STREAM INVENTORY REPORT

SOUTH FORK YAGER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on the South Fork Yager 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 the South Fork Yager 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.

A carcass survey was conducted in South Fork Yager Creek on February 4, 1992. No live fish or carcasses were found; however, two redds were observed. 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

The South Fork Yager Creek is tributary to Yager Creek, tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). South Fork Yager Creek's legal description at the confluence with Yager Creek is T2N R2E S10. Its location is 40°34'03" N. latitude and 123°56'21" W. longitude. The South Fork Yager Creek is a second order stream. The total length of blue line stream, according to the USGS Owl Creek and Yager Junction 7.5 minute quadrangles, is 11.2 miles.

The South Fork Yager Creek drains a watershed of approximately 11.5 square miles. Redwood, Douglas fir, and hardwood forests dominate the watershed. The watershed is owned by the Pacific Lumber Company and other private timber interests and is managed for timber production. Year round vehicle access exists from State Highway 36 near Carlotta, via Fisher Road, to Pacific Lumber Company's Yager Camp. The main Yager-Lawrence Haul Road leads to Road Four and the South Fork Yager Creek, 8 miles from Yager Camp.

METHODS

The habitat inventory conducted in the South Fork Yager Creek follows the methodology as presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). The inventory was conducted by two person teams. The California Conservation Corps (CCC), Technical Advisors conducting the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). The South Fork Yager Creek personnel were trained in May and June, 1991, by Gary Flosi and Scott Downie.

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 the South Fork Yager Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases the flows are estimated. Flows should be measured or estimated at major tributary confluences as well.

2. Channel Type:

Channel typing was 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 operations 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. 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 used 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". The South Fork Yager 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 measurements were accomplished 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 the South Fork Yager 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 the South Fork Yager 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 the South Fork Yager Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentages of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

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 the South Fork Yager 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 the South Fork Yager Creek to document the salmonid species composition and distribution. Three sites were electrofished in the South Fork Yager Creek using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, measured, and returned to the stream.

SUBSTRATE SAMPLING

Gravel sampling is conducted using either a 6 or 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). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, then taken to the laboratory for final processing.

In the laboratory the samples are wet sieved using standard Tyler screens. All particles greater than 0.85 mm diameter are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.85 mm is measured following one hour of settling in graduated cylinders or Imhoff cones. The fines measured in the field are added to these results.

Gravel sampling is conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles, at the tail-out of a pool, in the thalweg. The higher the percent of fine sediment, the lower the probability for eggs to survive to hatch. This is due to the reduced quantity of oxygenated water able to be percolated through the gravel, or because of the fine sediment capping the redd and preventing fry from emerging from the gravel.

DATA ANALYSIS

Data from the habitat inventory form is entered into Habtype, a dBASE 3+ data entry program developed by the Department and Fish and Game. From Habtype, the data is summarized by Habtab a dBASE 4.1 program in development by DFG.

The Habtab 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 the South Fork Yager 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 20 and 21, and August 29 and 30, 1991, was conducted by Brian Humphrey, Tony Sartori, Chris Coyle, and Erick Elliot (CCC). The total length of the stream surveyed was 6,631 feet, with an additional 509 feet of side channel.

The South Fork Yager Creek is a B2 channel type for the first 2,831 feet from the confluence with Yager Creek, then it changes to an A2 channel for the remaining 3,800 feet of the stream reach surveyed. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with stable stream banks. A2 channels are steep (4-10% gradient), very well confined boulder channels.

Water temperatures ranged from 50 to 61 degrees fahrenheit. Air temperatures ranged from 58 to 78 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 38.2%, flatwater types 35.8%, and pools 26.0% (Graph 1). Riffles made up 36.8% of the total **length**, flatwater habitats 47.7%, and pools 15.6% (Graph 2).

Thirteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were step runs, 22.8%, low gradient riffles, 21.1%, and high gradient riffles, 15.5% (Graph 3). By percent total **length**, step runs made up 39.7%, low gradient riffles 24.0%, and high gradient riffles 11.9%.

Thirty-two pools were identified (Table 3). Main channel pools were most often encountered at 68.7%, and comprised 75.2% 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. Twenty-seven of the 32 pools (84.4%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 27 pool tail-outs measured, 1 had a value of 1 (3.7%); 4 had a value of 2 (14.8%); 17 had a value of 3 (63.0%); and 5 had a value of 4 (18.5%). 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 types had the highest shelter rating at 62.1. Pools had a rating of 39.7 (Table 1). For the pool types, the backwater pools had the highest mean shelter rating at 53.3, main channel pools had a mean shelter rating of 40.5, and scour pools had a rating of 31.4 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in the South Fork Yager Creek and are extensive. Large woody debris is the next most common cover type. Graph 7 describes the pool cover in the South Fork Yager Creek.

