

STREAM INVENTORY REPORT

Unnamed Tributary #1, Steelhead Creek (Eel River), 1996

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Unnamed Tributary #1 to Steelhead 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 #1 to Steelhead 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 #1 to Steelhead 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 #1 to Steelhead Creek is tributary to Steelhead Creek, tributary to the Eel River, located in Humboldt County, California. Unnamed Tributary #1 to Steelhead Creek's legal description at the confluence with Steelhead Creek is T03S R04E. Its location is 40°09'31" North latitude and 123° 40'18" West longitude. Unnamed Tributary #1 to Steelhead Creek is a first order stream and has approximately 1.5 miles of blue line stream according to the USGS Fort Seward and Harris 7.5 minute quadrangles. The stream drains a watershed of approximately 1.6 square miles. Summer base flow is approximately 0.2 cubic feet per second (cfs) at the mouth, but over five cfs is not unusual during winter storms. Elevations range from about 850 feet at the mouth of the creek to 3,400 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rural residence. Vehicle access exists via Steelhead Road from the town of Alderpoint. Contact the landowner for permission to enter and for more explicit directions to the mouth of Unnamed Tributary #1 to Steelhead Creek.

METHODS

The habitat inventory conducted in Unnamed Tributary #1 to Steelhead Creek 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). Unnamed Tributary #1 to Steelhead 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 #1 to Steelhead 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 #1 to Steelhead 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 Unnamed Tributary #1 to Steelhead 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 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 #1 to Steelhead 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 #1 to Steelhead 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 #1 to Steelhead 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 #1 to Steelhead 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 #1 to Steelhead 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 October 23, 1996, was conducted by Dale Melton (WSP/AmeriCorps) and Frank Humphrey (PCFWWRA). The total length of the stream surveyed was 2,096 feet with an additional 78 feet of side channel. Flow was estimated to be 0.2 cfs during the survey period.

Unnamed Tributary #1 to Steelhead Creek is an A2 channel type for the entire 2,096 feet of stream reach surveyed. A2 channels are steep, narrow, cascading, step-pool streams with high energy transport associated with depositional soils. A2 channels have boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 54 to 63 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 37% riffle units, 37% pool units, and 25% flatwater units (Graph 1). Based on total **length** of Level II habitat types there were 42% riffle units, 33% flatwater units, and 24% pool units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 25%; step runs, 19%; and low gradient riffles, 15% (Graph 3). Based on percent total **length**, step runs made up 28%, cascades 20%, and low gradient riffles 14%.

A total of twenty-five pools were identified (Table 3). Main channel pools were most frequently encountered at 88% and comprised 91% 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. Ten of the 25 pools (40%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 25 pool tail-outs measured, 4 had a value of 1 (16%); 12 had a value of 2 (48%); 2 had a value of 3 (8%); none had a value of 4 (0%); and 7 had a value of 5 (28%) (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 65, and flatwater habitats had a mean shelter rating of 52 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 75. Main channel pools had a mean shelter rating of 63 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Unnamed Tributary #1 to Steelhead 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 #1 to Steelhead Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel 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 84%. The mean percentages of deciduous and coniferous trees were 99% and 1%, respectively (Graph 9).

For the stream reach surveyed, the mean percent right bank vegetated was 54%. The mean percent left bank vegetated was 60%. The dominant elements composing the structure of the stream banks consisted of 3.1% bedrock, 78.1% boulder, 18.8% cobble/gravel, and 0% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 22% of the units surveyed. Additionally, 71.9% 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 during the stream survey.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Unnamed Tributary #1 to Steelhead Creek.

DISCUSSION

Unnamed Tributary #1 to Steelhead Creek is an A2 channel type for the entire 2,096 feet of stream surveyed. A2 channel types are generally not considered suitable for fish habitat improvement structures because they are high energy streams with poor gravel retention capabilities.

The water temperatures recorded on the survey day October 23, 1996, ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 54 to 63 degrees Fahrenheit. This is an acceptable

water temperature range for salmonids. Unnamed Tributary #1 to Steelhead 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. Flatwater habitat types comprised 33% of the total **length** of this survey, riffles 42%, and pools 24%. The pools are relatively shallow, with only 10 of the 25 (40%) 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.

Two of the 25 pool tail-outs measured had embeddedness ratings of 3 or 4. Four 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 65. The shelter rating in the flatwater habitats was slightly lower at 52. 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 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 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.

The mean percent canopy density for the stream was 84%. 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 moderate at 54% and 60%, 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 #1 to Steelhead 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) The limited water temperature data available suggest that maximum temperatures are within 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.

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 Steelhead Creek. Channel type is an A2 for the entire 2096' of stream surveyed. |
| 308' | Young-of-the-year (YOY) steelhead rainbow trout were observed from the streambanks by surveyors. |
| 1576' | Vertical drop in stream elevation of 5-feet. Possible barrier for migrating salmonids. |
| 1650' | YOY salmonids observed from streambanks. |
| 1878' | Small tributary enters from left bank (LB). Temperature is 54°F. |
| 2002' | Spring on LB. |

2096' Stream gradient has dramatically increased. A series of 10-20' high waterfalls marks a barrier for migrating salmonids. 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.

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