STREAM INVENTORY REPORT

Unnamed Tributary to North Fork Bear Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear 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

Unnamed Tributary to North Fork Bear Creek is tributary to North Fork Bear Creek, tributary to Bear Creek, tributary to the Mattole River, located in Humboldt County, California. Unnamed Tributary to North Fork Bear Creek's legal description at the confluence with North Fork Bear Creek is T04S R01E S32. Its location is 40°09'03" North latitude and 124°05'34" West longitude. Unnamed Tributary to North Fork Bear Creek is a first order stream and has approximately 1.7 miles of blue line stream according to the USGS Honeydew 7.5 minute quadrangle. Unnamed Tributary to North Fork Bear

Creek drains a watershed of approximately 1.2 square miles. Summer base flow is approximately 0.2 cubic feet per second (cfs) at the mouth, but over 10 cfs is not unusual during winter storms. Elevations range from about 1,000 feet at the mouth of the creek to 2,700 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is owned entirely by the Bureau of Land Management and is managed for diverse recreation. Vehicle access exists via Briceland Road west from the town of Redway and then north and east on Horse Mountain Road approximately 7.2 miles to the mouth of Unnamed Tributary to North Fork Bear Creek.

METHODS

The habitat inventory conducted in Unnamed Tributary to North Fork Bear Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Pacific Coast Fisheries, Wetlands, and Wildlife Restoration Association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear 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". Unnamed Tributary to North Fork Bear 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 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 Unnamed Tributary to North Fork Bear 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

Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear 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 Unnamed Tributary to North Fork Bear Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length

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- 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 23, 24, and 25, 1996, was conducted by Rick Abbey and Mike Mezlin (PCFWWRA). The total length of the stream surveyed was 9,252 feet with an additional 677 feet of side channel.

Flows were not measured on Unnamed Tributary to North Fork Bear Creek.

Unnamed Tributary to North Fork Bear Creek is a B2 channel type for the first 7,651 feet of stream reach surveyed, and an A2 channel type for the remaining 1,601 feet of stream surveyed. B2 channels are moderately entrenched, moderate gradient, riffle dominated channels with stable banks and boulder-dominant substrates. A2 channel types are steep, narrow, cascading , step-pool streams with high energy/debris transport associated with depositional soils, and boulder-dominated substrates.

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Water temperatures taken during the survey period ranged from 59 to 64 degrees Fahrenheit. Air temperatures ranged from 63 to 69 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 43% flatwater units, 40% pool units, 16% riffle units, and 1% culvert units (Graph 1). Based on total **length** of Level II habitat types there were 59% flatwater units, 35% pool units, 6% riffle units, and 1% culvert units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 25%; step-pools, 18%; and high gradient riffles, 10% (Graph 3). Based on percent total **length**, step runs made up 45%, step-pools 24%, and runs 9%.

A total of fifty-seven pools were identified (Table 3). Main channel pools were most frequently encountered at 54% and comprised 74% 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. Twenty-nine of the 57 pools (51%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 55 pool tail-outs measured, 13 had a value of 1 (24%); 34 had a value of 2 (61%); six had a value of 3 (4%); none had a value of 4 (0%); and two had a value of 5 (4%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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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. Riffle habitat types had a mean shelter rating of 53, and flatwater habitats had a mean shelter rating of 26 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 29. Backwater pools had a mean shelter rating of 17 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel 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 58%. The mean percentages of deciduous and coniferous trees were 52% and 48%, respectively. Graph 9 describes the canopy in Unnamed Tributary to North Fork Bear Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 54%. The mean percent left bank vegetated was 56%. The dominant elements composing the structure of the stream banks consisted of 26% bedrock, 16% boulder, 11% cobble/gravel, and 47% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 62% of the units surveyed. Additionally, 13% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Young-of-the-year (YOY) salmonids were observed from the streambanks during the 1996 stream surveys.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Unnamed Tributary to North Fork Bear Creek.

DISCUSSION

Unnamed Tributary to North Fork Bear Creek is a B2 channel type for the first 7,651 feet of stream surveyed and an A2 for the remaining 1,601 feet. 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. A2 channel types are generally not suited for fish habitat improvement structures.

The water temperatures recorded on the survey days July 23 - 25, 1996, ranged from 59 to 64 degrees Fahrenheit. Air temperatures ranged from 63 to 79 degrees Fahrenheit. This is a good water temperature range for salmonids. Unnamed Tributary to North Fork Bear 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.

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Flatwater habitat types comprised 59% of the total length of this survey, riffles 6%, pools 35%, and culverts 1%. The pools are relatively deep, with 29 of the 57 (51%) 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.

Six of the 55 pool tail-outs measured had embeddedness ratings of 3 or 4. Thirteen 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 22. The shelter rating in the flatwater habitats was slightly better at 26. 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, whitewater 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 gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

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The mean percent canopy density for the stream was 58%. This is a relatively moderate 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 54% and 56%, 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) Unnamed Tributary to North Fork Bear Creek should be managed as an anadromous, natural production stream.

2) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good 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.

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) 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) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 5324', should then be treated to reduce the amount of fine sediments entering the stream.

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 North Fork Bear Creek. Channel type is a B2 for the first 7651' of stream surveyed.

168' Small tributary enters from the left bank (LB).

3491' Several 1+ steelhead rainbow trout observed in unit.

4989' Dry tributary on LB.

5324' Failure on right bank (RB); 50' long x 12' high. Contributing sediment directly to the stream.

5438' Dry tributary on LB.

5603' Tributary enters from RB.

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5934' Dry tributary on RB.

6769' King Range Road crosses creek; 10' diameter culvert look in good shape.

6875' Young-of-the-year (YOY) salmonids observed in unit.

7651' Channel type changes from a B2 to an A2 for the remaining 1601' of stream surveyed.

8227' Large debris accumulation (LDA) in stream channel; causing a small failure on RB. Not a fish barrier.

9252' Stream gradient steepens to greater than 40%. Cascade is 50' long. 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.

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nia 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.

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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