STREAM INVENTORY REPORT

SOUTH FORK YAGER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2000 on South Fork Yager Creek. The survey began at the confluence with Yager Creek and extended upstream approximately 1.0 mile.

The South Fork Yager Creek 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 South Fork Yager Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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.

Adult carcass surveys were conducted in South Fork Yager Creek from 1991 through 2000.

		Chinook Salmon				Other		
Year	# of Surveys	# of Live Chinook	# of Chinook carcasses	AdiposeClip CWT	# of Redds	# of Live Coho	# of Live SH	# of Live unknown
1991-1992	1	0	0	0	2	0	0	0
1992-1993	2	13	0	0	8	0	1	0
1994-1995	2	1	1	0	0	0	0	1
1997-1998	1	0	0	0	0	0	0	0
1999-2000	4	2	0	0	0	0	0	0

WATERSHED OVERVIEW

South Fork Yager Creek is a tributary to Yager Creek, a tributary to the Van Duzen River, located in Humboldt County, California (Map 1). South Fork Yager Creek's legal description at the confluence with Yager Creek is T02N R2E S10. Its location is 40°34′03″ north latitude and 123°56′21″ west longitude. South Fork Yager Creek is a second order stream and has approximately 9.4 miles of blue line stream according to the USGS Owl Creek and Yager Junction 7.5 minute quadrangles. South Fork Yager Creek drains a watershed of approximately

11.5 square miles. Elevations range from about 600 feet at the mouth of the creek to 2,800 feet in the headwater areas. Redwood/Douglas fir forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 36 to Fisher Road to Pacific Lumber Company Land.

METHODS

The habitat inventory conducted in South Fork Yager Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The 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 South 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". 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. 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 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) 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 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 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 South 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 South 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 root wads) 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 South Fork Yager Creek. In addition, seven sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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 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
- 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 5-8, July 5-7, and August 3, 2000, was conducted by Rhonda Weidenbeck, Kasey Sirkin, Daria Leibel and Karen Bromley (WSP). The total length of the stream surveyed was 5,225 feet with an additional 492 feet of side channel.

Stream flow was measured at the top of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.35 cfs on June 28, 2000.

South Fork Yager Creek is an F3 channel type for the first 887 feet, then a B2 channel type for 3,290 feet, then a F2 channel type for remaining 973 feet of the stream surveyed. F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio and a cobble channel. B2 channel types are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools; very stable plan and profile; stable banks; boulder channel. F2 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and boulder channels.

Water temperatures taken during the survey period ranged from 55 to 61 degrees Fahrenheit. Air temperatures ranged from 56 to 73 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 20% riffle units, 46% flatwater units, and 34% pool units (Graph 1). Based on total length of Level II habitat types there were 17% riffle units, 63% flatwater units, and 20% pool units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run, 24%; mid-channel pool, 21%; and runs, 15% (Graph 3). Based on percent total length, step runs made up 44%, mid-channel pools 13%, and pocket water

10%.

A total of 37 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 62%, and comprised 66% 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. Twenty-eight of the 37 pools (75%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 35 pool tail-outs measured, 2 had a value of 1 (6%); 1 had a value of 2 (3%); 9 had a value of 3 (26%); 1 had a value of 4 (3%); and 22 had a value of 5 (63%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 35 pool tail-outs that had a embeddedness value of 5 were as follows: 46% large cobble, 23% boulder and 9% small gravel.

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 habitat types had a mean shelter rating of 53, flatwater habitat types had a mean shelter rating of 33, and pool habitats had a mean shelter rating of 34 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 42, backwater pools had a mean shelter rating of 30 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in South Fork Yager Creek. Graph 7 describes the pool cover in South Fork Yager Creek. Boulders are the dominant pool cover type followed by root mass.
Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Large cobble was the dominant substrate observed in 46% of pool tail-outs while boulder was the next most frequently observed substrate type, at 23%.

The mean percent canopy density for the surveyed length of South Fork Yager Creek was 73%. The mean percentages of deciduous and coniferous trees were 75% and 25%, respectively. Graph 9 describes the mean percent canopy in South Fork Yager Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 50.8%. The mean percent left bank vegetated was 49.3%. The dominant elements composing the structure of the stream banks consisted of 59.3% boulder, 30.2% cobble/gravel, and 10.5% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 75.6% of the units surveyed. Additionally, 11.6% of the units surveyed had coniferous trees as the dominant vegetation type, and 8.1% had no vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Seven sites were electrofished for species composition and distribution in South Fork Yager Creek on September 20, 2000. During the electrofishing period of 11:37am to 3:45pm water

temperatures ranged from 58° to 60° Fahrenheit and air temperatures ranged from 64° to 69° Fahrenheit. The sites were sampled by Michele Gilroy (DFG), Kasey Sirkin and Rhonda Weidenbeck (WSP).

