STREAM INVENTORY REPORT

North Fork of South Fork Noyo River

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on North Fork of South Fork Noyo River and an unnamed 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 North Fork of South Fork Noyo 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

North Fork of South Fork Noyo River is tributary to the South Fork Noyo River, tributary to the Noyo River, located in Mendocino County, California (Map 1). North Fork of South Fork Noyo River's legal description at the confluence with South Fork Noyo River is T18N R16W S30. Its location is 39°23'27" north latitude and 123°41'4" west longitude. North Fork of South Fork Noyo River is a second order stream and has approximately 6.3 miles of blue line stream according to the USGS Noyo Hill 7.5 minute quadrangle. North Fork of South Fork Noyo River drains a watershed of approximately 8.5 square miles. Elevations range from about 120 feet at the mouth of the creek to 1400 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is primarily owned by state of California and is managed for timber production by the Jackson Demonstration State Forest.

METHODS

The habitat inventory conducted in North Fork of South Fork Noyo River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). 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 (Hopelain, 1994). 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. 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 North Fork of South Fork Noyo 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". North Fork of South Fork Noyo 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, 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 (Hopelain, 1995). Pool tail crest depth at each pool unit was measured in 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 North Fork of South Fork Noyo 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 North Fork of South Fork Noyo 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.

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 of South Fork Noyo 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 North Fork of South Fork Noyo 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 stream inventory is used to determine fish species and their distribution in the stream. In North Fork of South Fork Noyo River fish presence was observed from the stream banks, and three sites were electrofished using one 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 North Fork of South Fork Noyo 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 low gradient riffles
- 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 following results and discussion are for the mainstem North Fork of South Fork Noyo River. Results and discussion for the unnamed tributary are presented as a subsection following the main body of this report.

The habitat inventory of September 25, 26, 27 and October 2, 3, 4, 8, 9, 10, 11, 16, 1996, was conducted by Craig Mesman and Mark Dombrowski (CCC). The total length of the stream surveyed was 44,729 feet with an additional 1,730 feet of side channel.

A flow of 0.59 cfs was measured on October 3rd with a Marsh-McBirney Model 2000 flowmeter.

North Fork of South Fork Noyo River is an F4 channel type for the first 5,460 feet of stream surveyed, the next 1,400 feet of stream is a F1 channel type, then remainder of the stream, reverts to an F4 channel type for 37,869 feet. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel dominant substrates. F1 channels are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio, very stable bedrock controlled channels.

Water temperatures taken during the survey period ranged from 47 to 57 degrees Fahrenheit. Air temperatures ranged from 41 to 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 29% riffle units, 33% flatwater units, 35% pool units, and 3% was dry (Graph 1). Based on total **length** of Level II habitat types there were 20% riffle units, 43% flatwater units, 32% pool units, and 4% was dry (Graph 2).

Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 29%; mid-channel pool, 28%; and step run, 17% (Graph 3). Based on percent total **length**, step runs made up 28%, mid-channel pools 26%, and low-gradient riffles 20%.

A total of four hundred and one pools were identified (Table 3). Main channel pools were most frequently encountered at 80% 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 and eighty-eight of the four hundred and one pools had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 401 pool tail-outs measured, 99 (24.7%) had a value of 1; 128 (31.9%) had a value of 2; 79 (19.7%) had a value of 3; 24 (6.0%) had a value of 4; and 71 (17.7%) had a value of 5 or were unsuitable for spawning

(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. Pool habitat types had a mean shelter rating of 34, and flatwater habitats had a mean shelter rating of 20 (Table 1). Of the pool types, the main pools had the highest mean shelter rating at 41. Scour pools had a mean shelter rating of 19 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in North Fork of South Fork Noyo River. Small woody debris is the next most common cover type. Graph 7 describes the pool cover in North Fork of South Fork Noyo River.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 84% of the low gradient riffles measured. Small cobble was the next most frequently observed dominant substrate type and occurred in 13% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 89%. The mean percentages of deciduous and coniferous trees were 38% and 62%, respectively. Graph 9 describes the canopy in North Fork of South Fork Noyo River.

