STREAM INVENTORY REPORT

Brin Canyon

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Brin Canyon. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Brin Canyon. There is no known record of adult spawning surveys having been conducted on Brin Canyon.

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

Brin Canyon is a tributary to Horse Canyon Creek, a tributary to Hulls Creek, a tributary to the North Fork Eel River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Trinity County, California. Brin Canyon's legal description at the confluence with Horse Canyon Creek is T25N R12W S31. Its location is 39.9742 degrees north latitude and 123.2414 degrees west longitude. Brin Canyon is a first order stream and has approximately 2.2 miles of blue line stream according to the USGS Bluenose Ridge 7.5 minute quadrangle. Brin Canyon drains a watershed of approximately 3.7 square miles. Summer base flow is approximately 0.5 cubic feet per second (cfs) at the mouth, but over ten cfs is not unusual during winter storms. Elevations range from about 1,480 feet at the mouth of the creek to 3,800 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. Turn right on the dirt road at Brown's, approximately one mile east of the Trinity County line. Follow the dirt road across Hulls Creek up Horse Canyon to the mouth of Brin Canyon.

METHODS

The habitat inventory conducted in Brin Canyon follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The Pacific Coast 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). Brin Canyon personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. This inventory was conducted by a two-person team.

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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 Brin Canyon 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:

Water and air temperatures are measured at every tenth habitat unit. The time of the measurement is also recorded. 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". Brin Canyon 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 Brin Canyon, 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 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 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 Brin Canyon, 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 (1), and sub-dominant (2) substrate elements were ocularly estimated from a list of seven size classes.

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 Brin Canyon, 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 Brin Canyon, 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.

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, DFG. The 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 Brin Canyon 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

The habitat inventory of August 27, 1996 was conducted by Greg Mullins and Frank Humphrey (PCFWWRA). The total length of the stream surveyed was 2,452 feet with no additional feet of side channel.

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

Brin Canyon is a B2 channel type for the entire 2,452 feet of stream reach surveyed. B2 channels are moderately entrenched, moderate gradient, riffle-dominated channels with stable banks and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 60 to 73 degrees Fahrenheit. Air temperatures ranged from 73 to 84 degrees Fahrenheit.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 32% dry units, 27% riffle units, 21% flatwater units, and 19% pool units (Graph 1). Based on total length of Level II habitat types there were 69% dry units, 15% riffle units, 8% flatwater units, and 8% pool units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were dry units, 32%; low gradient riffles, 26%; and runs, 16% (Graph 3). Based on percent total length, dry units made up 69%, low gradient riffles 14%, and runs 5%.

A total of twelve pools were identified (Table 3). Scour pools were most frequently encountered at 58% and comprised 61% 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. Five of the 12 pools (42%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 12 pool tail-outs measured, one had a value of 1 (8%); three had a value of 2 (25%); eight had a value of 3 (67%); (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 90, and flatwater habitats had a mean shelter rating of 53 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 95. Main channel pools had a mean shelter rating of 75 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Boulders were the dominant substrate observed in half of the low gradient riffles measured (50%). Bedrock was also observed dominant substrate type and occurred in 50% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 82%. The mean percentages of deciduous and coniferous trees were 100% and 0%, respectively (Graph 9).

For the stream reach surveyed, the mean percent right bank vegetated was 18%. The mean percent left bank vegetated was 14%. The dominant elements composing the structure of the stream banks consisted of 56% bedrock and 44% boulders (Graph 10). Grass was the dominant vegetation type observed in 44% of the units surveyed. Additionally, 44% of the units surveyed had deciduous trees as the dominant vegetation type, including down trees, logs, and root wads (Graph 11).

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DISCUSSION

Brin Canyon is a B2 channel type for the entire 2,452 feet of stream surveyed. The suitability of B2 channel types for fish habitat improvement structures is described as excellent for low- and medium-stage plunge weirs, single and opposing wing-deflectors, and bank cover.

The water temperatures recorded on the survey day August 27, 1996 ranged from 60 to 73 degrees Fahrenheit. Air temperatures ranged from 73 to 84 degrees Fahrenheit. This is a marginal water temperature range for salmonids. Sixty-eight degrees Fahrenheit, if sustained, is near the threshold stress level for 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 8% of the total length of this survey, riffles 15%, pools 8%, and dry units 69%. The pools are relatively shallow, with five of the 12 (42%) 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 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.

Eight of the 12 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one had an 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 Brin Canyon, 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 high with a rating of 90. The shelter rating in the flatwater habitats was slightly lower at 53. 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, whitewater contributes 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

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

The mean percent canopy density for the stream was 82%. 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 14%, 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) Brin Canyon should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within/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 for 3 to 5 years.

3) Increase the canopy on Brin Canyon by planting willow, alder, and Douglas fir along the stream where shade canopy is at unacceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4) 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.

5) 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.

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.

Position (ft):	Comments:
0'	Start of survey at confluence with Horse Canyon Creek. Channel type is a B2 for the entire 2452' of stream surveyed.
413'	Young-of-the-year (YOY) observed from streambanks by surveyors.
608'	7’ high plunge.
932'	YOY salmonids and mature rainbow trout (12") observed in pool.
2452'	Waterfall, about 40' high, in stream channel. End of anadromy. 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.

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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