STREAM INVENTORY REPORT

MIDDLE FORK YAGER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on the Middle 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 Middle 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 being conducted on the Middle 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 Middle 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). Middle 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 Middle Fork Yager Creek is a second order stream. The total length of blue line stream, according to the USGS Owl Creek and Yager Junction quadrangles is 5.6 miles.

The Middle Fork Yager Creek drains a watershed of approximately 9.6 square miles. Redwood and hardwoods dominate the watershed. The watershed is privately owned 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 Middle Fork Yager Creek, 9 miles from Yager Camp.

METHODS

The habitat inventory conducted in the Middle 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 conducting the inventory

were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Middle 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 Middle Fork Yager 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 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 Middle 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 Middle 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 Middle 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 Middle 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 Middle 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 Middle Fork Yager Creek to document the salmonid species composition and distribution. Three sites were electrofished in the Middle Fork Yager Creek using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, measured, and returned to the stream.

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 Middle 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

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- 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, 25, and 26, 1991, was conducted by Steve Liebhardt and Erick Elliot (CCC). The total length of the stream surveyed was 4,237 feet, with an additional 306 feet of side channel.

The Middle Fork Yager Creek is a B2 channel type for the first 2,597 feet from the confluence of Yager Creek, then it changes to a B3 channel for the next 311 feet, then it changes to an A2 channel for the remaining 1,329 feet of stream reach surveyed. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with stable stream banks. B3 channels are moderate gradient, well confined, with unstable slopes. A2 channels are steep, boulder channels, which are very well confined.

Water temperatures ranged from 54 to 56 degrees fahrenheit. Air temperatures ranged from 57 to 61 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 36.2%, flatwater types 12.8%, and pools 50.0% (Graph 1). Flatwater habitat types made up 15.5% of the total survey **length**, riffles 49.2%, and pools 32.9% (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 mid-channel pools, 35.1%, and low gradient riffles, 25.5% (Graph 3). By percent total length, low gradient riffles made up 39.0%, and mid-channel pools made up 21.4%.

Forty-seven pools were identified (Table 3). Main-channel pools were most often encountered at 83.0%, and comprised 86.0% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. The maximum depth for 32 of the 47 pools (68.1%) was two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 46 pool tail-outs measured, eight had a value of 1 (17.4%); 14 had a value of 2 (30.4%); 24 had a

value of 3 (52.2%); and zero had a value of 4 (0.0%). 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. Pool habitat types had the highest shelter rating at 54.60 (Table 1). For the pool types, the scour pools had the highest mean shelter rating at 71.43, backwater pools had a mean shelter rating of 60.00, and main-channel pools had a rating of 51.44 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 13 of the 24 low gradient riffles (54.2%). Boulder was the next most frequently observed dominant substrate type, and occurred in 33.3% of the low gradient riffles (Graph 8).

Sixty percent of the survey reach lacked shade canopy. Of the 40% of the stream covered with canopy, 58.2% was composed of deciduous trees, and 41.8% was composed of coniferous trees. Graph 9 describes the canopy in the Middle Fork Yager 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 68.4%. The mean percent left bank vegetated was 73.6%. The dominant elements composing the structure of the stream banks consisted of 9.6% bedrock, 21.3% boulder, 10.6% cobble/gravel, 1.1% bare soil, 1.1% grass. Additionally, 46.8% of the banks were covered with deciduous trees, and 9.6% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on the Middle Fork Yager Creek. The units were sampled on August 13 and 29, 1991 by Steve Liebhardt, Jerry Suissa, Erick Elliot and Craig Mesman (CCC). The results are as follows:

The first site sampled was habitat unit 002, a boulder formed lateral scour pool, approximately 39 feet from the confluence with Yager Creek. The site had an area of 193.6 sq ft and a volume of 135.5 cu ft. The combined total of fish was 16 steelhead, ranging from 34 to 148 mm fork length; 9 roach, ranging from 50 to 68 mm length; and 6 stickleback, ranging from 32 to 38 mm fork length.

The second site was habitat unit 089, a mid-channel pool, approximately 4,201 feet from the confluence. This site had an area of 108.9 sq ft and a volume of 196.0 cu ft. Six steelhead were sampled, ranging from 46 to 177 mm fork length.

The third site was a plunge pool, approximately 4,260 feet from the confluence and approximately 20 feet above a 16 foot high bedrock plunge. No fish were found.

DISCUSSION

The Middle Fork Yager Creek has three channel types: A2, B2, and B3. The high energy and steep gradient of the A2 channel type is generally not suitable for instream enhancement structures. The B3 channel type is also unsuitable for instream structures due to its unstable stream banks.

The B2 channel type is good for many types of low and medium stage instream enhancement structures. There are 2,662 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 24-26, 1991 ranged from 54 ° F to 56° F. Air temperatures ranged from 57° F to 61° 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.

Riffles comprised 59.2% of the total **length** of this survey, pools 32.9, and flatwater types 15.5%. The pools are relatively deep with 32 of the 47 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 high stream energy, or interfere with unstable stream banks.

Fourteen of the 46 pool tail-outs measured had embeddedness ratings of 3 or 4. Eight had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In the Middle 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 54.6. The shelter rating in the flatwater habitats was 30.4. However, a pool shelter rating of

approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, bedrock and large woody debris contribute a small amount. Log and root wad cover structures in the 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.

Fifteen of the 24 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 40%. 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 Middle Fork Yager Creek should be managed as an anadromous, natural production stream.

2) Increase the canopy on the Middle Fork of 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 survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be 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) Increase woody cover in the flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.

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.

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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 confluence with North Fork Yager Creek. Reach #1 is a B2 channel type.

1106' Tributary enters from the left bank. Salmonid fry observed, probably steelhead young of the year (YOY).

1569' Log and debris accumulation (LDA) 10' high x 20' long on the left bank.

1725' LDA 40' long x 15' wide x 8' high; no barrier.

2662' Channel type changes from a B2 to a B3 (reach #2).

2853' LDA 20' long x 60' wide x 15' high, retaining gravel and sand.

2936' Two plunges, 3' high and 4' high, empty into pool. Channel type changes from a B3 to an A2 (reach #3).

2982' Plunge 4' high.

3007' Right bank erosion 50' long x 35' high, depositing silt and gravel into the channel.

3114' Slide on the right bank, partially revegetated.

3394' LDA 11' long x 10' wide x 8' high.

3576' Right bank erosion 30' long x 15' high, depositing gravel into the channel.

3690' LDA 20' long x 10' wide x 15' high on the left bank.

3885' Left bank erosion 20' long x 10' high, depositing gravel into the channel.

4237' End of survey. Plunge of 16' from bedrock. At property ownership change the upstream landowner denied access to the survey.