For the stream reach surveyed, the mean percent right bank vegetated was 82.6%. The mean percent left bank vegetated was 88.4%. The dominant elements composing the structure of the stream banks consisted of 13.57% bedrock, 1.16% boulder, 63.95% cobble/gravel, and 21.32% silt/clay (Graph 10). Brush was the dominant vegetation type observed in 35.27% of the units surveyed. Additionally, 11.24% of the units surveyed had deciduous trees as the dominant vegetation type, and 29.46% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on October 15, 1995, in North Fork of South Fork Noyo River. The sites were sampled by Craig Mesman and Mark Dombrowski.

The first site sampled included habitat units 5 through 7, a mid-channel pool, low gradient riffle and run, approximately 328 feet from the confluence with South Fork Noyo River. The site yielded 16 steelhead, 2 coho, 2 stickleback, and 6 Pacific giant salamanders.

The second site included habitat units 90 through 94, a bedrock sheet, mid-channel pool, step run, trench pool, and bedrock sheet, located approximately 7,074 feet above the creek mouth. The site yielded 15 steelhead, 1 coho, and 2 stickleback.

The third site sampled included habitat units 381 through 384, a mid-channel pool, low gradient riffle, run and plunge pool, located approximately 22,400 feet above the creek mouth. The site yielded 13 steelhead, 1 sculpin, 4 Pacific giant salamanders, and 1 tailed-frog.

DISCUSSION

North Fork of South Fork Noyo River is an F4 channel type for the first 5460 feet of stream surveyed, an F1 channel type for the next 1400 feet, and reverts to an F4 channel type for the remaining 37,869 feet. The suitability of F4 and F1 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank placed boulders, fair for low-stage weirs, single and opposing wing deflectors, channel constrictors and log cover, and poor for medium stage weir and boulder clusters. F1 channel types good for bank placed boulders, fair for single wing deflectors and log cover, and poor for low and medium stage weirs, boulder clusters and opposing wing deflectors.

The water temperatures recorded on the survey days September 25 through October 16, 1995, ranged from 47 to 57 degrees Fahrenheit. Air temperatures ranged from 41 to 65 degrees Fahrenheit. 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 43% of the total **length** of this survey, riffles 20%, pools 32%, and dry habitat the remaining 4%. The pools are relatively deep, with 188 of the 401 (46.9%) 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.

Of the 401 pool tail-outs measured, 174 (43.4%) had embeddedness ratings of 3, 4 or 5. Only 99 (24.7%) had a 1 rating. 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 of South Fork Noyo River, 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 low with a rating of 34. The shelter rating in the flatwater habitats was slightly lower at 20. 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 structure 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.

Of the 38 low gradient riffles fully measured, 97% had gravel or small cobble as the dominant substrate. This is considered good for spawning salmonids.

The mean percent canopy density for the stream was 89%. This is a high percentage of canopy. 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 82.6% and 88.4%, 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 of South Fork Noyo River should be managed as an anadromous, natural production stream.

2) 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 and in some areas the material is locally available.

3) 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.

4) 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.

COMMENTS AND LANDMARKS

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

0'	Begin survey at confluence with South Fork Noyo River. Channel type is F4.
328'	First electrofishing site.
359'	Downstream side of bridge, 18' long x 32' wide. Five feet above the water.
2,208'	Left bank tributary. Flow estimated at less than 0.1 cfs.
4,341'	Left bank tributary. Very steep, not anadromous.
5,275'	Right bank tributary. Steep, narrow, no fish observed. Also an old bridge crossing.
5,460'	Channel type changes to an F1.
5,872'	Old bridge abutments on both banks.