Table 6 (Graph 8) describes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 61.5% of the low gradient riffles. Large cobble was the next most frequently observed dominant substrate type, and occurred in 15.4% of the 26 low gradient riffles.

Nearly 63% of South Fork Yager Creek lacked shade canopy. Of the 37% of the stream that was covered with canopy, 51% was composed of deciduous trees, and 49% was composed of coniferous trees. Graph 9 describes the canopy in the South Fork Yager Creek.

Table 2 summarizes the mean percent of the right and left stream banks covered with vegetation by habitat unit type. For the stream reach surveyed, the mean percent right bank vegetated was 52.5%. The mean percent left bank vegetated was 54.1%. The elements composing the structure of the stream banks consisted of 18.7% boulder, 0.8% cobble/gravel, 4.9% bare soil, 3.3% grass, and 10.6% brush. Additionally, 53.7% of the banks were composed of deciduous trees, and 8.1% of coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on the South Fork Yager Creek. The units were sampled on August 14, 1991 by Craig Mesman and Jay Miller (CCC). The results are as follows:

The first site sampled was habitat unit 004, a run, approximately 260 feet from the confluence with Yager Creek. This site had an area of 1,336.7 sq ft and a volume of 1,336.7 cu ft. The combined total of fish was 26 steelhead, ranging from 35 to 139 mm fork length, and 33 roach, ranging from 55 to 91 mm fork length.

The second site was habitat unit 028, a mid-channel pool,

approximately 1,915 feet from the confluence with Yager Creek. The site had an area of 1,136.2 sq ft and a volume of 2,272.4 cu ft. Sixty one steelhead were sampled. They ranged from 41 to 136 mm fork length.

The third site was a step pool, approximately 500 feet upstream from the mouth of Owl Creek. This site had an area of 940 sq ft and a volume of 2,585 cu ft. Thirteen steelhead were sampled, ranging from 49 to 162 mm fork length.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on the South Fork Yager Creek.

DISCUSSION

The South Fork Yager Creek has two channel types: A2 and B2. The high energy and steep gradient of the A2 channel type is generally not suitable for instream enhancement structures. The B2 channel type is suitable for many types of low and medium stage instream enhancement structures. There are 2,831 feet of this type of channel in the survey reach. 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 20-21 and August 29-30, 1991 ranged from 50° F to 61° F. Air temperatures ranged from 58° F to 78° F. This is a very good water temperature regime for salmonids. However, 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 47.7% of the total **length** of this survey, riffles 36.8%, and pools 15.6%. The pools are relatively deep with 27 of the 32 pools having a maximum depth of two feet or greater. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by the high stream energy of the A2 channel type.

Twenty-two of the 27 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In the South Fork Yager Creek, sediment

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

The mean shelter rating for pools was moderate with a rating of 39.7. The shelter rating in the flatwater habitats was better at 50.1. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. A small amount of additional cover is provided by large woody debris. 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.

Twenty of the 26 low gradient riffles had boulder or large cobble as the dominant substrate. This is on the high end of the substrate size considered desirable for spawning salmonids. The mean percent canopy for the stream was 37%. This is a relatively low percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) The South Fork Yager 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.

4) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 6,449', 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) There are several log debris accumulations present on the South Fork Yager Creek that are retaining 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.

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'	Survey begins at the confluence with Yager Creek. Reach #1 is a B2 channel type.
284'	Right bank erosion 7' high x 30' long.
829'	Left bank cut 10' high x 1,000' long, with vegetation along it.
1572'	Log and debris accumulation (LDA) 4' high x 20' wide x 5' long; not a barrier.
1915'	LDA 10' high x 20' wide x 20' long; not a barrier.
2011'	LDA across the channel is forming a pool.
2152'	Left cut bank 10' high.
2217'	Cat trail crosses the channel.
2831'	Right cut bank 6' high. Channel type changes from a B2 to an A2 (reach #2).
3471'	LDA within the channel.
3583'	Plunge over log 6' high.
3633'	LDA 15' high x 30' wide.
3796'	LDA 10' high x 30' wide across the right half of the channel.
4125'	LDA is retaining gravel.
4222'	LDA 15' high x 90' wide x 15' long, retaining gravel.

4526' LDA 12' high x 25' wide.

4576' Owl Creek enters from the right bank.

5164' LDA 10' high x 60' wide x 5' long, retaining gravel.

5199' Tributary enters from the right bank. Right bank slide 60' high x 40' long. LDA 12' high x 50' wide x 37' long.

5414' LDA 20' high x 20' wide x 40' long.

6052' LDA 10' high x 20' wide x 10' long.

6449' Bank erosion 30' high x 20' long.

6488' Bank erosion 30' high x 15' long.

6631' 10-20' waterfalls. End of survey.