STREAM INVENTORY REPORT

JACK OF HEARTS CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Jack of Hearts 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 Jack of Hearts 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 Jack of Hearts 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

Jack of Hearts Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Jack of Hearts Creek's legal description at the confluence with South Fork Eel River is T22N R16W S29. Its location is 39°43'26" N. latitude and 123°38'58" W. longitude. Jack of Hearts Creek is a second order stream and has 3.9 miles of blue line stream, according to the USGS Lincoln Ridge 7.5 minute quadrangle. Jack of Hearts Creek drains a watershed of approximately 4 square miles. Elevations range from 1,400 feet at the mouth of the creek to 2,200 feet in the headwater areas. Grass, oak and Douglas fir forest dominate the watershed. The watershed is privately owned and is managed for timber and livestock production. Vehicle access exists from Highway 101 at Laytonville via State Highway 271 west through Branscomb to Sanctuary Road, and north approximately three miles to Jack of Hearts Creek. Access is controlled by various property owners.

METHODS

The habitat inventory conducted in Jack of Hearts 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 California Department of Fish and Game (DFG) in May, 1992.

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 Jack of Hearts 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". Jack of Hearts 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 Jack of Hearts 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 Jack of Hearts 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 Jack of Hearts 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 Jack of Hearts 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 Jack of Hearts Creek to document the fish species composition and distribution. Two sites were electrofished in Jack of Hearts 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 (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 Jack of Hearts 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 June 13, 14, 15, 16, and October 5 and 6, 1992, was conducted by Judah Sanders, Warren Mitchell, Chris Coyle and Ed Davis (contract seasonals and CCC). The total length of the stream surveyed was 15,224 feet, with an additional 199 feet of side channel.

Flows were not measured on Jack of Hearts Creek.

Jack of Hearts Creek is an B3 channel type for the entire 15,224 feet of stream reach surveyed. B3 channels are moderate gradient, well confined streams, with unstable rejuvenating banks: a source of unlimited sediment supply.

Water temperatures ranged from 49 to 62 degrees fahrenheit. Air temperatures ranged from 59 to 79 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 37.7%, flatwater types 35.2%, and pools 26.9% (Graph 1). Flatwater habitat types made up 53.2% of the total survey **length**, riffles 25.8%, and pools 20.9% (Graph 2).

Eighteen 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, 32.7%; runs, 19.8%; and step runs, 13.3% (Graph 3). By percent total **length**, step runs made up 37.4%, low gradient riffles 22.8%, and runs 18.6%.

Eighty-seven pools were identified (Table 3). Main-channel pools were most often encountered at 55.2%, and comprised 62.9% 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. Fifty-eight of the 87 pools (67%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-

outs. Of the 79 pool tail-outs measured, twelve had a value of 1 (15.2%); 25 had a value of 2 (31.7%); 13 had a value of 3 (16.4%); and 29 had a value of 4 (36.7%). 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. Pools habitat types had the highest shelter rating at 49.5. Flatwater habitats followed with a rating of 35.8 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 127.5, scour pools had a rating of 47.6, and main channel pools rated 44.4 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Jack of Hearts Creek, however, there is an almost equal proportion of undercut banks. Aquatic vegetation and white water are lacking in nearly all habitat types. Graph 7 describes the pool cover in Jack of Hearts Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 49 of the 106 low gradient riffles (46.2%). Gravel was the next most frequently observed dominant substrate type, and occurred in 39.6% of the low gradient riffles (Graph 8).

Fourteen percent of the survey reach lacked shade canopy. Of the 86% of the stream covered with canopy, 54% was composed of deciduous trees, and 46% was composed of coniferous trees. Graph 9 describes the canopy in Jack of Hearts 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 45.2%. The mean percent left bank vegetated was 49.7%. The dominant elements composing the structure of the stream banks consisted of 2.9% bedrock, 2.9% boulder, 6.5% cobble/gravel, 11.6% bare soil, 28.9% grass, 30.7% brush. Additionally, 13.3% of the banks were covered with deciduous trees, and 3.2% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on October 6, 1992 in Jack of Hearts Creek. The units were sampled by Ed Davis and Warren Mitchell (CCC and contract seasonal). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 209, a mid-channel pool, approximately 10,027 feet from the confluence with the South Fork Eel River. This site had an area of 128.3 sq ft, and a volume of 166.8 cu ft. The unit yielded 1 steelhead, and 25 coho. No measurements were taken, but they were all of young-of-year size.