6,340'	Old bridge abutments on both banks.
6,404'	Brandon Gulch enters from the right bank.
6,719'	Bridge crossing, 40' wide x 28' long. Fourteen feet above the water.
6,860'	Channel type changes to an F4.
7,074'	Second electrofishing site.
8,227'	Old log bridge abutments on both banks.
11,729'	Tributary enters from the left bank, dry.
14,599'	Tributary enters from the right bank, dry.
15,945'	Tributary enters from the left bank. Estimated at less than 0.1 cfs. Steep and narrow, not anadromous.
16,799'	Tributary enters from the right bank.
18,520'	Tributary enters from the left bank. Steep and narrow.
19,051'	Log debris accumulation (LDA), 12' long x 30' wide x 6' high. Not a barrier.
19,528'	Tributary enters from the left bank. Flow estimated at less than 0.1 cfs. Low gradient at the mouth. Fish observed.
19,632'	Last campsite on the right bank.
22,114'	Wooden trestle on the left bank.
22,400'	Third electrofishing site.
22,892'	Right bank erosion delivered two trees into the channel, 70' long x 60' high.
22,947'	Tributary enters from the right bank. Flow estimated at 0.15 cfs. See subsection report.
23,702'	Tributary enters from the left bank, dry.
23,810'	LDA, 20' long x 40' wide x 7' high, caused by an old trestle. Not retaining gravel.
23,997'	Trestle on the left bank.

24,386' Trestle on the left bank.

24,611' Trestle on the left bank.

24,670' Trestle crosses to the right bank.

25,129' Trestle on the left bank.

25,408' Trestle on the right bank.

25,738' LDA, 20' long x 60' wide x 6' high. Not retaining gravel.

25,811' Trestle on the right bank.

26,579' Trestle on the left bank.

26,677' LDA, 30' wide x 7' high, caused by the instream railroad trestle.

27,166' Tributary enters from the left bank.

27,378' Trestle on the right bank.

27,811' LDA, 30' long x 50' wide x 8' high, with associated left bank erosion. Not retaining gravel.

28,651' Tributary enters from the left bank. Trickle of a flow.

28,483' Tributary enters from the right bank. Flow estimated at less than 0.1 cfs. Probably not anadromous.

28,807' LDA, 30' long x 35' wide x 5' high. Not retaining gravel.

29,698' LDA, 15' long x 15' wide x 8' high. Retaining some gravel but not a barrier.

30,843' Trestle on the left bank.

31,178' LDA, 50' long x 35' wide x 7' high. Not retaining gravel, flow going under the LDA.

31,347' Left bank erosion, 50' long x 65' high. Has contributed large wood and fines to the stream.

31,548' Trestle crosses the stream.
32,170' Trestle crosses the stream.

32,219' Tributary enters from the left bank. The mouth is clogged with woody debris.

32,444' LDA, 45' long x 20' wide x 6' high, caused by a railroad trestle. Not retaining gravel. The flow is going under the LDA.

32,677' Foot bridge.

32,789' LDA, 40' long x 60' wide x 12' high. Retaining gravel.

33,109' LDA, 30' long x 20' wide x 4' high. Not retaining gravel.

33,636' Trestle crosses stream.

33,741' Foot bridge.

33,872' Tributary enters from the left bank.

35,010' LDA, 10' long x 20' wide x 5' high. Retaining some gravel.

35,591' Tributary enters from the right bank.

35,643' Log foot bridge.

35,891' Log foot bridge.

36,527' Trail crosses the stream.

37,496' Log foot bridge.

37,910' Log foot bridge.

37,957' Tributary enters from the left bank, dry.

38,177' Tributary enters from the left bank. Accessible to fish but none observed.

39,058' Log foot bridge.

39,505' Log foot bridge.

40,039' Log foot bridge.

40,069' Railroad trestle.

40,506' Narrow bedrock channel with debris blocking approximately 40% of the channel width. Retaining gravel, possible barrier.

40,680' Fourteen foot high bedrock falls. Fish observed in the pool below the falls. Fish also observed upstream of the falls, possibly resident salmonids.

40,888' LDA, 20' long x 7' wide x 5' high. Retaining gravel.

41,037' LDA, 4' high. Retaining gravel.

41,274' LDA, 3' high. Retaining gravel.

41,734' LDA, 3' high. Retaining gravel.

41,949' Trail on the right bank.

42,093' LDA, 50' long.

42,468' Log foot bridge.

42,669' LDA, 3.5' high. Retaining gravel.

42,672' Trail on the right bank.

43,540' Log foot bridge. End of the left bank road.

44,508' End of survey at the confluence of the right bank tributary. No fish observed for approximately 4,000 feet.

References

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, 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