STREAM INVENTORY REPORT

Thompson Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Thompson 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 Thompson 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 Thompson 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

Thompson Creek is tributary to the Mattole River, located in Mendocino County, California. Thompson Creek's legal description at the confluence with the Mattole River is T05S R02E S--. Its location is 39°59'04" north latitude and 123°55'42" west longitude. Thompson Creek is a first order stream and has approximately 3.0 miles of blue line stream according to the USGS Bear Harbor and Briceland 7.5 minute quadrangles. Thompson Creek drains a watershed of approximately 3.6 square miles. Summer base runoff is approximately 2.5 cubic feet per second (cfs) at the mouth, but over 25 cfs is not unusual during winter storms. Elevations range from about 1,100 feet at the mouth of the creek to 1,500 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed as a forest preserve. Vehicle access exists via the Briceland/Shelter Cove Road from Redway to Whitethorn Junction. Drive south, approximately 1.5 miles past the town of Whitethorn to Our Lady of the Redwoods Abbey. A path leads from the Abbey to the mouth of Thompson Creek.

METHODS

The habitat inventory conducted in Thompson Creek 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). Thompson 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 Thompson 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". Thompson 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 Thompson 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 5 or "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 Thompson 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 (1) and sub-dominant (2) substrate elements were ocularly estimated from a list of seven size classes.

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 Thompson 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 Thompson 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 Thompson Creek fish presence was observed from the stream banks, and two sites were 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 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 Thompson 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 June 10 through 20, 1996, was conducted by Rick Abbey and Ray Bevitori (PCFWWRA). The total length of the stream surveyed was 17,337 feet with an additional 122 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.5 cfs on June 18, 1996.

Thompson Creek is a B1 channel type for the first 8,257 feet, and an F1 channel type for the remaining 9,080 feet of stream reach surveyed. B1 channels are moderately entrenched, moderate gradient (2-4%), riffle dominated channels with infrequently spaced pools, stable banks, and predominantly bedrock substrate. F1 channels are entrenched, meandering riffle/pool channels on low gradients with predominantly bedrock substrate.
Water temperatures taken during the survey period ranged from 52 to 59 degrees Fahrenheit. Air temperatures ranged from 52 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 43% pool units, 32% flatwater units, and 25% riffle units (Graph 1). Based on total **length** of Level II habitat types there were 41% flatwater units, 39% pool units, and 20% riffle units (Graph 2).

Twenty Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 35%; runs, 26%; and low gradient riffles, 23% (Graph 3). Based on percent total **length**, mid-channel pools made up 33%, runs 32%, and low gradient riffles 19%.

A total of 150 pools were identified (Table 3). Main channel pools were most frequently encountered at 87% and comprised 87% 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 and fourteen of the 150 pools (76%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs.

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Of the 150 pool tail-outs measured, none had a value of 1; 38 had a value of 2 (25%); 84 had a value of 3 (56%); three had a value of 4 (2%); and 25 had a rating of 5 (not suitable for spawning) (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 43, and flatwater habitats had a mean shelter rating of 27 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 57. Scour pools had a mean shelter rating of 47 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Thompson Creek. Graph 7 describes the pool cover in Thompson Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 70 of the 80 low gradient riffles measured (88%). Small cobble was the next most frequently observed dominant substrate type and occurred in 23% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 88%. The mean percentages of deciduous and coniferous trees were 94% and 6%, respectively. Graph 9 describes the canopy in Thompson Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 78%. The mean percent left bank vegetated was 79%. The dominant elements composing the structure of the stream banks consisted of 2.8% bedrock, 18.8% cobble/gravel, and 78.5% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 35% of the units surveyed. Additionally, 52% of the units surveyed had deciduous trees as the dominant vegetation type, and 4.2% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on June 18, 1996, in Thompson Creek. The sites were sampled by Todd Kraemer (AmeriCorps/WSP) and Ray Bevitori (PCFWWRA).

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The first site sampled included habitat unit 007, a run approximately 223 feet from the confluence with the Mattole River. This site had an area of 1,100 sq ft and a volume of 880 cu ft. The site yielded four young-of-the-year (YOY) steelhead rainbow trout and one coho YOY.

The second site included habitat units 330-331, a run/pool sequence located approximately 16,762 feet above the creek mouth. This site had an area of 600 sq ft and a volume of 520 cu ft. The site yielded five steelhead YOY and two coho YOY.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Thompson Creek.

DISCUSSION

Thompson Creek is a B1 channel type for the first 8,257 feet of stream surveyed and an F1 for the remaining 9,080 feet. The suitability of both B1 and F1 channel types for fish habitat improvement structures is excellent for bank-placed boulders, and good for log cover structures.

The water temperatures recorded on the survey days June 10-20, 1996, ranged from 52 to 59 degrees Fahrenheit. Air temperatures ranged from 52 to 70 degrees Fahrenheit. This is an acceptable 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 41% of the total **length** of this survey, riffles 20%, and pools 39%. The pools are relatively deep, with 114 of the 150 (76%) 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.

Eighty-seven of the 150 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 Thompson 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 43. The shelter rating in the flatwater habitats was slightly lower at 27. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris 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.

Seventy-four of the 80 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 88%. 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 77% and 79%, 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) Thompson Creek 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) There are several log debris accumulations present on Thompson Creek that are retaining large quantities of fine

sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with large woody cover is desirable and in some areas the material is locally available.

5) 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.

6) 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.

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 the Mattole River. Channel type is a B1 for the first 8,257'.
223'	Bioinventory site #1.
667'	Entire unit comprised of concrete for a dam.
967'	Yew Creek enters Thompson Creek from the right bank (RB).
2745'	Young-of-the-year (YOY) salmonids observed in stream by surveyors.
3999'	Large debris accumulation (LDA) across stream channel. Not a barrier to fish.
4125'	Tributary enters stream from RB.
6300'	Old skid road observed by surveyors; approximately 100' up on RB.

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8257' Channel type changes from B1 to F1 for remaining 9,080' of stream surveyed.

8650' Spring on left bank (LB) - 52°F.

12347' Motorcycle trail crosses stream.

12485' LDA in stream channel - not a barrier to fish.

14094' Tributary enters stream from LB - 54°F.

16762' Bioinventory site #2.

17337' Corrugated metal pipe (CMP) - 25'L x 4'diameter. Fish observed above the culvert. 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]	6.522

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