STREAM INVENTORY REPORT

Yew Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Yew 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 Yew 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 Yew 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

Yew Creek is tributary to Thompson Creek, tributary to the Mattole River, located in Mendocino County, California. Yew Creek's legal description at the confluence with the Mattole River is T05S R02E S00. Its location is 39°59'54" North latitude and 123°55'49" West longitude. Yew Creek is a first order stream and has approximately 1.9 miles of ephemeral stream according to the USGS Bear Harbor 7.5 minute quadrangle. Yew Creek drains a watershed of approximately 0.8 square miles. Summer base flow is approximately 1.0 cubic feet per second (cfs) at the mouth, but over 15 cfs is not unusual during winter storms. Elevations range from about 1,060 feet at the mouth of the creek to 1,400 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for rural residence. Vehicle access exists via Whitethorn Road, south approximately 1.6 miles to Thompson Creek. Walk upstream approximately 1,000 feet to the mouth of Yew Creek.

METHODS

The habitat inventory conducted in Yew 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). Yew 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 Yew 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 taken 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". Yew 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 Yew 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 Yew 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 Yew 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 Yew 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 Yew Creek fish presence was observed from the stream banks, and one site was electrofished using one Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

SUBSTRATE SAMPLING

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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 Yew 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 June 13, 1996, was conducted by Dave Smith and Dylan Brown (PCFWWRA). The total length of the stream

surveyed was 3,444 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.1 cfs on June 16, 1996.

Yew Creek is a B4 channel type for the entire 3,444 feet of stream reach surveyed. B4 channels are moderately entrenched, moderate gradient, riffle-dominated channels with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 56° Fahrenheit. Air temperatures ranged from 53 to 63°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 46% pool units, 28% riffle units, and 26% flatwater units (Graph 1). Based on total **length** of Level II habitat types there were 46% flatwater units, 33% pool units, and 20% riffle units (Graph 2). Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 33%; low gradient riffles, 21%; and step runs, 20% (Graph 3). Based on percent total **length**, step runs made up 42%, mid-channel pools 24%, and low gradient riffles 16%.

A total of thirty-eight pools were identified (Table 3). Main channel pools were most frequently encountered at 79% and comprised 82% of the total length of all pools (Graph 4).

Table 4 summarizes maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty of the 38 pools (53%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 38 pool tail-outs measured, none had a value of 1; seven had a value of 2 (18%); 25 had a value of 3 (66%); and none had a value of 4 (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 64, and flatwater habitats had a mean shelter rating of 30 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 90. Main channel pools had a mean shelter rating of 51 (Table 3).

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Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Yew Creek. Large and small woody debris are found in nearly all habitat types. Graph 7 describes the pool cover in Yew Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in all of the low gradient riffles measured (100%).

The mean percent canopy density for the stream reach surveyed was 93%. The mean percentages of deciduous and coniferous trees were 79% and 21%, respectively (Graph 9).

For the stream reach surveyed, the mean percent right bank vegetated was 84%. The mean percent left bank vegetated was 80%. The dominant elements composing the structure of the stream banks consisted of 30% bedrock and 70% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 8% of the units surveyed. Additionally, 78% of the units surveyed had deciduous trees as the dominant vegetation type, and 15% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on June 16, 1996, in Yew Creek. The site was sampled by Scott Downie and Ruth Goodfield (DFG).

The site sampled included habitat units 0016-0017, a riffle/run sequence approximately 774 feet from the confluence with Thompson Creek. This site had an area of 240 sq ft and a volume of 120 cu ft. The site yielded three young-of-the-year (YOY) coho salmon, two YOY steelhead rainbow trout, and one 1+ steelhead.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Yew Creek.

DISCUSSION

Yew Creek is a B4 channel type for the entire 3,444 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters and log cover; and good for medium-stage plunge weirs.

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The water temperatures recorded on the survey days June 13, 1996, ranged from 51 to 56 degrees Fahrenheit. Air temperatures ranged from 53 to 63 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 46% of the total **length** of this survey, riffles 20%, and pools 33%. The pools are relatively deep, with 20 of the 38 (53%) 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.

Twenty-five of the 38 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 Yew 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 moderate with a rating of 64. The shelter rating in the flatwater habitats was slightly lower at 30. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by terrestrial vegetation 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.

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 93%. This is a relatively high percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

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The percentage of right and left bank covered with vegetation was high at 84% and 80%, 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) Yew Creek should be managed as an anadromous, natural production stream.

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

3) Streamside sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

4) Sediment sources related to the watershed's road system and other land uses should be mapped and rated according to their potential sediment yields, and control measures should be taken.

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 Thompson Creek. Channel type is a B4 for the entire 3,44' of stream surveyed.

774' Bioinventory site. Coho and steelhead rainbow trout YOY identified.

1773' Site of instream log structures. Structures appeared to be in good condition - creating scour and preventing bank erosion.

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2779' Logs placed along banks for armor. Bank erosion still occurring.

3377' Numerous trees have fallen in and over the stream channel. May be a site for LDA modification.

3415' Small tributary enters from right bank. The tributary is very steep and choked with woody debris. No fish were observed in the tributary. Temperature is 54°F.

3444' The stream channel has become choked with woody debris. Stream appears impenetrable for approximately 1/4 mile. No fish sighted above this point, although potentially good rearing habitat is available upstream. 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