STREAM INVENTORY REPORT

EAST BRANCH LITTLE NORTH FORK BIG RIVER

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on the East Branch Little North Fork Big River. The survey began at the confluence with Little North Fork Big River and extended upstream 2.3 miles.

The East Branch Little North Fork Big River 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 East Branch Little North Fork Big 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

East Branch Little North Fork Big River is a tributary to the Little North Fork Big River, tributary to the Big River, located in Mendocino County, California (Map 1). The East Branch Little North Fork Big River's legal description at the confluence with Little North Fork Big River is T17N R16W S08. Its location is 39°20′34″ north latitude and 123°40′13″ west longitude. The East Branch Little North Fork Big River is a second order stream and has approximately 2.4 miles of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. The East Branch Little North Fork Big River drains a watershed of approximately 1.8 square miles. Elevations range from about 200 feet at the mouth of the creek to 800 feet in the headwater areas. Mixed hardwood and mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production and rangeland. Vehicle access exists via Highway 20 east from Willits.

METHODS

The habitat inventory conducted in East Branch Little North Fork Big 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 (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 East Branch 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 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". East Branch 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. 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 East Branch 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) 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 East Branch 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. 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 East Branch 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 East Branch Little North Fork Big 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 (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in East Branch Little North Fork Big River. In addition, three 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 East Branch 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
- 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 30-July 23, 2002, was conducted by Bob Pagliuco and Lori Schmitz (WSP). The total length of the stream surveyed was 12,376 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.05 cfs on July 1, 2002.

The East Branch Little North Fork Big River is an A4 channel type for the first 4,560 feet of the stream surveyed and a B4 channel type for the remaining 7,816 feet surveyed. A4 channels are steep, narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a gravel channel. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools and very stable profile with stable banks and a gravel channel.

Water temperatures taken during the survey period ranged from 55° to 65° Fahrenheit. Air temperatures ranged from 58° to 81° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 31% riffle units, 23% flatwater units, and 39% pool units (Graph 1). Based on total length of Level II habitat types there were 18% riffle units, 20% flatwater units, and 44% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 31%; mid-channel pool, 26%; and run, 21% (Graph 3). Based on percent total length, step pools made up 23%, mid-channel pools 20%, and low gradient riffles 18%.

A total of 130 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 99%, and comprised 99% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Forty-five of the 130 pools (34.6%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 125 pool tail-outs measured, 46 had a value of 1 (36.8%); 18 had a value of 2 (14.4%); 22 had a value of 3 (17.6%); 19 had a value of 4 (15.2%); and 20 had a value of 5 (16%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 32, flatwater habitat types had a mean shelter rating of 35, and pool habitats had a mean

shelter rating of 68 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 68. Scour pools had a mean shelter rating of 60 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 80% of pool tail-outs while silt/clay was the next most frequently observed substrate type, at 12%.

The mean percent canopy density for the surveyed length of East Branch Little North Fork Big River was 88%. The mean percentages of deciduous and coniferous trees were 29% and 71%, respectively. Graph 9 describes the mean percent canopy in East Branch Little North Fork Big River.

For the stream reach surveyed, the mean percent right bank vegetated was 92.1%. The mean percent left bank vegetated was 94.7%. The dominant elements composing the structure of the stream banks consisted of 5.67% bedrock, 1.33% boulder, 13.33% cobble/gravel, and 79.67% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 45.33% of the units surveyed. Additionally, 30.33% of the units surveyed had grass as the dominant vegetation type, 17% had deciduous trees as the dominant vegetation and 7% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in East Branch Little North Fork Big River on July 24, 2002. Water temperature taken during the electrofishing period was 58° Fahrenheit. Air temperatures ranged from 64° to 68° Fahrenheit. The sites were sampled by Allan Renger (DFG), Bob Pagliuco, Lori Schmitz, and Hillary Kleeb (WSP).

The first site was habitat unit 0064, a mid-channel pool located approximately 2,584 feet above the creek mouth. The site yielded one age one-plus steelhead and 26 young-of-the-year coho.

