STREAM INVENTORY REPORT

CASOOSE CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Casoose 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 Casoose 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 Casoose 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

Casoose Creek is tributary to Hulls Creek, tributary to the North Fork Eel River, located in Trinity County, California. Casoose Creek's legal description at the confluence with Hulls Creek is T25N R12W S31. Its location is 39°54'46" N. latitude and 123°14'41" W. longitude. Casoose Creek is a second order stream and has approximately 10 miles of blue line stream according to the USGS Bluenose Ridge and Black Rock Mountain 7.5 minute quadrangles. Casoose Creek drains a watershed of approximately 24.8 square miles. Elevations range from about 1,440 feet at the mouth of the creek to 5,280 feet in the headwater areas. Grass, mixed hardwood, and mixed conifer forest dominate the watershed. The watershed is primarily privately owned and is managed for timber production and rangeland. Vehicle access exists via 4 x 4 road on Buck Mountain Ranch to the ford across Hulls Creek at Horse Canyon Creek. It is approximately 0.5 miles down Hull's Creek to the confluence with Casoose Creek.

METHODS

The habitat inventory conducted in Casoose Creek follows the

methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Pacific Coast Fisheries, Wildlife, and Wetlands Restoration Association (PCFWWRA) personnel that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Casoose Creek personnel were trained in May, 1995, by Scott Downie and Ruth Goodfield. 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 Casoose 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 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 each tenth unit typed. 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". Casoose 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were measured for mean width, mean depth, and maximum depth (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). 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 Casoose 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). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited 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 fully-described 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 Casoose 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 fully-described 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 is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Casoose Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results were recorded.

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 Casoose Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-described 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. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, or 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 (*Stream Substrate Quality for Salmonids: Guidelines for Sampling, Processing, and Analysis*, Valentine, 1995).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat7.3, 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 Lotus 1,2,3. Graphics developed for Casoose 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
- 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 25 - 27, 1995, was conducted by Greg Mullins and Frank Humphreys (PCFWWRA). The total length of the stream surveyed was 5,362 feet with an additional 1,360 feet of side channel.

Flows were not measured on Casoose Creek.

Casoose Creek is a B2 channel type for the entire 5,632 feet of stream reach surveyed. B2 channels are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, stable banks, and predominantly boulder substrate.

Water temperatures ranged from 60 to 67° Fahrenheit. Air temperatures ranged from 57 to 74° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 42%,

flatwater types 31%, and pools 28% (Graph 1). Pool habitat types made up 37% of the total survey **length**, flatwater 35%, and riffles 28% (Graph 2).

Twelve Level IV habitat types were identified. These data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were high gradient riffles, 29%; step runs, 19.-%; and mid-channel pools, 18% (Graph 3). By percent total **length**, step runs made up 26%, mid-channel pools 24%, and high gradient riffles 20%.

Fifty-six pools were identified (Table 3). Main channel pools were most often encountered at 71% and comprised 78% 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. Forty-five of the 56 pools (80%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 60 pool tail-outs measured, 40 had a value of 1 (67%); 20 had a value of 2 (33%); and none of the tail-outs measured had values of 3 or 4. On this scale, a value of 1 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. Flatwater habitat types had the highest shelter rating at 49. Riffle habitats followed with a rating of 47 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 47, and scour pools rated 43 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in four of the six low gradient riffles measured (67%). Large cobble and boulder were the next most frequently observed dominant substrate types, and each occurred in 17% of the low gradient riffles (Graph 8).

The mean percent canopy for the stream reach surveyed was 86%. The mean percentages of deciduous and coniferous trees were 74% and 12%, respectively. Graph 9 describes the canopy in Casoose Creek.

For the stream reach surveyed, the mean percent right bank

vegetated was 24%. The mean percent left bank vegetated was 29%. The dominant elements composing the structure of the stream banks consisted of 21.7% bedrock, 67.9% boulder, and 10.4% cobble/gravel (Graph 10). Grass was the dominant vegetation type observed in 15% of the units surveyed. Additionally, 74.5% of the units surveyed had deciduous trees as the dominant vegetation type, and 1.0% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Ocular streambank observations were made throughout the habitat inventory. Steelhead rainbow trout fry and juveniles were observed during the survey.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Casoose Creek.

DISCUSSION

Casoose Creek is a B2 channel type for the entire 5,362 feet of stream surveyed. The suitability of B2 channel types for fish habitat improvement structures is excellent for low and medium stage plunge weirs, single and opposing wing deflectors, and bank cover.

The water temperatures recorded on the survey days September 25 - 27, 1995, ranged from 60 to 67° Fahrenheit. Air temperatures ranged from 57 to 74° Fahrenheit. This is an acceptable water temperature range 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 Casoose 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 would need to be conducted.

Flatwater habitat types comprised 31% of the total **length** of this survey, riffles 42%, and pools 19%. The pools are relatively shallow, with only 22 of the 56 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.

None of the 60 pool tail-outs measured had embeddedness ratings of 3 or 4. Forty 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.

The mean shelter rating for pools was low with a rating of 45. The shelter rating in the flatwater habitats was slightly better at 45. 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, bedrock ledges 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.

Four of the six low gradient riffles measured 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 relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

The percentage of right and left bank covered with vegetation was moderate at 24% and 29%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Casoose Creek should be managed as an anadromous, natural production stream.

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.

PROBLEM SITES AND LANDMARKS

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

0'	Begin survey at confluence with Hulls Creek. Channel type is a B2 for entire length of survey.
760'	Large spring enters from right bank (RB).
1597'	Numerous steelhead observed, ranging in size from 2 inches to 12 inches.
4887'	Twenty-two foot waterfall on side-channel. Main channel appears passable for fish, and steelhead juveniles observed above unit.
4912'	Crawdad observed, as well as steelhead juveniles.
5362'	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