STREAM INVENTORY REPORT

Upper Mattole River

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Upper Mattole River, upstream from the confluence of the river with Gibson 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 Upper Mattole River. 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

Upper Mattole River is part of the Mattole River system, located in Humboldt and Mendocino Counties, California. Upper Mattole River's legal description at the confluence with Gibson Creek is T05S R02E S--. Its location is 40°01'18" North latitude and 123°56'14" West longitude. Upper Mattole River is a third order stream and has approximately 5.4 miles of blue line stream according to the USGS Briceland and Bear Harbor 7.5 minute quadrangles. Upper Mattole River drains a watershed of approximately 12.8 square miles. Summer base flow is approximately 1.0 cubic feet per second (cfs) at its confluence with Gibson Creek, but over 20 cfs is not unusual during winter storms. Elevations range from about 980 feet at the mouth of the creek to 1,300 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production, rural residence, and hiking trails. Vehicle access exists from the Briceland-Shelter Cove Road from Thorn Junction via the Whitethorn Road through Whitethorn to Gibson Creek approximately 0.2 miles north of Whitethorn School. The confluence of the Mattole River and Gibson Creek marks the beginning of the 1996 Upper Mattole River stream survey.

METHODS

The habitat inventory conducted in Upper Mattole River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 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). Upper Mattole River 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 Upper Mattole River 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". Upper Mattole River 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 Upper Mattole River, 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 Upper Mattole River, 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 Upper Mattole River, 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 Upper Mattole River, 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.

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BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Upper Mattole River 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 Upper Mattole River 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

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- 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 August 28 to September 9, 1996, was conducted by Ray Bevitori and Dave Smith (PCFWWRA). The total length of the stream surveyed was 35,199 feet with an additional 517 feet of side channel.

Flow was estimated to be 1.0 cfs during the survey period.

Upper Mattole River is an F3 channel type for the entire 35,199 feet of stream reach surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 49 to 57 degrees Fahrenheit. Air temperatures ranged from 46 to 67 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 44% riffle units, 27% flatwater units, and 27% pool units (Graph 1). Based on total **length** of Level II habitat types there were 43% pool units, 34% flatwater units, and 22% riffle units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 41%; runs, 23%; and mid-channel pools, 19% (Graph 3). Based on percent total **length**, mid-channel pools made up 35%, runs 27%, and low gradient riffles 21%.

A total of one hundred seventy-three pools were identified (Table 3). Main channel pools were most frequently encountered at 74% and comprised 83% 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. One hundred sixty-seven of the 173 pools (97%) had a depth of two

feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 160 pool tail-outs measured, none had a value of 1 (0%); 66 had a value of 2 (38%); 94 had a value of 3 (54%); and none had a value of 4 (0%) (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 100, and flatwater habitats had a mean shelter rating of 100 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 128. Scour pools had a mean shelter rating of 125 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Bedrock ledges are the dominant cover type in Upper Mattole River and are extensive. Large and small woody debris are present in nearly all habitat types (Graph 7).
Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in eight of the 10 low gradient riffles measured (80%). Small cobble was the next most frequently observed dominant substrate type and occurred in 20% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 83%. The mean percentages of deciduous and coniferous trees were 71% and 29%, respectively. Graph 9 describes the canopy in Upper Mattole River.

For the stream reach surveyed, the mean percent right bank vegetated was 83%. The mean percent left bank vegetated was also 83%. The dominant elements composing the structure of the stream banks consisted of 20% bedrock, 2% boulder, 2% cobble/gravel, and 76% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 11% of the units surveyed. Additionally, 74% of the units surveyed had deciduous trees as the dominant vegetation type, and 5.7% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Young-of-the-year (YOY) and juvenile (1+) salmonids were observed from the streambanks during the 1996 summer survey of Upper

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Mattole River. The fish were observed by Ray Bevitori and Dave Smith (PCFWWRA).

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Upper Mattole River.

DISCUSSION

Upper Mattole River is an F3 channel type for the entire 35,199 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is good for bank-placed boulders, and single and opposing wing-deflectors; fair for low-stage weirs, boulder clusters, channel constrictors, and log cover; and poor for medium-stage weirs.

The water temperatures recorded on the survey days August 28 to September 9, 1996, ranged from 49 to 57 degrees Fahrenheit. Air temperatures ranged from 46 to 67 degrees Fahrenheit. This is a good water temperature range 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 34% of the total **length** of this survey, riffles 22%, and pools 43%. The pools are relatively deep, with 103 of the 173 (60%) pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three 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.

Ninety-four of the 160 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 Upper Mattole River, 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 100. The shelter rating in the flatwater habitats was slightly lower at 64. A pool shelter rating of approximately 100 is desirable. The relatively large amount of cover that now exists is being provided primarily by large and small woody debris in all habitat types. Additionally, undercut banks contribute a large 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 ten 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 83%. 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 high at 83% and 83%, 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) Upper Mattole River should be managed as an anadromous, natural production stream.

2) 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.

3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment

yield. Identified sites, like the site at 16670', should then be treated to reduce the amount of fine sediments entering the stream.

4) Inventory and map erosion sources related to the watershed's road system and other land uses. These should be rated according to present and potential sediment yield. Identified sites 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 Gibson Creek. Channel type is an F3 for the entire 35,199' of stream surveyed.
2096'	Sanctuary Forest vehicle bridge crosses the stream.
2883'	Stanley Creek enters from the right bank (RB). Temperature is 54°F.
4500'	Several pieces of large woody debris along both stream banks. This material could be easily introduced to the stream if needed for fish habitat improvement.
6934'	Baker Creek enters from RB - temperature is 54°F.
10120'	Vehicle bridge to Monastery crosses stream.
12743'	Thompson Creek enters from the left bank (LB). Temperature is 54°F.
15782'	Steel vehicle bridge crosses stream at Gopherville.
16105'	Helen Barnum Creek enters from RB - temperature is 54°F.
16153'	Lost Man Creek enters from RB. Temperature is 56°F.
16670'	Lewis's bridge crosses stream - appears to be in need

of some repair. Bank erosion is apparent. This situation could probably be easily remedied by some bank reinforcement

17533' Some lateral erosion occurring on the LB. Could use some armoring.

19706' Rip-rap project along bank - appears to be in good condition and protecting the bank.

20747' Site of log structure project.

21167' Dry tributary enters from RB.

22000' Stream enhancement project site.

23835' Lateral erosion occurring on RB - could be a problem in the near future.

24869' Spring on LB.

25536' Stream enhancement project site. Everything appears to be in good condition.

26376' Rip-rap project along bank. Appears to be in good condition.

26593' Spring on LB - 53°F. Enters stream through a 4' diameter corrugated metal pipe (CMP).

29416' Tributary enters from RB - 52°F.

31457' Several pieces of large woody debris are accumulated in the stream channel. Small woody debris is collecting behind the larger wood, and erosion is beginning to occur along the RB.

32332' Old flat-car bridge crosses the stream. Appears to be in need of some repair.

33312' The stream flow is becoming intermittent. No fish have been sighted by surveyors for several hundred feet.

34943' Several pieces of large woody debris in stream channel. Channel is almost completely restricted.

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35199' No fish have been observed since 33312 comment. Flow is still intermittent and decreasing. 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