 (35.7%); and 14 had a value of 4 (50%). 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 26.4. Flatwater habitats followed with a rating of 13.8 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 26.8, and main channel pools rated 26.1 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Johnson Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Johnson Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 34 of the 49 low gradient riffles (69.4%). Gravel was the next most frequently observed dominant substrate type, and occurred in 18.4% of the low gradient riffles (Graph 8).

Twenty percent of the survey reach lacked shade canopy. Of the 80% of the stream covered with canopy, 85% was composed of deciduous trees, and 15% was composed of coniferous trees. Graph 9 describes the canopy in Johnson 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 61.3%. The mean percent left bank vegetated was 65.6%. The dominant elements composing the structure of the stream banks consisted of 1.5% boulder, 3.1% cobble/gravel, 18.1% bare soil, 9.2% grass, 13.5% brush. Additionally, 2.3% of the banks were covered with deciduous trees, and 52.3% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on August 24, 1993 in Johnson Creek. The units were sampled by Craig Mesman and Charles Patton (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 5, a step run, approximately 230 feet from the confluence with Gates Creek.

This site had an area of 445 sq ft, and a volume of 178 cu ft. The unit yielded 10 steelhead, ranging from 49 to 107mm.

The second site was habitat units 63, 64, and 65, a step run, low gradient riffle, and lateral scour pool - boulder, located below a log debris accumulation and possible barrier, approximately 3,342 feet above the creek mouth. This site had an area of 690 sq ft and a volume of 345 cu ft. Thirteen steelhead were sampled, ranging from 51mm to 120mm. In addition seven sculpin were found.

The third site sampled was habitat units 71 through 75, a run, low gradient riffle, lateral scour pool - boulder, low gradient riffle, and mid-channel pool, located approximately 3,772 feet above the creek mouth. The reach had an area of 520 sq ft, and a volume of 188 cu ft. One steelhead measuring 131mm was sampled from this site. However, 15 sculpin were observed.

DISCUSSION

Johnson Creek has two channel types: B2 and A3. The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. The high energy and steep gradient of the A3 channel type is generally not suitable for instream enhancement structures. There are 4,903 feet of this type of channel in Daugherty Creek. 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 of August 17 and 18, 1993, ranged from 59° F to 65° F. Air temperatures ranged from 71° F to 81° F. This is a good water temperature regime for salmonids. However, 65° F, if sustained, 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 29.6% of the total **length** of this survey, riffles 49.2%, and pools 6.6%. The pools are relatively shallow with only one of the 28 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. 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 be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Twenty-four of the 28 pool tail-outs measured had embeddedness ratings of 3 or 4. None 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 Johnson 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 26.4. The shelter rating in the flatwater habitats was 13.8. 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.

Forty-three of the 49 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 80%. This is good 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) Johnson Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Johnson 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) 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) 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, 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) There are several log debris accumulations present on Johnson 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.

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 Gates Creek. Channel type is a B2.
71'	Left bank erosion 9' high x 180' long.
308'	Right bank erosion 10' high x 40' long.
3237'	Right bank erosion 35' high x 60' long, contributing fines into the channel.
3373'	Log debris accumulation (LDA), 5' high x 35' wide x 15' long, retaining fines. Possible barrier.
3748'	Right bank erosion 15' high x 25' long, contributing fines into the channel.
4903'	Channel type changes from a B2 to an A3.

5293'	LDA, 35' wide x 6' high x 15' long, retaining gravel.

5805'	Right bank erosion 20' high x 60' long, contributing fines into the channel.

6164'	LDA, 13' high x 56' high x 25' long, retaining gravel 10' high. End of survey due to the LDA's.

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