STREAM INVENTORY REPORT

NORTH FORK YAGER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on the North 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 North 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.

There is no known record of adult spawning surveys having been conducted on the North Fork Yager Creek. The objective of this report is to document the current habitat conditions, and recommend options for the enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

The North 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). North Fork Yager Creek's legal description at the confluence with Yager Creek is T2N R2E S02. Its location is 40°34'35" N. latitude and 123°55'43" W. longitude. The North Fork Yager Creek is a third order stream. The total length of blue line stream, according to the USGS Owl Creek and Yager Junction quadrangles is 12.1 miles.

The North Fork Yager Creek drains a watershed of approximately 50.1 square miles. Douglas fir, hardwoods, and grassland dominates the watershed. The watershed is owned by the Pacific Lumber Company and other private interests and is managed for timber production and rangeland. 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 North Fork Yager Creek, 9 miles from Yager Camp.

METHODS

The habitat inventory conducted in the North Fork Yager Creek follows the methodology as presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). The inventory was conducted by a two person team. The California Conservation Corps (CCC), Technical Advisors, Tony Sartori and Brian Humphrey, conducting the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). The North 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 North Fork Yager Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured at the beginning of the stream survey reach using standard flow measuring equipment. The flow is recorded in cubic feet per second of discharge.

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 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 North 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 North 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 North 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 North 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 North 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 North Fork Yager Creek to document the salmonid species composition and distribution. Four sites were electrofished in the North 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 North 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 24-27, 1991, was conducted by Tony Sartori and Brian Humphrey (CCC). The total length of the stream surveyed was 20,361 feet, with an additional 646 feet of side channel.

The North Fork Yager Creek is a C3 channel type for the first 1,550 feet from the confluence with Yager Creek, then it changes to a B2 channel for the next 11,757 feet, then it changes to a C2 channel for the remaining 7,054 of the stream reach surveyed. C3 channels are low gradient (0.5-1.0%), meandering gravel bed channels. B2 channels are moderate gradient (1.0-2.5), stable, cobble/gravel channels. C2 channels are low gradient (0.3-1.0%), moderately confined, with cobble stream beds.

Water temperatures ranged from 56 to 63 degrees Fahrenheit. Air temperatures ranged from 59 to 74 degrees Fahrenheit.

Table 1 summarizes the riffle, flatwater, and pool habitat types. By **percent occurrence**, riffles make up 37.9%, flatwater types make up 41.6%, and pools make up 20.5% (Graph 1). Riffles make up 33.3% of the **total length**, flatwater habitats make up 50.6%, and pools make up 16.2% (Graph 2).

Fifteen habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by **percent occurrence** were low gradient riffles, 30.0%, runs, 19.0%, and step runs, 12.6% (Graph 3). By **percent total length**, low gradient riffles made up 29.4%, step runs made up 21.5%, and runs made up 15.5%.

Table 3 summarizes the pool habitat types. Of these pools, 66.7% were scour pools. These scour pool types comprised 75.9% of the total length for all pools (Graph 4).

Table 4 (Graph 5) is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. The maximum depth for 37 of the 39 pools (95%) was three feet or deeper. This level indicates a good quality of pool habitat in the North Fork Yager Creek.

The depth of cobble embeddedness was estimated at the pool tail-outs. Of the 38 pool tail-outs, zero had a value of 1; 9 had a value of 2 (23.7%); 25 had a value of 3 (65.8%); and 4 had a value of 4 (10.5%). On this scale, a value of one is best for fisheries. Graph 6 describes embeddedness.

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. Riffles had the highest shelter rating at 61.1 (Table 1). For the pool types, the backwater pools had the highest mean shelter rating at 50.0, main channel pools had a mean shelter rating of 29.1, and scour pools had a rating of 25.2 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in the North Fork Yager Creek and are extensive. Bedrock ledges are the next most common cover type. Graph 7 describes the pool cover in the North Fork Yager Creek.

Table 6 (Graph 8) describes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 36.8% of the low gradient riffles. Small cobble was the next most frequently observed dominant substrate type, and occurred in 22.8% of the 57 low gradient riffles.

Nearly 91% of the South Fork Yager Creek lacked shade canopy. Of the 9% of the stream that was covered with canopy, 67% was composed of deciduous trees, and 33% was composed of coniferous trees. Graph 9 describes the canopy in the South Fork Yager Creek.

Table 2 summarizes the mean percent by habitat unit type of the right and left stream banks covered with vegetation. For the stream reach surveyed, the mean percent right bank vegetated was 41.8%. The mean percent left bank vegetated was 42.5%. The dominant elements composing the structure of the stream banks consisted of 11.1% bedrock, 8.4% boulder, 5.3% cobble/gravel, 11.1% bare soil, 1.6% grass, and 3.2% brush. Additionally, 57.9% of the banks were composed of deciduous trees, and 1.6% of coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Four electrofishing sites were sampled on the North Fork Yager Creek. The units were sampled on August 13 and September 10, 1991 by Steve Liebhardt, Jerry Suissa, Brian Humphrey, and Erick Elliot (CCC). The results are as follows:

The first site sampled was the upper section of habitat unit 007, a run, approximately 644 feet from the confluence with Yager Creek. The combined total of fish was 25 steelhead (53 to 168 mm fork length), 34 roach (28 to 84 mm fork length), 5 sucker (88 to 157 mm fork length), 2 stickleback (22 and 32 mm length), and 3 lamprey (111, 114, and 114 mm length).

