STREAM INVENTORY REPORT

THOMPSON CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Thompson Creek to assess habitat conditions for anadromous salmonids. 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 salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

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.

WATERSHED OVERVIEW

Thompson Creek is tributary to the Eel River, located in Humboldt County, California (Figure 1). Thompson Creek's legal description at the confluence with the Eel River is T1S R3E S29. Its location is 40°20'40" N. latitude and 123°51'12" W. longitude. Thompson Creek is a second order stream and has approximately 4.1 miles of blue line stream, according to the USGS Myers Flat 7.5 minute quadrangle. Thompson Creek drains a watershed of approximately 3.8 square miles. Elevations range from about 140 feet at the mouth of the creek to 2,400 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned by the Pacific Lumber Company and is managed for timber production. Vehicle access exists from U.S. Highway 101 at Dyerville, via a private road.

METHODS

The habitat inventory conducted in Thompson Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The contract seasonal Technical Advisors 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 and June, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by two person teams.

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. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are taken and recorded at each tenth unit typed. The time of the measurement is also recorded. Both temperatures are taken in 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. Unit measurements included mean length, mean width, mean depth, and maximum depth. Depth of the

pool tail crest at each pool habitat unit was measured at 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 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).

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 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 habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Thompson Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

9. Bank Composition:

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 in both the right and left banks was selected from a list of eight options on 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. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Thompson Creek to document the fish species composition and distribution. Three sites were electrofished in Thompson Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game. This program also processes and summarizes the data.

The Runtime program produces the following summary 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

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE RESULTS *

The habitat inventory of June 24-26, 30, July 1-2, and August 3, 1992, was conducted by Judah Sanders, Jason Cleckler, and Aaron Nadig (contract seasonals). The total length of the stream surveyed was 6,951 feet, with an additional 133 feet of side channel.

Flow was not measured in Thompson Creek.

Thompson Creek is an B2 channel type for the entire 6,951 feet of stream reach surveyed. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with stable stream banks.

Water temperatures ranged from 58 to 66 degrees fahrenheit. Air temperatures ranged from 61 to 79 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 45.7%, flatwater types 31.8%, and pools 22.5% (Graph 1). Riffle habitats made up 48.9% of the total survey **length**, flatwater 35.8%, and pools 15.3% (Graph 2).

Twelve Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were high gradient riffles, 21.4%; low gradient riffles, 17.9%; runs, also 17.9%; and step runs, 13.9 (Graph 3). By percent total **length**, high gradient riffles made up 25.9%, step runs 19.9%, low gradient riffles 17.6%, and runs 15.9% (Table 2).

Sixty-three pools were identified (Table 3). Main channel pools were most often encountered at 77.8%, and comprised 83.0% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Forty-three of the 63 pools (68%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 51 pool tail-outs measured, 16 had a value of 1 (31.4%); 26 had a value of 2 (51.0%); 7 had a value of 3

(13.7%); and 2 had a value of 4 (3.9%). On this scale, a value of one is the best for fisheries (Graph 6).

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 the highest shelter rating at 50.5. Pool habitats followed with a rating of 38.2 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 40.5, main channel pools had a rating of 39.0, and backwater pools rated 22.5 (Table 3). Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Thompson Creek and are extensive. Large and small woody debris are the next most common cover types. Graph 7 describes the pool cover in Thompson Creek.

Table 6 summarizes the dominant substrate by habitat type. Large cobble was the dominant substrate observed in 27 of the 50 low gradient riffles (54.0%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 28.0% of the low gradient riffles (Graph 8).