The second site was habitat unit 233, a corner pool, 10,942 feet above the creek mouth. This site had an area of 690 sq ft, and a volume of 621 cu ft. Six coho were recovered, ranging in length from 73 to 86mm FL. Also, 4 small Pacific lampreys were observed. No steelhead were sampled.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Jack of Hearts Creek.

DISCUSSION

The B3 channel type is generally not suitable for fish habitat improvement structures. B3 channels are found in moderate energy, moderate gradient stream reaches. They have channels dominated by unconsolidated small cobble and gravel. Lacking cohesiveness, the banks of B3 channels are extremely susceptible to erosion and migration.

The water temperatures recorded on the survey days June 14-16 and October 5-6, 1992 ranged from 49° F to 62° F. Air temperatures ranged from 59° F to 79° F. This is a good water temperature regime for salmonids. However, 62° 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 53.2% of the total **length** of this survey, riffles 25.8%, and pools 20.9%. The pools are moderately deep with 57 of the 87 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 in locations where their

installation will not be threatened by high stream energy, cause streambank erosion, or conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravels. Any necessary modifications to them should be done with the intent of metering the gravels 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.

Forty-two of the 79 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 12 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 Jack of Hearts 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 49.5. The shelter rating in the flatwater habitats was slightly lower at 35.8. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, undercut banks, small woody debris, and bedrock ledges contribute a moderate amount. Log and root wad cover structures in the pool and flatwater habitats will 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.

Ninety-one of the 106 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 86%. This is a 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) Jack of Hearts 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. Adding more 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, like the site at 6005', should then be treated to reduce the amount of fine sediments entering the stream.

5) 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.

6) There are several log debris accumulations present on Jack of Hearts 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 South Fork Eel River. Braided and terraced mouth. Channel type is B3 for the entire survey reach.
763'	Vehicle bridge 16' high x 10' wide x 40' long. Large quantities of silt within the stream. Young-of-the-year (YOY) salmonids observed.
1,582'	Braided channel causing flow and sediment problems.
1,906'	Channel continues to be braided. YOY observed but overall numbers have decreased.
3,822'	Small tributary enters from right bank.
4,670'	Large woody debris accumulation (LDA) 5' high x 30' wide x 24' long blocking channel. Possible barrier. YOY observed.
8,161'	Private vehicle bridge crossing channel. Siltation in stream continues to be high. YOY observed.

8,628' Small tributary enters from right bank.

8,706' Logging road crosses stream forming a small stagnant pool near right bank.

8,885' Small LDA 2' high x 3' long x 6' wide retaining gravel and causing erosion on right bank. Right bank erosion contributing fines. YOY observed.

9,120' Large LDA 5' high x 35' long x 28' wide. Potential barrier. A few YOY observed.

9,708' Partial log jam retaining 4' of gravel.

9,832' Dry tributary entering from left bank.

10,012' Large LDA 5' high x 20' wide x 18' long. Possible barrier.

10,328' Downed log 5' diameter causing silt and gravel retention 3'.

10,515' Old road crossing stream and causing small woody debris accumulation.

11,126' Old flatcar bridge 6' above creek.

12,352' Old pine bridge crossing 10' above creek.

12,789' Small LDA 40' wide x 15' long x 4' high. Retaining gravel at top of unit.

12,797' LDA from unit 281 continues into current unit.

12,970' Road crossing top of unit. Culvert in road creating dammed pool.

13,093' 2' log plunge retaining gravel and fines 20' wide x 2' high x 30' long. Small spring enters from left bank.

14,421' Small LDA 15' wide x 20' long x 4' high covering part of unit.

14,936' Bridge at top of unit 11' wide x 16' long x 7' high crossing creek.

15,059' LDA at top of unit. Not a barrier.

15,224' Creek forks. No fish observed in either fork or for the last 4000' of the habitat inventory. 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