The first site sampled was habitat unit #20, a plunge pool approximately 713 feet from the confluence with Yager Creek. The site yielded three young-of-the-year and three one-plus age class steelhead.

The second site sampled was at habitat unit #21.02, side channel pocket water located approximately 807' feet above the creek mouth. The site yielded six young-of-the-year and one one-plus age class steelhead.

The third site sampled was at habitat unit #26, a mid-channel pool located approximately 887' feet above the creek mouth. The site yielded twelve young-of-the-year and one one-plus age class steelhead.

The fourth site sampled was at habitat unit #73, a mid-channel pool located approximately 3,492' feet above the creek mouth. The site yielded two one-plus age class steelhead.

The fifth site sampled was at habitat unit #76.02, a side channel mid-channel pool located approximately 3,680' feet above the creek mouth. The site yielded one young-of-the-year steelhead.
The sixth site sampled was at habitat unit #81, a mid-channel pool located approximately 3,783' feet above the creek mouth. The site yielded one young-of-the-year and one one-plus age class steelhead.

The seventh site sampled was a plunge pool located approximately 3,831 feet above the creek mouth and approximately 1,394' feet above the 1994 end of survey. The site yielded two one-plus age class steelhead and one two-plus age class steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
9/20/00	1	713	20	5.6	1	F3	3	3	0
9/20/00	2	807	21.02	3.1	1	F3	6	1	0
9/20/00	3	887	26	4.2	1	F3	12	1	0
9/20/00	4	3,492	73	4.2	2	B2	0	2	0

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
9/20/00	5	3,680	76.02	4.2	2	B2	1	0	0
9/20/00	6	3,783	81	4.2	2	B2	1	1	0
9/20/00	7	3,831	82	5.6	2	B2	0	2	1

DISCUSSION

South Fork Yager Creek is a F3 channel type for the first 887 feet of stream surveyed, a B2 channel type for 3,290 feet, and a F2 channel type for the remaining 973 feet of the stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders, single and opposing wing-deflectors; fair for plunge-weirs, boulder clusters, channel constrictors and log cover. The suitability of B2 channel types for fish habitat improvement structure is as follows: excellent for plunge weirs, single and opposing wing-deflectors and log cover. The suitability of F2 channel types for fish habitat improvement structures is as follows; fair for plunge weirs, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 5-8, July 5-7, and August 3, 2000, ranged from 55 to 61 degrees Fahrenheit. Air temperatures ranged from 56 to 73 degrees Fahrenheit. This is a good water temperature 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 63% of the total length of this survey, riffles 17%, and pools 20%. The pools are relatively deep, with 28 of the 37 (75%) 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.

Three of the 35 pool tail-outs measured had embeddedness ratings of 1 or 2. Ten of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty-two of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Three of the 22 were unsuitable for spawning due to the dominant substrate being silt/sand/clay. The remainder of pool tails valued at 5 were dominated by large cobble or boulders. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Eight of the 35 pool tail-outs measured had gravel or small cobble as the dominant substrate.

The mean shelter rating for pools was 34. The shelter rating in the flatwater habitats was 33. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, root mass contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance 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 73%. Reach 1 had a canopy density of 87% while Reaches 2 and 3 had canopy densities of 65% and 77%, respectively. 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 50.8% and 49.3%, 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) South 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) 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 withYager Creek. Channel type is F3.

447' Opposing rock deflector structure causing 2 mid-channel pools.

538' Opposing rock deflector structure.

658' Boulder deflector structure on right bank. CCC site #765.

691' Boulder weir structure. CCC site # 845.

713' Electrofishing site #1.

807' Electrofishing site #2.

887' Channel type changes to a B2. Electrofishing site #3.

985' Opposing boulder deflector structure. CCC site #1160.

1,138' Boulder and log structure.

1,244' Boulder and log structure. CCC site #1490.

1,897' Opposing digger log structure. CCC site # 2290.

3,359' Log debris accumulation (LDA), 26' wide x 10' long x 8' high.

3,451' LDA, 72' wide x 18' high x 75' long. Probable barrier.

3,493' Electrofishing site #4.

3,680' Electrofishing site #5.

3,783' Electrofishing site #6.

3,831' Electrofishing site #7.

4,177' Channel type changes to a B2.

4,578' Tributary enters on right bank. Water temperature 59°F.

5,225' End of survey. No fish sighted since LDA at 3,451'. Increase in gradient noted and large boulders more prevalent.

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 TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	