

## STREAM INVENTORY REPORT

### **Bear Trap Creek**

#### INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Bear Trap 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 Bear Trap 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 Bear Trap Creek.

The objective of this report is to document the current habitat conditions, and recommend options for potential improvements 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

Bear Trap Creek is tributary to Honeydew Creek, tributary to the Mattole River, located in Humboldt County, California. Bear Trap Creek's legal description at the confluence with Honeydew Creek is T03S R01E S06. Its location is 40°15'36" North latitude and 124°06'03" West longitude. Bear Trap Creek is a first order stream and has approximately 2.7 miles of blue line stream according to the USGS Honeydew and Shubrick Peak 7.5 minute quadrangles. Bear Trap Creek drains a watershed of approximately 1.7 square miles. Summer 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 320 feet at the mouth of the creek to 1,100 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is subdivided for rural residence. Vehicle access exists via the Shelter Cove Road from Redway to the Honeydew Road on Wilder Ridge. Continue to the BLM Honeydew Creek Campgrounds. The confluence of Beartrap Creek with Honeydew Creek is located approximately 200 feet downstream from the campgrounds.

#### METHODS

The habitat inventory conducted in Bear Trap Creek follows the

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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). Bear Trap 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 Bear Trap 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

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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". Bear Trap 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 Bear Trap 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

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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 Bear Trap 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Bear Trap 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 Bear Trap 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

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Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Bear Trap Creek fish presence was observed from the stream banks, and one site was electrofished using one Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

### SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter McNeil gravel sampler. Sample sites are numbered from the most upstream sample 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 Bear Trap 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

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### HABITAT INVENTORY RESULTS

\* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT \*

The habitat inventory of August 5 and 6, 1996, was conducted by Dave Smith and Ray Bevitori (PCFWWRA). The total length of the stream surveyed was 9,883 feet with an additional 708 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.1 cfs on September 17, 1996.

Bear Trap Creek is a B2 channel type for the entire 9,883 feet of stream reach surveyed. B2 channels are moderately entrenched, meandering, riffle/pool channels on moderate gradients with stable banks and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 72° F. Air temperatures ranged from 60 to 76° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 45% riffle units, 34% flatwater units, and 21% pool units (Graph 1).

Based on total **length** of Level II habitat types there were 44% riffle units, 35% flatwater units, 15% pool units, and 6% dry units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 44%; runs, 24%; and mid-channel pools, 18% (Graph 3).

Based on percent total **length**, low gradient riffles made up 43%, runs 20%, and step-runs 15%.

A total of forty-four pools were identified (Table 3). Main channel pools were most frequently encountered at 84% and comprised 82% 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. Thirty-two of the 44 pools (72%) had a depth of 2' or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 44 pool tail-outs measured, none had a value of 1; 3 had a value of 2 (7%); 36 had a value of 3 (82%); none had a value of 4; and 5 had a value of 5, or not suitable for spawning (11%) (Graph 6). On this scale, a value of 1 indicates the highest

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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 71, and flatwater habitats had a mean shelter rating of 34 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 114. Main channel pools had a mean shelter rating of 64 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Bear Trap Creek and are extensive. Root mass and terrestrial vegetation are lacking in nearly all habitat types (Graph 7).

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in two of the three low gradient riffles measured (67%). Gravel was the next most frequently observed dominant substrate type and occurred in 33% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 66%. The mean percentages of deciduous and coniferous trees were 81% and 19%, respectively (Graph 9).

For the stream reach surveyed, the mean percent right bank vegetated was 71%. The mean percent left bank vegetated was 69%.

The dominant elements composing the structure of the stream banks consisted of 17.0% bedrock, 15.2% boulder, 25.9% cobble/gravel, and 42.0% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 33% of measured units. Additionally, 51.8% of the units surveyed had deciduous trees as the dominant vegetation type, and 7.1% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

One site was electrofished on September 17, 1996, in Bear Trap Creek. The site was sampled by Ruth Goodfield (DFG) and Dale Melton (WSP/AmeriCorps).

The site sampled included habitat units 009-011, a riffle/run/pool sequence, approximately 982 feet from the confluence with the Honeydew Creek. This site had an area of 560 sq ft and a volume of 392 cu ft. The site yielded thirty young-

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of-the-year (YOY) steelhead rainbow trout, and four stickleback.

### GRAVEL SAMPLING RESULTS

No gravel samples were taken on Bear Trap Creek.

### DISCUSSION

Bear Trap Creek is a B2 channel type for the entire 9,883 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 July 7 through August 6, 1996, ranged from 56 to 72 degrees Fahrenheit. Air temperatures ranged from 60 to 76 degrees Fahrenheit. This is a fair water temperature range for salmonids. However, 72° 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 35% of the total **length** of this survey, riffles 44%, and pools 15%. The pools are relatively deep, with 33 of the 44 pools (75%) 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. Structures that will increase or deepen pool habitat are recommended where they will not be subject to high stream energy.

Thirty-six of the 44 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 Bear Trap Creek, 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 low with a rating of 71.

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The shelter rating in the flatwater habitats was slightly lower at 34. 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, undercut banks 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 three 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 density for the stream was 66%. This is a relatively moderate level 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 71% and 69%, 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) Bear Trap 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

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some areas the material is locally available.

- 4) The limited water temperature data available suggest that maximum temperatures are in the high 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.
- 5) Increase the canopy on Bear Trap Creek by planting willow, alder, redwood, 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 flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

### 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 the Mattole River. Channel type is a B2 for entire length of survey. |
| 638'  | Steel and concrete bridge crosses stream channel.  |
| 892'  | Bioinventory site #1.  |
| 2927' | Slope failure on left bank (LB) - approximately 200' long x 40' high.                                |
| 3217' | Slope failure on LB - approximately 100' long x 100' high.   |
| 3266' | Dry tributary on LB.   |
| 3934' | Slope failure on LB - approximately 125' long x 100' high.   |
| 4537' | Twelve-foot high waterfall. Possible barrier for migrating salmonids.                                |
| 8711' | Tributary enters from right bank (RB). Temperature is  |

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59°F.

- 9293' Left bank is failing - contributing fines to stream channel. Nine-foot waterfall; possible fish barrier.
- 9583' Slope failures on both banks - contributing fines to stream channel.
- 9883' Stream is dry. No fish observed by surveyors since 9293'. 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
<b>RIFFLE</b>		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
<b>CASCADE</b>		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
<b>FLATWATER</b>		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
<b>MAIN CHANNEL POOLS</b>		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
<b>SCOUR POOLS</b>		
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
<b>BACKWATER POOLS</b>		
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