STREAM INVENTORY REPORT

Unnamed Tributary, Fourmile Creek, Mattole River

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Unnamed Tributary of Fourmile 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 of Fourmile Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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 of Fourmile Creek tributary to the Mattole River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Unnamed Tributary of Fourmile Creek's legal description at the confluence with Mattole River is T03S R01E S21. Its location is 40°11′58″ North latitude and 124°03′56″ West longitude. Unnamed Tributary of Fourmile Creek is a third order stream and has approximately 3.23 miles of blue line stream according to the USGS Honeydew 7.5 minute quadrangle. Unnamed Tributary of Fourmile Creek drains a watershed of approximately 1.76 square miles. Elevations range from about 520 feet at the mouth of the creek to 1440 feet in the headwater areas. Douglas fir and mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Refer to Fourmile Creek Watershed Overview for vehicle access.

METHODS

The habitat inventory conducted in Unnamed Tributary of Fourmile Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi, et.al., 1998). The AmeriCorps Watershed Stewards Project (AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). 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, 1995). 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, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. 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 of Fourmile Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see Fourmile Creek Report.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Unnamed Tributary of Fourmile Creek fish presence was observed from the stream banks, and sites were electrofished using a 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 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.

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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 Quattro Pro. Graphics developed for Unnamed Tributary of Fourmile 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 the pool tail outs
- 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 August 27, 1998, was conducted by C. Jezierski and P. Retherford (WSP). The total length of the stream surveyed was 6,187 feet with an additional 20 feet of side channel.

Flows were not measured on Unnamed Tributary of Fourmile Creek.

Unnamed Tributary of Fourmile Creek is a C4 channel type for the first 2,697 feet and a A4 channel type for the next 3,490 feet of the stream reach surveyed. C4 channel types are low gr adient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplain; gravel channel. A4 channel types are steep, narrow, cascading, step-pool streams; high energy/debris transport associated with depositional soils; gravel channel.

Water temperatures taken during the survey period ranged from 61°- 80° F. Air temperatures ranged from 68°- 83° F.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% riffle units, 32% flatwater units, and 27% pool units (Graph 1). Based on total length of Level II habitat types there were 44% riffle units, 41% flatwater units, and 8% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 35%; mid-channel pool, 24%; and step run, 17% (Graph 3). Based on percent total length, low gradient riffle made up 43%, step run 33%, and mid-channel pool 08%.

A total of 31 pools were identified (Table 3). Main channel pools were most frequently encountered at 90% occurrence and comprised 92% 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. Eight of the 31 pools (26%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 31 pool tail-outs measured, zero had a value of 1 (0.0%); five had a value of 2 (16.13%); ten had a value of 3 (32.26%); 16 had a value of 4 (51.61%) and zero had a value of 5 (0.0%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning.

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 68, flatwater habitat types had a mean shelter rating of 39, and pool habitats had a mean shelter rating of 04 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 17. Main pools had a mean shelter rating of 03 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Unnamed Tributary of Fourmile 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 of Fourmile Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Gravel was the dominant substrate observed in 18 of the 31 pool tail outs measured (58%). Silt and clay was the next most frequently observed dominant substrate type and occurred in 19% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 49%. The mean percentages of conifer and deciduous trees were 30% and 70%, respectively. Graph 9 describes the canopy in Unnamed Tributary of Fourmile Creek.

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For the stream reach surveyed, the mean percent right bank vegetated was 23.9%. The mean percent left bank vegetated was 25.8%. The dominant elements composing the structure of the stream banks consisted of 4.76% bedrock, 0% boulder, 73.81% cobble/gravel, and 21.43% sand/silt/clay (Graph 10). Of the units surveyed,66.67% had deciduous trees as the dominant bank vegetation, and 7.14% had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on September 3, 199 in Unnamed Tributary of Fourmile Creek. The sites were sampled by Janet Lester and Paul Retheford (CDFG and WSP).

The first site sampled included habitat units 11 and 12 , approximately 683 feet from the confluence with Fourmile Creek. This site had an area of 374 sq ft and a volume of 269 cu ft. The site yielded fourteen young of the year steelhead, two juvenile steelhead, and three yellow legged frogs.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Unnamed Tributary of Fourmile Creek.

DISCUSSION

Unnamed Tributary of Fourmile Creek is a C4 channel type for the first 2,697 feet of stream surveyed and a A4 for the remaining 3,490 feet. The suitability of C4 and A4 channel types for fish habitat improvement structures is good for bank-placed boulders. Fair for plunge weirs; single and opposing wing-deflectors; channel constrictors; log cover. Poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey day of August 27, 1998, ranged from 61° - 80° F. Air temperatures ranged from 68° - 83° F. This is a poor water temperature range for salmonids. Additionally, 80° F, if sustained, is above the lethal level for salmonids. The Unnamed Tributary of Fourmile Creek seems to have temperatures unfavorable 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 32% of the total length of this survey, riffles 37%, and pools 27%. The pools are relatively shallow, with only eight of the 31 (26%) 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.

Zero of the thirty-one pool tail-outs measured had an embeddedness rating of 1. Five (16%) of the pool tail-outs measured had an embeddedness value of 2. Twenty-six of the pool tail-outs had embeddedness ratings of 3 or 4 (84%). Zero of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. 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 Unnamed Tributary of Fourmile 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 4. The shelter rating in the flatwater habitats was slightly better at 39. 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 nearly all habitat types. Additionally, terrestrial vegetation contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Instream cover created by small and large woody debris provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Twenty-two of the thirty-one (71%) pool tail outs 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 49%. This is a relatively low percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 23.9% and 25.8%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting native species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

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RECOMMENDATIONS

1) Unnamed Tributary of Fourmile Creek 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 Unnamed Tributary of Fourmile 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.

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

5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

6) 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.

7) 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.

8) Suitable size spawning substrate on Unnamed Tributary of Fourmile Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

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COMMENTS 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 Fourmile Creek. Channel type is a C4
1145'	Left bank failure 75' H x 30' D x 75' L
1850'	Right bank tributary. Water temperature not measured
1882'	Right bank slide 50' H x 10' D x 25' L
2298'	Large debris accumulation (LDA)
2438'	Channel type changes to an A4
2544'	Upslope failure occurring on both banks and are bare of vegetation
2697'	Young-of-the-year salmonids seen
3739'	Right bank failure
4043'	Young-of-the-year and juvenile salmonids observed
4862'	Left bank tributary, dry
5317'	Left bank tributary, dry
5608'	LDA spans channel
6187'	End of survey due to lack of water.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. *California Salmonid Stream Habitat Restoration Manual, 3rd 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