STREAM INVENTORY REPORT

Unnamed Tributary to Jacoby Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on an unnamed tributary to Jacoby Creek. 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 the unnamed tributary. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

The unnamed tributary is a tributary to Jacoby Creek, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). The unnamed tributary's legal description at the confluence with Jacoby Creek is T5N R1E S14. Its location is 40.8144 degrees north latitude and 124.0247 degrees west longitude, LLID number 1240251408144. The unnamed tributary is a first order stream and has approximately 0.75 miles of blue line stream according to the USGS Arcata South 7.5 minute quadrangle. The unnamed tributary drains a watershed of approximately 1.2 square miles. Elevations range from about 60 feet at the mouth of the creek to 760 feet in the headwater areas. Mixed hardwood and conifer forest dominates the watershed. The watershed is entirely privately owned and is mostly managed for timber production. Vehicle access exists via Jacoby Creek Road approximately three miles east from the junction of Jacoby Creek Road and Old Arcata Road.

METHODS

The habitat inventory conducted in the unnamed tributary to Jacoby Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Northwest Emergency Assistance Program (NEAP), Watershed Stewards Project/ AmeriCorps (WSP/AmeriCorps) Members, Humboldt Fish Action Council (HFAC) and Pacific Coast Fish, Wildlife, and Wetlands Restoration Association (PCFWWRA) that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). 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 the unnamed tributary 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.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). 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 five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees 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". The unnamed tributary 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. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were 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 the unnamed tributary, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

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 the unnamed tributary, 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 and recorded as a one and two respectively.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In the unnamed tributary, an estimate of the percentage of the habitat unit covered by canopy was made from the center of every unit. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

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 the unnamed tributary, the dominant composition type and the dominant vegetation type of both the right and left banks for each unit were selected from 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. In the unnamed tributary fish presence was observed from the stream banks, and one site was electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

Unnamed Tributary to Jacoby Creek

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, 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 Quattro Pro. Graphics developed for the unnamed tributary 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
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of September 6, 1996 was conducted by Hugh Holt and Jan Friedrichsen (NEAP). The total length of the stream surveyed was 2,115 feet with an additional 291 feet of side channel.

Flow was not measured on the unnamed tributary to Jacoby Creek.

The unnamed tributary is an F4 channel type for the entire 2,115 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 50 to 57 degrees Fahrenheit.

Unnamed Tributary to Jacoby Creek

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 50% flatwater units, 38% pool units, 10% dry units and 2% culvert units (Graph 1). Based on total length of Level II habitat types there were 66% flatwater units, 19% pool units, 10% dry units and 5% culvert units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 42%; and log enhanced lateral scour pools, 25% (Graph 3). Based on percent total length, runs made up 62%, log enhanced lateral scour pools 11%, and dry units 10%.

A total of 20 pools were identified (Table 3). Scour pools were most frequently encountered at 85% and comprised 76% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Ten of the 20 pools (50%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 20 pool tail-outs measured, two had a value of 2 (10%); 17 had a value of 3 (85%); and one had a value of 5 (5%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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. Flatwater habitat types had a mean shelter rating of 31 and pool habitats had a mean shelter rating of 43 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 45. Main channel pools had a mean shelter rating of 32 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in the unnamed tributary. Graph 7 describes the pool cover in the unnamed tributary.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in the one step run measured (Graph 8).

The mean percent canopy density for the stream reach surveyed was 92%. The mean percentages of deciduous and coniferous trees were 50% and 50%, respectively. Graph 9 describes the canopy in the unnamed tributary.

For the stream reach surveyed, the mean percent right bank vegetated was 89%. The mean percent left bank vegetated was 87%. The dominant elements composing the structure of the stream banks consisted of 61% sand/silt/clay, 21% cobble/gravel, 16% bedrock, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 76% of the units surveyed. Additionally, 23% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

Unnamed Tributary to Jacoby Creek

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on September 23, 1996 in the unnamed tributary to Jacoby Creek. The site was sampled by Hugh Holt (NEAP) and Kevin McKernan (WSP\AmeriCorps).

The site sampled included Habitat Units #004 and #005, approximately 200 feet from the confluence with Jacoby Creek. The site yielded one coho salmon, four steelhead/rainbow trout, and one Pacific giant salamander.

DISCUSSION

The unnamed tributary to Jacoby Creek is an F4 channel type for the entire 2,115 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank placed boulders; fair for low stage weirs, single and opposing wing deflectors, channel constrictors, and log cover; and poor for medium stage weirs and boulder clusters.

The water temperatures recorded on the survey day, September 6, 1996, ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 50 to 57 degrees Fahrenheit. This is a good water temperature range for salmonids. The unnamed tributary seems to have temperatures favorable to salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 66% of the total length of this survey and pools 19%. The pools are relatively deep, with 10 of the 20 (50%) pools having a maximum depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream 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. Installing structures that will increase or deepen pool habitat is recommended.

Eighteen of the 20 pool tail-outs measured had embeddedness ratings of 3, 4 or 5. None had an and embeddedness rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In the unnamed tributary, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low at 43. The shelter rating in the flatwater habitats was slightly lower at 31. 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, small woody debris and terrestrial vegetation 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.

Gravel was the dominant substrate in the one step run measured. No low gradient riffles were measured. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 92%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 89% and 87%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) The unnamed tributary to Jacoby Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for three to five years.

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 large woody debris. Adding high quality complexity with woody cover is desirable.

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) Suitable size spawning substrate on the unnamed tributary is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

Unnamed Tributary to Jacoby Creek

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Habitat unit #:	Comments:
0'		Start of survey at the confluence with Jacoby Creek. Channel type is F4.
74'		Four foot diameter culvert with rusted outlet with the flow partially blocked. Bottom rusted, and 2 flanges have popped.
184'		Electroshock site.
467'		Log jam.
838'		Old train trestle with lots of large woody debris across creek.
1,115'		Old train trestle with 4' diameter logs. Log jams across channel.
2,115'		End of survey. Log jam creates a 6' jump, barrier to fish.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPE KEY

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