STREAM INVENTORY REPORT

South Fork Albion River

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on South Fork Albion River and an unnamed right bank tributary.

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 South Fork Albion River. 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 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

South Fork Albion River is tributary to the Albion River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). South Fork Albion River's legal description at the confluence with Albion River is T16N R16W S17. Its location is 39°15′25″ north latitude and 123°40′14″ west longitude. South Fork Albion River is a first order stream and has approximately 6.3 miles of blue line stream according to USGS Elk, Mathison Peak, Comptche, and Navarro 7.5 minute quadrangles. South Fork Albion River drains a watershed of approximately 9.0 square miles. Elevations range from about 150 feet at the mouth of the river to 800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The surveyed portion of the watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 128.

METHODS

The habitat inventory conducted in South Fork Albion River 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, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types

encountered for the first time are further 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 Albion River 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.

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.

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 Albion River 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 dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were 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 South Fork Albion River, 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, having a bedrock tail-out, 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 Albion River, 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 Albion River, 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 Albion River, 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 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 Albion River. In addition, one site was 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 Albion River 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 the pool tail-outs
- 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 24, 25, 26, and July 1, 2, 6, 7, 8, and 15, 1998, was conducted by Kevin McKernan (CCC), Gina Capser, and Lisa Campbell (WSP\AmeriCorps). The total length of the stream surveyed was 37,414 feet with an additional 146 feet of side channel. In addition 2,318 feet of marsh was not surveyed.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 3.4 cfs on June 24, 1998, and it was measured to be 2.4 cfs on July 8, 1998.

South Fork Albion River is an F4 channel type for 5,841 feet (Reach 1), an F3 channel type for 3,136 feet, an F4 channel for 4,491 feet, an F3 channel type for 2,191 feet, and an E6 channel type for 9,981 feet, and an F4 channel type for 9,456 feet. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. E6 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and silt/clay-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 25% riffle units, 40% flatwater units, and 35% pool units (Graph 1). Based on total **length** of Level II habitat types there were 12% riffle units, 41% flatwater units, and 47% pool units (Graph 2).

Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were runs, 26%; mid-channel pools, 27%; and low gradient riffles, 21% (Graph 3). Based on percent total **length**, runs made up 24%, mid-channel pools 36%, and low gradient riffles 9%.

A total of 209 pools were identified (Table 3). Main channel pools were most frequently encountered at 76% and comprised 83% 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. One hundred ninety-two of the 209 pools (92%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 209 pool tail-outs measured, 9 had a value of 1 (4%); 38 had a value of 2 (18%); 68 had a value of 3 (33%); 58 had a value of 4 (28%) and 35 had a value of 5 (17%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning. In South Fork Albion River, 21 of the 35 pool tail-outs which were valued at 5 had silt/clay/sand or gravel too small to be suitable for spawning as the substrate. The other tail-outs were unsuitable for spawning due to the tail-outs being comprised of large cobble, boulder, bedrock or wood.

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 12, flatwater habitat types had a mean shelter rating of 16, and pool habitats had a mean shelter rating of 29 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 41. Main channel pools had a mean shelter rating of 23 and backwater pools had a

mean shelter rating of 14 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in South Fork Albion River. Large and small woody debris are lacking in many of the habitat types. Graph 7 describes the pool cover in South Fork Albion River.

Table 6 summarizes the dominant substrate by habitat type. Of the 11 low gradient riffles fully measured, 5 had a dominant substrate of gravel and 3 had a dominant substrate of small cobble. Gravel was the dominant substrate observed in 113 of the 209 pool tail-outs measured (54%). Small cobble was the next most frequently observed dominant substrate type and occurred in 17% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 91%. The mean percentages of deciduous and coniferous trees were 32% and 68%, respectively. Graph 9 describes the canopy in South Fork Albion River.

For the stream reach surveyed, the mean percent right bank vegetated was 79%. The mean percent left bank vegetated was 84%. The dominant elements composing the structure of the stream banks consisted of 58% sand/silt/clay, 19% cobble/gravel, 17% bedrock, and 6% boulder (Graph 10). Brush was the dominant vegetation type observed in 38.2% of the units surveyed. Additionally, 19.4% of the units surveyed had deciduous trees as the dominant vegetation type, and 13.2% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on July 16, 1998, in South Fork Albion River. The site was sampled by Kevin McKernan and Lisa Campbell.

The site sampled included habitat units 554-557, a run/riffle/pool combination approximately 34,000 feet from the confluence with the Albion River. The site yielded 4 steelhead.

DISCUSSION

South Fork Albion River is an F4 channel type for the first 5,841 feet of stream surveyed, an F3 channel type for the next 3,136 feet, an F4 channel for the next 4,491 feet, an F3 channel type for the next 2,191 feet, an E6 channel type for the next 9,981 feet, and an F4 channel type for the remaining 9,456 feet. The suitability of F4, F3, and E6 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. F3 channels are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover. E6 channels are good for bank-placed boulders and fair for opposing wing-deflectors.

The air temperatures recorded on the survey days of June 24, 25, 26, and July 1, 2, 6, 7, 8, and 15, 1998, ranged from 59 to 82 degrees Fahrenheit. Water temperatures ranged form 56 to 62 degrees Fahrenheit. This is a fair water temperature range for salmonids. To obtain a more complete temperature profile, temperature monitoring should be performed for several additional years.

Flatwater habitat types comprised 41% of the total **length** of this survey, riffles 12%, and pools 47%. The pools are relatively deep, with 192 of the 209 (92%) 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.