Fifty percent of the survey reach lacked shade canopy. Of the 50% of the stream covered with canopy, 77% was composed of deciduous trees, and 23% was composed of coniferous trees. Graph 9 describes the canopy in Thompson Creek.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 40.0%. The mean percent left bank vegetated was 40.8%. The dominant elements composing the structure of the stream banks consisted of 13.6% boulder, 13.4% cobble/gravel, 11.6% bare soil, 2.1% grass, 19.8% brush. Additionally, 36.3% of the banks were covered with deciduous trees, and 3.2% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Thompson Creek. The objective was to identify fish species and distribution. The units were sampled on July 13, 1992, by Chris Coyle and Craig Mesman (CCC). Each unit was end-blocked with nets to contain the fish within the sample reach. Three passes were conducted at each site, fork lengths (FL) measured and recorded, and the fish returned to the stream.

The first site sampled was a step run/mid-channel pool/step run sequence, approximately 7,026 feet from the confluence with the

Eel River and 75 feet above the end of the habitat inventory survey. The site yielded four steelhead, ranging from 125 to 160mm FL.

The second site was habitat unit 152, a mid-channel pool, located approximately 4,049 feet above the creek mouth. This site had an area of 272.0 sq ft, and a volume of 353.6 cu ft. Sixteen steelhead were sampled. They ranged from 33 to 170mm FL.

The third site sampled was habitat unit 022, a step run, located approximately 755 feet above the creek mouth. The site had an area of 795 sq ft, and a volume of 557 cu ft. The site yielded 25 steelhead, ranging from 41 to 112mm, and one sculpin, 72mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Thompson Creek.

DISCUSSION

The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days June 24-July 2, and August 3, 1992 ranged from 58° F to 66° F. Air temperatures ranged from 61° F to 79° F. This is a very good water temperature regime for salmonids. However, 66° 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 conducted.

Flatwater habitat types comprised 35.8% of the total **length** of this survey, riffles 48.8%, and pools 15.3%. The pools are relatively shallow with only 20 of the 63 pools having a maximum depth greater than 2 feet. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total 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. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Nine of the 51 pool tail-outs measured had embeddedness ratings of 3 or 4. Sixteen had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The mean shelter rating for pools was moderate with a rating of 38.2. The shelter rating in the flatwater habitats was lower at 29.9. However, 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, large and small woody debris contribute a moderate 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.

Eighteen of the 50 low gradient riffles had gravel or small cobble as the dominant substrate. The remaining 32 low gradient riffles had large cobble or boulder as the dominant substrate. This is on the high end of the substrate size generally considered suitable for spawning salmonids.

The mean percent canopy for the stream was 50%. This is a relatively low percentage of canopy, since 80 percent is generally considered desirable. Water temperatures could be reduced by increasing stream canopy.

RECOMMENDATIONS

1) Thompson 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 at hand.

4) Increase the canopy on Thompson Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels.

5) Spawning gravels on Thompson Creek are limited to relatively few reaches. Projects should be designed at

suitable sites to trap and sort spawning gravels in order to expand redd distribution in the stream.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All the distances are approximate and taken from the beginning of the survey reach.

0'	Begin survey at confluence with the Eel River. Channel type is a B2 for the entire survey reach. Large pool to the left of mouth has numerous 10-16" squawfish.
518'	Young-of-the-year steelhead (YOY) observed.
817'	All terrain vehicle trail crosses the channel.
3410'	Numerous YOY observed.
3877'	Log and debris accumulation (LDA) retaining gravel 10' wide x 15' long.
3921'	Plunge 7' high over small woody debris.
3988'	Small tributary enters from the right bank.
4218'	Confluence with South Fork Thompson Creek.
4676'	Road crosses the channel.
4762'	LDA 9' wide x 11' long x 7' high with plunge 6' high; possible barrier.
5092'	LDA 60' wide x 4' high; possible barrier.
5499'	Small road crossing.
5759'	Numerous 2+ steelhead observed.
6030'	No YOY observed for the remainder of the survey reach.
6150'	Tributary enters from the left bank at a steep gradient. No YOY observed in this tributary.
6636'	Steep gradient with 4' high plunge.
6646'	Plunge 4' high over log, retaining gravel 25' long.

6799' Left bank erosion 200' high x 243' long, contributing cobble and gravel into the channel.

6951' End of survey due to 10% gradient.