STREAM INVENTORY REPORT

North Fork Yager Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on North Fork Yager Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in North Fork Yager 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

North Fork Yager Creek is tributary to Yager Creek, tributary to the Van Duzen River, tributary to the Eel River, tributary to the Pacific Ocean, located in Humblodt County, California. North Fork Yager Creek's legal description at the confluence with Yager Creek is T2N R2E S02. Its location is 40□34'35" north latitude and 123□55'43" west longitude. North Fork Yager Creek is a third order stream and has approximately 12.1 miles of blue line stream according to the USGS Owl Creek and Yager Junction 7.5 minute quadrangles. North Fork Yager Creek drains a watershed of approximately 50.1 square miles. Elevations range from 700 feet at the mouth of the creek to 2800 feet in the headwater areas. 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, nine miles from Yager Camp.

METHODS

The habitat inventory conducted in North Fork Yager Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). 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. 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, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are 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 North 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 a Marsh-McBirney Model 2000 flow meter.

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. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded 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". 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. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, bedrock, 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 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 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. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In North Fork Yager 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 North Fork Yager Creek, the dominant composition type and the dominant vegetation type 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 (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in North Fork Yager Creek. No biological sampling was conducted on North Fork Yager Creek.

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 Quattro Pro. Graphics developed for 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

- Mean 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, 18, and 19, 1996, was conducted by Paul Ouradnik and Kelley Garrett (WSP/AmeriCorps). The total length of the stream surveyed was 12,743 feet with an additional 596 feet of side channel.

Flows were not measured on North Fork Yager Creek.

North Fork Yager Creek is a C3 channel type for the first 1,493 feet from the confluence with Yager Creek, then it changes to a B2 channel for the remaining 11,250 feet of the stream reach surveyed. C3 channels are low gradient, meandering, point-bar, riffle/pool, alluvial cobble channels with broad, well defined floodplain. B2 channel types are moderately entrenched, moderate gradient, riffle dominated boulder channels with infrequently spaced pools; very stable plan and profile; and stable banks.

Water temperatures taken during the survey period ranged from 60□ to 65□ F. Air temperatures ranged from 59□ to 70□ F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 43% flatwater units, 31% pool units, 26% riffle units, and 1% dry units (Graph 1). Based on total **length** of Level II habitat types there were 55% flatwater units, 24% riffle units, and 21% pool units (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were runs, 26%; mid-channel pools, 22%; and low gradient riffles, 20% (Graph 3). Based on percent total **length**, runs made up 29%, low gradient riffles 20%, and step runs 17%.

A total of forty-nine pools were identified (Table 3). Main channel pools were most frequently encountered at 71% and comprised 78% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Forty-six of the forty-nine pools (94%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the forty-nine pool tail-

outs measured, six had a value of 1 (12%); eighteen had a value of 2 (38%); eleven had a value of 3 (22%); three had a value of 4 (6%); and eleven had a value of 5 (22%) (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. Riffle and pool habitat types had mean shelter ratings of 38, and flatwater habitats had a mean shelter rating of 19 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 55. Main channel pools had a mean shelter rating of 38 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in North Fork Yager Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in North Fork Yager Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in twenty-six of the thirty-two low gradient riffles measured (80%). Large cobble was the next most frequently observed dominant substrate type and occurred in 20% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 18%. The mean percentages of deciduous and coniferous trees were 21% and 79%, respectively. Graph 9 describes the canopy in North Fork Yager Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 86%. The mean percent left bank vegetated was 88%. The dominant elements composing the structure of the stream banks consisted of 2% bedrock, 4% boulder, 46% cobble/gravel, and 48% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 56% of the units surveyed and 28% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads. Additionally, brush comprised 14% of the dominant vegetation and grass contributed 2% (Graph 11).

DISCUSSION

North Fork Yager Creek is a C3 channel type for the first 1,493 feet of stream surveyed and a B2 for the remaining 11,250 feet. The suitability of C3 and B2 channel types for fish habitat improvement structures is as follows: C3 are excellent for bank-placed boulders; and good for plunge weirs; boulder clusters; single and opposing wing deflectors; and log cover. B2 channels are excellent for plunge weirs; single and opposing wing-deflectors; and log cover.

The water temperatures recorded on the survey days June 13, 18 and 19, 1996, ranged from 60□ to 65□ F. Air temperatures ranged from 59□ to 70□ F. This is a good 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 55% of the total **length** of this survey, riffles 24%, and pools 21%. The pools are relatively deep, with forty-six of the forty-nine (94%) pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Six of the forty-nine (12%) of the pool tail-outs measured had an embeddedness value of 1. Eighteen had an embeddedness value of 2 (38%). Fourteen (28%) of the pool tail-outs measured had embeddedness ratings of 3 or 4. Eleven of the pool tail-outs measured were unsuitable with a value of 5. 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 North Fork Yager 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 38. The shelter rating in the flatwater habitats was 19. 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. 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.

The mean percent canopy density for the stream was 18%. In general, re-vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 85.6% and 87.6%, 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) North Fork Yager Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3)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.

4) 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.

5) Increase the canopy on 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 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.

6) 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.

7) 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.

COMMENTS AND LANDMARKS

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

0'	Begin survey at confluence with Yager Creek. Channel type is C3.
1,493'	Channel type changes to B2.
4,591'	Right bank slide approximately 70' high x 150' long.
5,267'	Right bank tributary.
6,454'	Right bank slide approximately 100' high x 200' long.
6,787'	Left bank slide approximately 30' high x 100' long.
11,485'	Left bank slide approximately 150' high x 30' long.
12,242'	Left bank slide approximately 30' high x 150' long.

12,743' End of survey.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, 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