The second sample site was the middle portion of habitat unit 071, a step run, located approximately 13,800 feet above the creek mouth. The total fish were 33 steelhead (52 to 144 mm fork length), 58 roach (34 to 74 mm fork length), and one lamprey (93mm in length). Two salamanders were also found.

The third site sampled was habitat unit 151, a glide, located approximately 15,737 feet above the creek mouth. Unit 151 had an area of 9,000 sq ft, and a volume of 11,700 cu ft. The combined total of fish were 14 steelhead, ranging from 49 to 165 mm fork length, 41 roach, ranging from 21 to 74 mm fork length, and one lamprey, 103 mm in length.

The fourth site sampled was the bottom portion of habitat unit 172, a step run, located approximately 18,365 feet above the confluence with Yager Creek. The combined total of fish was 57 steelhead (41 to 141 mm fork length), 47 roach (35 to 74 mm fork length), and one lamprey (109 mm in length). Two salamanders were also found.

GRAVEL SAMPLING RESULTS

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

DISCUSSION

The North Fork Yager Creek has three channel types: B2, C2, and C3. The B2 channel type is suitable for many types of low and medium stage instream enhancement structures. There are 11,793 feet of this type of channel in the North Fork Yager Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The C2 channel type is suitable for many stream enhancement structures. The upper 7,054 of the stream reach surveyed is this type of channel. For the most part C2 channels are found in stable, low gradient stream reaches. Well placed and engineered structures that constrict the channel to form pool habitat or cover structures are usually appropriate and have a good chance of success in this channel type.

The lower 1,550 feet of the survey reach is a C3 channel. C3 channels are meandering steam types on noncohesive gravel beds which have poorly consolidated and unstable stream banks. They are generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover

and shelter structures in straight reaches are often appropriate. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey days June 24-27, 1991 ranged from 56° F to 63° F. Air temperatures ranged from 59° F to 74° F. This is a good water temperature regime for salmonids. However, 63° F, if sustained, is near the threshold

stress level for salmonids. This does not seem to be the case here, and the North Fork Yager Creek seems to have temperatures favorable to 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 50.6% of the total **length** of this survey, riffles 33.3%, and pools 16.2%. The pools are relatively deep with 32 of the 39 pools having a maximum depth of three 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 pool habitat is recommended for locations where their installation will not jeopardize the unstable C3 stream banks, or subject the structures to high stream energy.

Twenty-nine of the 38 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In the North 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 low with a rating of 27.6. The shelter rating in the flatwater habitats was better at 37.4. Riffles rated highest at 61.1. 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 and bedrock in all habitat types. 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-four of the 57 low gradient riffles had either gravel or small cobble as the dominant substrate. The remaining 33 low gradient riffles had either large cobble or boulder as the

dominant substrate. This is generally considered in the high range of substrate size for spawning salmonids.

The mean percent canopy for the survey reach was only 9%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Water temperatures could be lowered by increasing stream canopy.

RECOMMENDATIONS

1) The North Fork Yager Creek should be managed as an anadromous, natural production stream.

2) Increase the canopy on the North Fork Yager Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this inventory section must be treated as well, since the water being delivered here is being warmed above. In many cases, planting will need to coordinated to follow bank stabilization or upslope erosion control projects.

3) 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.

4) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from boulders and bedrock. Adding high quality complexity with woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations.

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 the distances are approximate and taken from the beginning

of the survey reach.

0'	Yager Creek bifurcates into the North and Middle Forks. Reach #1 is a C3 channel type.
776'	Left bank erosion 30' high x 30' long, protected by boulders at the toe.
1550'	Both banks are well armored with 3' diameter boulders. Channel changes from a C3 to a B2 channel type (reach #2).
1981'	Bare soil area 100' long on the right bank.
2384'	Log bridge 45' wide x 20' long x 14' high crosses the channel.
3925'	Left bank erosion 100' high.
4461'	Right bank blue goo slide.
4508'	Left bank blue goo slide 70' high.
5094'	Right bank erosion 20' high x 40' long.
5744'	Left bank erosion 50' high x 20' long.
5910'	Right bank blue goo slide 100' high x 500' long.
6101'	Left bank erosion 100' high x 500' long.
7676'	Right bank slide.
7808'	Tributary cascades in from the right bank.
8323'	Right bank blue goo slide 20' high x 100' long.
8561'	Right bank erosion 100' high x 50' long, stabilized at the toe by boulders.
8991'	Approximately twenty steelhead (5-8" long) observed.
9436'	Approximately 50 steelhead trout YOY observed.
9718'	Right bank erosion 100' high x 500' long, partially revegetated.
10166'	Right bank erosion 200' high x 200' long.
10810'	Left bank blue goo slide 50' high x 130' long.

11343'	Left bank blue goo slide 50' high x 500' long.
11497'	Right bank blue goo slide 25' high x 150' long.
12905'	Left bank blue goo slide 250' long.
13307'	Channel changes from a B2 to a C2 channel type (reach #3).
13684'	Right bank erosion 70' high x 70' long.
13755'	Left bank blue goo slide 30' high.
14763'	Gravel bank 20' wide x 100' long x 1' high, creating a side channel.
15117'	Stream plunges over two logs and scours around both sides of a root wad on the left side of the channel.
16409'	Tributary enters from the left bank.
18215'	Left bank erosion 30' high x 50' long.
20272'	Left bank erosion 30' high x 30' long.
20361'	End of survey at PAL