STREAM INVENTORY REPORT

LITTLE NORTH FORK BIG RIVER

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Little North Fork Big River, upstream of the confluence with East Branch Little North Fork Big River. 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 Little North Fork Big River. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Little North Fork Big River.

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

Little North Fork Big River is tributary to Big River, tributary to the Pacific Ocean, located in Mendocino County, California (Figure 1). Little North Fork Big River's legal description at the confluence with Big River is T17N R17W S24. Its location is 39E18N510 north latitude and 123E42N160 west longitude. Little North Fork Big River is a second order stream and has approximately 12.5 total miles of blue line stream according to the USGS Mathison Peak, Noyo Hill, and Comptche 7.5 minute quadrangles. Little North Fork Big River drains a watershed of approximately 12.8 square miles. Summer base runoff is approximately 0.03 cubic feet per second (cfs) above Berry Gulch. Elevations range from about 20 feet at the mouth of the creek to 1000 feet in the headwater areas. Redwood and Douglas fir forest dominates the watershed. The watershed is partly located within Jackson Demonstration State Forest and is managed for timber production. Vehicle access exists via California Department of Forestry and Fire Protection (CDF) Road 70.

METHODS

The habitat inventory conducted in Little North Fork Big River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 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). Little North Fork Big River personnel were trained in May, 1995, by Gary Flosi. 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 Little North Fork Big 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". Little North Fork Big 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 (*Sampling Levels for Fish Habitat Inventory*, 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 Little North Fork Big 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), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) 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 Little North Fork Big 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*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Little North Fork Big 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 Little North Fork Big River, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) 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 Little North Fork Big 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 Lotus 1,2,3. Graphics developed for Little North Fork Big 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 habitat inventory of October 2-11, 1995, was conducted by Chris Coyle (CCC) and Shelly Dunn, Bettina Chimarios, and Kyle Young (WSP/AmeriCorps). The total length of the stream surveyed was 19,441 feet with an additional 210 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.03 cfs on October 12, 1995.

Little North Fork Big River is a G4 channel type for the entire 19,441 feet of stream reach surveyed. G4 channels are entrenched, gully-like, step-pool channels on moderate gradients with low width/depth ratios.

Water temperatures ranged from 53 to 59 degrees Fahrenheit. Air temperatures ranged from 48 to 71 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 47% pool units, 30% flatwater units, and 16% riffle units (Graph 1). Based on total **length** of Level II habitat types there were 52% pool units, 34% flatwater units, and 8% riffle units (Graph 2).

Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools 24%, glides 20%, and low-gradient riffles 15% (Graph 3). Based on percent total **length**, mid-channel pools made up 26%, glides 20%, and trench pools 19%.

A total of 287 pools were identified (Table 3). Main channel pools were most frequently encountered at 83% and comprised 87% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. One hundred and forty-five of the 287 pools (51%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 198 pool tail-outs measured, 15 had a value of 1 (7.6%); 27 had a value of 2 (13.6%); 76 had a value of 3 (38.4%); and 80 had a value of 4 (40.4%) (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 at 33, and riffle habitats had a mean shelter rating of 21 (Table 1). Main channel pools had a mean shelter rating at 43, and backwater pools had a mean shelter rating of 28 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Little North Fork Big River. Graph 7 describes the pool cover in Little North Fork Big River.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 8 of the 10 low gradient riffles measured (80%). Silt 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 89%. The mean percentages of deciduous and coniferous trees were 10% and 90%, respectively. Graph 9 describes the canopy in Little North Fork Big River.

For the stream reach surveyed, the mean percent right bank vegetated was 87%. The mean percent left bank vegetated was 86%. The dominant elements composing the structure of the stream banks consisted of 1.4% bedrock, 0.7% boulder, 33.3% cobble/gravel, and 64.6% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 82% of the units surveyed. Additionally, 4% of the units surveyed had deciduous trees as the dominant vegetation type, and 8% 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 5, 1995, in Little North Fork Big River. The units were sampled by Craig Mesman and Heidi Hickethier (CCC).

The first site sampled included habitat units 166-172, a series of pools, runs, and a riffle approximately 6,767 feet from the confluence with East Branch Little North Fork Big River. This site had a length of 180 feet. The site yielded twelve 0+ coho, fifteen 0+ steelhead, and four 1+ steelhead.

