STREAM INVENTORY REPORT

Hoaglin Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Hoaglin 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 Hoaglin 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 Hoaglin 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

Hoaglin Creek is tributary to the Salt Creek, tributary to the North Fork Eel River, located in Trinity County, California. Hoaglin Creek's legal description at the confluence with Salt Creek is T04S R07E S23. Its location is 40°06'15" North latitude and 123°21'26" West longitude. Hoaglin Creek is a first order stream and has approximately 3.6 miles of intermittent stream according to the USGS Long Ridge and Lake Mountain 7.5 minute quadrangles. Hoaglin Creek drains a watershed of approximately 2.9 square miles. Summer base flow is approximately 0.1 cubic feet per second (cfs) at the mouth, but over ten cfs is not unusual during winter storms. Elevations range from about 2,080 feet at the mouth of the creek to 2,880 feet in the headwater areas. Mixed conifer forest dominates the watershed. Approximately half of the watershed is privately owned and half is national forest. The watershed is managed for timber production and rangeland. Vehicle access exists via Alderpoint Road. From Alderpoint Road, follow Route 12 to Zenia and thence through Kettenpom to Hoaglin Valley. Check with personnel at the Heller Hiwater Ranch for access permission and directions.

METHODS

The habitat inventory conducted in Hoaglin Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Hoaglin Creek personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield.

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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 Hoaglin 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. Additionally, a recording thermograph was deployed in Hoaglin Creek from July 22, 1996 to September 5, 1996 to record temperatures on a 24 hour basis during warm summer months.

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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". Hoaglin 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 Hoaglin 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 Hoaglin 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.

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 Hoaglin 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, 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 Hoaglin 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 Hoaglin Creek fish presence was observed from the stream banks. This sampling technique is 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 0.85 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 Hoaglin 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 July 17, 1996, was conducted by Dale Melton and Paul Ouradnik (WSP/AmeriCorps). The total length of the stream surveyed was 3,303 feet with an additional 69 feet of side channel.

Flows were estimated to be 0.1 cubic feet per second (cfs) on July 17, 1996, near the mouth of Hoaglin Creek.

Hoaglin Creek is an B1 channel type for the entire 3,303 feet of stream reach surveyed. B1 channels are entrenched, moderately steep, riffle dominated channels, with infrequently spaced pools, stable banks and bedrock-dominant substrates.

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Water temperatures taken during the survey period ranged from 64° to 84° F. Air temperatures ranged from 69° to 74° F. Water temperatures taken with a recording thermograph deployed from July 22 to August 5, 1996, ranged from 51° to 85° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 36% riffle units, 36% flatwater units, and 27% pool units (Graph 1). Based on total **length** of Level II habitat types there were 45% flatwater units, 29% riffles units, and 26% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were high gradient riffles, 29%; step runs, 25%; and mid-channel pools, 23% (Graph 3). Based on percent total **length**, step runs made up 37%, high gradient riffles 22%, and mid-channel pools 21%.

A total of thirty pools were identified (Table 3). Main pools were most frequently encountered at 97% and comprised 97% 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. Seventeen of the 30 pools (57%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the thirty pool tail-outs measured, zero had a value of 1 (0%); zero had a value of 2 (0%); one had a value of 3 (3%); zero had a value of 4 (0%) and 29 had a value of 5 (97%) (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. Pool habitat types had a mean shelter rating of 32, and flatwater habitats had a mean shelter rating of 16 (Table 1). Of the pool types, the main pools had the highest mean shelter rating at 36. Scour pools had a mean shelter rating of 10 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in all of the low gradient riffles measured (100%) (Graph 8).

The mean percent canopy density for the stream reach surveyed was 30%. The mean percentages of deciduous and coniferous trees were 61% and 39%, respectively. Graph 9

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describes the canopy in Hoaglin Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 62.6%. The mean percent left bank vegetated was 48.1%. The dominant elements composing the structure of the stream banks consisted of 50% bedrock, 29% cobble/gravel, 19% boulder and 2% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 28.57% of the units surveyed. Additionally, 40.48% of the units surveyed had deciduous trees as the dominant vegetation type, including down trees, logs, and root wads (Graph 11).

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Hoaglin Creek.

DISCUSSION

The water temperatures recorded on the survey day July 17, 1996, ranged from 64 to 84 degrees Fahrenheit. Air temperatures ranged from 69 to 74 degrees Fahrenheit. Further samples from a recording thermograph deployed during the summer of 1996 measured water temperatures ranged from 51° to 85° Fahrenheit. This is a poor water temperature range for salmonids. Water temperatures above 67° F, if sustained, approach the threshold stress level for salmonids. To make any further conclusions, temperatures should be monitored throughout the warm summer months, and more extensive biological samples need to be conducted. This stream has a lake at its headwaters and it may influence the diel temperature regime. Placement of multiple thermographs during summer might help explain the erratic temperatures recorded.

Flatwater habitat types comprised 45% of the total **length** of this survey, riffles 29%, and pools 26%. The pools are relatively deep, with only 17 of the 30 (57%) 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.

One of the 30 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 to indicate good quality spawning substrate for salmon and steelhead. In Hoaglin Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

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The mean shelter rating for pools was low with a rating of 32. The shelter rating in the flatwater habitats was slightly lower at 16. A pool shelter rating of approximately 100 is desirable. The relatively large amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, 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.

All of the low gradient riffles measured had small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 30%. This is a relatively low 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 moderate at 62% and 48%, 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)Hoaglin Creek should be managed as an anadromous, natural production stream.

2)The water temperature data available suggest that maximum temperatures are above 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 at several sites for 3 to 5 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 boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

5)Increase the canopy on Hoaglin Creek by planting willow, alder, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

6)Spawning gravel sites on Hoaglin Creek are limited to relatively few reaches. Crowding and/or superimposition of redds is likely in years of good escapement. Any instream projects should be designed with the objective in mind to expand suitable sites to trap and sort spawning gravel in order to expand redd site opportunity in the stream.

7)Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Fish passage should be monitored and improved where possible.

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 Salt Creek. Channel type is a B1 for the entire 3303' of stream surveyed.

502'Twenty young-of-the-year (YOY) and two 1+ salmonids observed.

2440'Dry tributary enters from left bank.

2920'Seven YOY salmonids observed.

2979'Bedrock sheet substrate into plunge pool appears to be fish barrier.

3094'Dry tributary enters from right bank.

3303'No fish seen since bedrock chute. 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.

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