The second site sampled was habitat unit 0072, a mid-channel pool approximately 3,653 feet from the confluence with Little North Fork Big River. The site yielded 11 young-of-the-year coho.

The third site sampled was habitat unit 0144, a step pool located approximately 5,194 feet above the creek mouth. The site yielded one age one-plus steelhead and 25 young-of-the-year coho.

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The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	SH 0+	SH 1+	coho 0+
7/24/02	1	2,584	0064	4.2	1	A4	0	1	26
7/24/02	2	3,653	0072	4.2	1	A4	0	0	11
7/24/02	3	5,194	0144	4.4	2	B4	0	1	25

DISCUSSION

The East Branch Little North Fork Big River is an A4 channel type for the first 4,560 feet of stream surveyed and a B4 channel type for the remaining 7,816 feet. The suitability of A4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors, and log cover; poor for boulder clusters and single wing-deflectors. The suitability of B4 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 30-July 24, 2002, ranged from 55° to 65° Fahrenheit. Air temperatures ranged from 58° to 81° degrees Fahrenheit. This is an acceptable 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 20% of the total length of this survey, riffles 18%, and pools 44%. The pools are relatively shallow, with only 45 of the 130 (34.6%) 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. Installing structures that will deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Sixty-four of the 125 pool tail-outs measured had embeddedness ratings of 1 or 2. Forty-one of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in East Branch Little North Fork Big River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One-hundred-eight of the 130 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 68. The shelter rating in the flatwater habitats was 35. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, small woody debris and aquatic vegetation contribute to the overall cover. 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 88%. Reach 1 had a canopy density of 89% while Reach 2 had a canopy density of 88%. 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 92.1% and 94.7%, 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) East Branch Little North Fork Big River should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are close to exceeding 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) Where feasible, design and engineer pool enhancement structures to deepen existing pool habitat. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from large and small woody debris. Additional complexity composed of large wood cover is desirable.

5) 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.

0'	Begin survey at confluence with Little North Fork Big River. Channel type is A4.
533'	Old railroad trestle providing woody cover in stream.
797'	Log debris accumulation (LDA), 110' long x 30' wide x 14' high. Composed of 44 pieces of wood.
1,041'	LDA, 75' long x 35' wide x 5' high. Composed of 21 pieces of wood.
1,978'	Spring enters stream on left bank.
2,052'	Railroad trestle over creek.
2,245'	LDA, 20' long x 25' wide x 8' high. Composed of 16 pieces of wood.
2,584'	Electrofishing site #1.
3,053'	Old railroad trestle above creek providing good pool habitat.
3,543'	LDA, 30' long x 22' wide x 5' high. Composed of 14 pieces of wood. Retaining sediment.
3,646'	Tributary enters on left bank and was dry at the time of survey.
3,653'	Electrofishing site #2.
4,633'	Channel type changes from A4 to B4.
5,194'	Electrofishing site #3.
5,817'	LDA, 20' long x 12' wide x 5' high. Composed of 11 pieces of wood. Retaining sediment. Possible barrier to juvenile salmonids.
6,075'	LDA, 20' long x 16' wide x 8' high. Composed of 7 pieces of wood. Retaining sediment. Possible barrier to juvenile salmonids.
6,557'	Tributary enters on left bank and was dry at the time of survey.
6,678'	Old railroad trestle paralleling stream for approximately 300 feet, often directly over the stream.

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6,921' Six, 1+ salmonids in pool.

7,448' Small spring enters left bank.

7,587' Tributary enters right bank and does not appear accessible to fish. Water temperature was 57° F.

9,220' Six inch long salmonid observed.

9,713' Steep 5' drop at the top of pool. Probable juvenile passage obstruction. Adults could possibly pass during winter flows.

9,832' Recent road built on right bank. No vegetation on right or left bank for 80 feet. Slash and gravel stabilizing bank. Stream filled with algae.

12,376' End of survey due to dry channel.

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.