Nine of the 209 pool tail-outs measured had an embeddedness rating of 1. One-hundred-twenty-six of the pool tail-outs had embeddedness ratings of 3 or 4. Thirty-five of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. Twenty-one of the 35 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or gravel being too small to be suitable. 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 South Fork Albion River, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One hundred forty-nine of the 209 pool tail outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 29. The shelter rating in the flatwater habitats was 16. 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. Additionally, small woody debris contributes a small amount. 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 91%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 79% and 84%, 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 Albion River 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 in the pools is from boulders. Adding high quality complexity with woody cover in the pools is desirable.

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.

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.

Position (ft):	Comments:
0'	Begin survey at confluence with Albion River. Channel type is F4.
171'	Unimproved road ford branches off from right bank.
1,379'	Railroad flat car bridge with corrugated steel abutment. Boulder rip-rap lines up both sides up to 6' high. Bridge is 20' long x 80' wide x 12' high.
2,503'	Log debris accumulation 8' long x 20' wide x 7' high, retaining sediment 100' long x 2' high.
3,510'	Right bank tributary - not accessible to fish. Flow is less than 0.01 cfs.
3,763'	Left bank seep through 1' diameter corrugated metal pipe (CMP) running down from road.
3,968'	Left bank seep through 1' diameter CMP.
5,021'	Anderson Gulch enters from left bank. Flow is less than 0.5 cfs and is not accessible to fish beyond 150' due to impassible road culvert. Culvert contains no baffles.
5,738'	Channel type changes to F3.
5,960'	Gunari Gulch enters from right bank, not accessible to fish.

6,091'	Rip rap for bridge abutment, 60' long.
6,113'	Bridge, 12' long x 70' wide x 8' high.
6,529'	Left bank tributary, flow is less than less than 0.5 cfs.
7,450'	Excavated road tailings 50' wide x 100' high on right bank. Loose, unsorted, angular cobble/gravel reaching creek from tailings.
8,809'	Right bank erosion recruiting large woody debris and fine sediment.
8,872'	Log debris accumulation, 2' long x 25' wide x 2' high - good cover but backing sediment 100' long x 15' wide x 1' high.
9,527'	Norden Gulch enters from right bank, through 3' diameter CMP. Culvert has 9' high jump into opening and has a shallow jump pool. Creek contains good spawning habitat above the culvert.
11,104’	Left bank tributary.
11,510'’	Left bank seep.
12,012'’	Right bank road failure contributing fine sediment to stream.
12,591'’	Right bank erosion contributing large woody debris and fine sediment to stream.
12,795'’	Left bank erosion filling pool with sediment. Log debris accumulation, 12' long x 20' wide x 10' high - not a barrier.
13,103’	Log debris accumulation, 30' long x 8' wide x 3' high.
14,053'’	Log debris accumulation, 15' long x 30' wide x 8' high, retaining sediment 15' long x 10' wide x 2' high. Left bank erosion, 10' long x 10' high, delivering sediment to stream.
14,084’	Little North Fork Albion River enters through 3' diameter x 100' long culvert on right bank.
15,491'	Substrate composed of clay. Channel changes to E6.
15,685'	Channel has marsh characteristics.
15,714'	Surveyors exited stream at this point. No longer accessible to humans due to steep, narrow banks, and excessive overgrowth of bank vegetation, 1,538' not surveyed.

17,652'	CMP with trickle from road. Flow is less than 0.01 cfs.
21,723'	Very large bay tree on right bank, 10 feet form stream channel - good location identifier from road.
21,946'	Unit runs dry over 1.5' diameter CMP. High flows probably run over culvert, but this might create a problem for juvenile salmonid downstream migrants. This site needs to be evaluated for fish passage.
22,302'	Log debris accumulation, 40' long x 8' wide x 4' high - not a barrier.
23,016'	Left bank tributary.
23,127'	Road runs 5' from stream.
23,319'	Surveyors exited stream, not accessible to humans. 780' not surveyed.
24,743'	Log debris accumulation, 60' long x 13' wide x 3' high, not a barrier.
25,071'	Road runs 5' from stream for the next 176'.
25,404'	Log debris accumulation, 25' long x 15' wide x 4' high, not a barrier.
26,165'	Log debris accumulation, 20' long x 15' wide x 2' high, not a barrier.
27,136'	Right bank road ford. Water draft site.
27,163'	Bridge, 17' long x 60' wide x 7' high.
27,778'	Bridge, 12' long x 40' wide x 5' high.
29,906'	Road crossing through stream.
30,095'	Log debris accumulation, 5' long x 17' wide x 5' high, backing sediment 5' long x 10' wide x 2' high.
31,005'	Right bank tributary, dry. House approximately 400 feet from the stream.
31,506'	Two inch, unscreened PVC pipe on right bank, not currently taking water.
31,682'	Right bank tributary, less than 0.1 cfs, 60 degrees Fahrenheit. Fish observed up to 100 feet.
31,838'	Concrete weir with low-flow notch.
32,666'	Bull Team Gulch enters from right bank, 61 degrees Fahrenheit.

33,966'	Log debris accumulation, 8' long x 10' wide x 8' high, not a barrier.
34,245'	Log debris accumulation, 3' long x 7' wide x 6' high backing sediment 8' long x 4' wide x 3' high.
35,416'	Unnamed right bank tributary. See subsection report.
35,874'	Three foot high jump at head of pool.
35,918'	Log debris accumulation, 33' long x 12' wide x 3' high.
36,144'	Log debris accumulation, 10' long x 14' wide x 4' high, not a barrier.
36,169'	Four foot high jump at head of pool created by root mass.
36,303'	Culvert, 6' diameter with almost no grade, no jump required.
36,523'	Right bank erosion, 20' long x 7' high delivering fines to stream.
36,962'	Right bank erosion, 25' long x 15' high contributing fines.
37,414'	End of survey, due to lack of access.

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]	