The second site included habitat units 251-255, a series of pools and runs located approximately 10,603 feet above the survey start. This site had a length of 118 feet. The site yielded nine 0+ coho, two 0+ steelhead, and five 1+ steelhead.

The third site sampled included habitat units 595-603, a series of pools, runs, and riffles located approximately 19,341 feet above the survey start. The site had a length of 100 feet. The site yielded two 1+ steelhead.

DISCUSSION

Little North Fork Big River

Little North Fork Big River is a G4 channel type for the entire 19,441 feet of stream surveyed. The suitability of G4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for low-stage weirs, opposing wing deflectors, and log cover; and poor for medium-stage weirs, boulder clusters, and single wing deflectors.

The water temperatures recorded on the survey days October 2-11, 1995, ranged from 53 to 59 degrees Fahrenheit. Air temperatures ranged from 48 to 71 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 34% of the total **length** of this survey, riffles 8%, and pools 52%. The pools are relatively deep, with 145 of the 287 (50.5%) 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.

One hundred and fifty-five of the 199 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 15 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 Little North Fork Big 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 33. The shelter rating in the flatwater habitats was lower at 16. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large 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.

Eight of the 10 low gradient riffles measured had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 89%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 87% and 86%, 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.

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Coho were observed through unit 553, 18,141 feet upstream from the confluence with East Branch Little North Fork Big River. No barriers to fish migration were noted between that point and the culverts at the end of the surveyed reach, and juvenile steelhead were sampled just below the culverts, suggesting that the entire 19,441 feet of stream surveyed are available to anadromous fish.

RECOMMENDATIONS

1) Little North Fork Big River should be managed as an anadromous, natural production stream.

2) 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.

3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available. In particular, large wood should be placed in a manner to increase backwater areas to produce winter holdover habitat.

4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 6,705', should then be treated to reduce the amount of fine sediments entering the stream.

5) 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.

PROBLEM SITES 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 East Branch Little North Fork Big River. Channel type is G4.

637' Relic trestle pilings.

2362' Berry Gulch enters right bank.

2468' Log and debris accumulation (LDA) 4' high x 18' wide x 19' long retaining gravel 5' deep at base. Left bank erosion 7' high x 10' long.

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2866' Left bank erosion 6' high x 173' long.

3007' LDA 8' high x 20' wide x 32' long retaining gravel 2' deep at base. Right bank erosion.

3169' Dry left bank tributary.

4248' Right bank erosion 6' high x 100' long.

4325' LDA 3' high x 15' wide x 10' long.

4858' Left bank erosion 6' high x 86' long.

5183' Right bank erosion 10' high x 66' long.

5268' Right bank tributary.

5810' Dry left bank tributary.

6184' Right bank erosion 25' long.

6336' Right bank erosion 9' high x 20' long.

6374' Left bank erosion 60' long.

6392' LDA 6' high x 16' wide x 41' long retaining gravel 2' deep at base.

6467' Right bank erosion 134' long.

6635' LDA 2' high x 6' wide x 8' long.

6705' Left bank erosion 12' high x 30' long.

7375' Right bank tributary.

11539' LDA 3' high x 75' wide x 15' long retaining gravel 2' deep x 50' wide x 50' long. Not a barrier.

12246' Left bank erosion 15' high x 30' long contributing fines.

12340' Down log creates 3' jump with 2' of sediment retention.

12462' Right bank seep.

12972' Down log creates 4' jump with 3' of sediment retention.

13348' Corrugated metal pipe (CMP) culvert, 10' diameter x 68' long, placed below grade with a natural bottom.

13540' LDA 4' high x 15' wide x 5' long retaining gravel 2' deep at base. Not a barrier.

13636' Left bank tributary. Estimated flow 1 gallon per minute (gpm).

13707' Many 4' diameter chunks in channel. No gravel retention.

14094' Dry right bank tributary.

14373' Log raft 15' wide x 47' long. No gravel retained and not a barrier (NBNG).

14734' Log raft 15' wide x 22' long. NBNG.

15818' Relic railroad trestle.

15909' Left bank tributary. Estimated flow 1 gpm. Possibly fish-bearing.

16283' LDA 5' high x 15' wide x 10' long. NBNG.

19401' Dual CMP culverts 4' diameter x 40' long. No baffles. Not a barrier.

19441' End of survey. Channel above culverts is congested with emergent aquatic vegetation.

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