STREAM INVENTORY REPORT

Horse Canyon Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Horse Canyon 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 Horse Canyon Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Horse Canyon 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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Horse Canyon Creek is tributary to Hulls Creek, tributary to the North Fork Eel River, tributary to the Eel River, located in Mendocino and Trinity Counties, California. Horse Canyon Creek's legal description at the confluence with North Fork Eel River is T05S R08E S33. Its location is 38°58'32" North latitude and 123°14'44" West longitude. Horse Canyon Creek is a second order stream and has approximately 3.6 miles of blue line stream according to the USGS Bluenose Ridge 7.5 minute quadrangle. Horse Canyon Creek drains a watershed of approximately 9.5 square miles. Summer base flow is approximately 0.5 cubic feet per second (cfs) at the mouth, but over 10 cfs is not unusual during winter storms. Elevations range from about 1,430 feet at the mouth of the creek to 3,500 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is privately owned and is managed for timber production and rangeland. Vehicle access exists via Mina Road to Pine Flat and then along the county road to the mouth of Hulls Creek. Contact the private landowners to secure permission to enter and for more specific directions to the mouth of Horse Canyon Creek.

METHODS

The habitat inventory conducted in Horse Canyon Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The Pacific Coast

Horse Canyon Creek

Fisheries, Wildlife, and Wetlands Restoration association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Horse Canyon Creek personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Horse Canyon 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.

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". Horse Canyon 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 sampled for all features on the sampling form (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 Horse Canyon 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" (value 5) 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 Horse Canyon 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 density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Horse Canyon 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. In addition, canopy area 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 Horse Canyon 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. In Horse Canyon Creek fish presence was observed from the stream banks. This sampling technique is discussed in the *California Salmonid Stream Habitat Restoration Manual*.

SUBSTRATE SAMPLING

Horse Canyon Creek

Gravel sampling is conducted using a 9" diameter standard McNeil gravel sampler. Sample sites are identified numerically from the most upstream site in the stream. Gravel samples are analyzed to determine respective percent volumes using five sieve sizes: 25.4, 12.5, 4.7, 2.37, and 0.85 mm (Valentine, 1995).

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 Lotus 1,2,3. Graphics developed for Horse Canyon 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 August 28, 1996, was conducted by Greg Mullins and Frank Humphrey (PCFWWRA). The total length of the stream surveyed was 4,231 feet with an additional 38 feet of side channel.

Flow was estimated to be 0.5 cfs during the survey period.

Horse Canyon Creek is a B4 channel type for the first 3,499 feet

of stream reach surveyed and an A4 for the remaining 732 of surveyed stream. B4 channels are moderately entrenched, Moderate gradient, riffle/pool channels with high width/depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading streams with high energy/debris transport associated with depositional soils, and have gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 60 to 65 degrees Fahrenheit. Air temperatures ranged from 59 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 36% flatwater units, 33% riffle units, 23% pool units, and 8% dry units (Graph 1). Based on total **length** of Level II habitat types there were 34% flatwater units, 29% dry units, 21% riffle units, and 16% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 27%; pocket water, 17%; and mid-channel pools, 13% (Graph 3). Based on percent total **length**, dry units made up 29%, low gradient riffles 18%, and pocket water 16%.

A total of twenty-four pools were identified (Table 3). Main channel pools were most frequently encountered at 63% and comprised 54% 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. Nine of the 24 pools (38%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 24 pool tail-outs measured, 10 had a value of 1 (42%); 11 had a value of 2 (46%); 3 had a value of 3 (12%); and none had a value of 4 (0%) (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 79, and riffle habitats had a mean shelter rating of 78 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 83. Main channel pools had a mean shelter rating of 68 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Horse Canyon Creek and are extensive. Large and small woody debris are lacking in nearly all

habitat types. Graph 7 describes the pool cover in Horse Canyon Creek.

Table 6 summarizes the dominant substrate by habitat type. Boulder was the dominant substrate observed in all of the low gradient riffles measured (Graph 8).

The mean percent canopy density for the stream reach surveyed was 78%. The mean percentages of deciduous and coniferous trees were 98% and 2%, respectively. Graph 9 describes the canopy in Horse Canyon Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 18%. The mean percent left bank vegetated was also 18%. The dominant elements composing the structure of the stream banks consisted of 27.1% bedrock, 68.8% boulder, 4.2% cobble/gravel, and 0% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 19% of the units surveyed. Additionally, 58.3% of the units surveyed had deciduous trees as the dominant vegetation type, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Young-of-the-year (YOY) and juvenile (1+) steelhead rainbow trout were observed from the streambanks on Horse Canyon Creek during the survey of August 28, 1996.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Horse Canyon Creek.

DISCUSSION

Horse Canyon Creek is a B4 channel type for the first 3,499 feet of stream surveyed and an A4 for the remaining 734 feet. The suitability of B4 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing-deflectors, and log cover; and good for medium-stage plunge weirs. The suitability of A4 channel types for fish habitat improvement structures is good for bank-placed boulders; fair for low-stage weirs, opposing wing-deflectors, and log cover; and poor for medium-stage weirs, boulder clusters, single wing-deflectors, and log cover.

Horse Canyon Creek

The water temperatures recorded on the survey days August 28, 1996, ranged from 60 to 65 degrees Fahrenheit. Air temperatures ranged from 59 to 77 degrees Fahrenheit. This is a fair water temperature range 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 would need to be conducted.

Flatwater habitat types comprised 34% of the total **length** of this survey, riffles 21%, and pools 16%. The pools are relatively shallow, with only nine of the 24 (38%) pools having a maximum depth greater than 2 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 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.

Three of the 24 pool tail-outs measured had embeddedness ratings of 3 or 4. Ten had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

The mean shelter rating for pools was low with a rating of 76. The shelter rating in the flatwater habitats was slightly better at 78. 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.

All of the low gradient riffles had boulders as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy density for the stream was 78%. This is a relatively high percentage of canopy. In general, re-

vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 18% and 18%, 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) Horse Canyon 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. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

4) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Acceptable water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

5) Shade canopy in the reaches above the end of this survey should be inventoried to determine if the relatively warm water temperatures are being caused by low canopy levels. If that is the case, tree planting should be considered.

PROBLEM SITES AND LANDMARKS

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

0' Begin survey at confluence with Hulls Creek. Channel type is a B4 for the first 3499' of stream surveyed.

739' Young-of-the-year (YOY) salmonids observed by stream

surveyors.

3346'Minor slope failure on the left bank (LB). Appears to be re-vegetating and stabilized.

3500'Channel type changes to an A4 for the remaining 732' of stream surveyed.

4231'Bedrock waterfall, approximately 30' high, marks the end of anadromy. Surveyors did observe native rainbow trout above the falls. End of survey.

References

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

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, California.

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