STREAM INVENTORY REPORT

North Branch North Fork Elk River

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on North Branch North Fork Elk River to assess habitat conditions for anadromous salmonids. 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 Branch North Fork Elk River. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of spawning surveys having been conducted on North Branch North Fork Elk River. 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.

WATERSHED OVERVIEW

North Branch North Fork Elk River is tributary to North Fork Elk River, a tributary to Elk River, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California. North Branch North Fork Elk River's legal description at the confluence with North Fork Elk River is T04N R01E S35. Its location is 40.6867 degrees north latitude and 124.0331 degrees west longitude. North Branch North Fork Elk River is a second order stream and has approximately 3.2 total miles of blue line stream according to the USGS McWhinney Creek 7.5 minute quadrangle. North Branch North Fork Elk River is approximately 2.0 miles in length. North Branch North Fork Elk River drains a watershed of approximately 4.0 square miles. Elevations range from about 440 feet at the mouth of the creek to 1,800 feet in the headwater areas. Redwood forest and Douglas fir forest dominate the watershed. The watershed is privately owned and is managed for timber production. Access is via a locked gate on the Wrigley Road.

METHODS

The habitat inventory conducted in North Branch North Fork Elk 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 that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). North Branch North Fork Elk River personnel were trained in June, 1994, by Gary Flosi and Scott Downie. This inventory was conducted by a two-person team.

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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 Branch North Fork Elk 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. Flows should also be measured or estimated at major tributary confluences.

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 each tenth unit typed. The time of the measurement is also recorded. Both temperatures are taken in 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 Branch North Fork Elk 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. Unit measurements included mean length, mean width, mean depth, and maximum depth. 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 Branch North Fork Elk 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).

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 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 Branch North Fork Elk 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 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 is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In North Branch North Fork Elk River, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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 Branch North Fork Elk River, the dominant bank composition type and the dominant vegetation type of both the right and left banks 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. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual.*

Biological inventory was conducted in North Branch North Fork Elk River to document the fish species composition and distribution. Four sites were electrofished in North Branch North Fork

Elk River using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

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 North Branch North Fork Elk 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

The habitat inventory of May 23 through June 16, 1994 was conducted by Jason MacDonnell, Chris Coyle, Craig Mesman, and Charles Bartolotta (CCC). The total length of the stream surveyed was 9,862 feet with an additional 255 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.1 cfs on June 1, 1994.

North Branch North Fork Elk River is an F4 channel type for the first 9,403 feet of stream reach surveyed (Reach 1) and an F3 for the final 459 feet (Reach 2). F-type channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios. F4 channels

have gravel-dominant substrates, while F3 channels have cobble-dominant substrates.

Water temperatures ranged from 52 to 56 degrees Fahrenheit. Air temperatures ranged from 55 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, pools made up 44%, riffles 28%, and flatwater 27% (Graph 1). Flatwater habitat types made up 35% of the total survey length of the survey, pools 35%, and riffles 30% (Graph 2).

Sixteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent occurrence were low gradient riffles 28%; mid-channel pools 24%; and runs 13% (Graph 3). By percent total length, low gradient riffles made up 30%, mid-channel pools 20%, and step runs 20%.

One-hundred-fifty-five pools were identified (Table 3). Main channel pools were most often encountered at 55% and comprised 59% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Eighty-three of the 155 pools (54%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 146 pool tail-outs measured, 25 had a value of 1 (17%); 92 had a value of 2 (63%); 20 had a value of 3 (14%); and nine had a value of 4 (6%). On this scale, a value of one is the best for fisheries (Graph 6).

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 the highest shelter rating at 49. Flatwater habitats followed with a rating of 17 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 67. Main channel pools had a mean shelter rating of 41 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 89 of the 98 low gradient riffles (91%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 7% of the low gradient riffles (Graph 8).

Seventeen percent of the survey reach lacked shade canopy. Of the 83% of the stream covered with canopy, 43% was composed of deciduous trees, and 57% was composed of coniferous trees. Graph 9 describes the canopy in North Branch North Fork Elk River.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 91%. The mean percent left bank vegetated was 93%. The dominant elements composing the structure of the stream banks consisted of 73.0% sand/silt/clay, 27% cobble/gravel, and 1%

bedrock (Graph 10). Deciduous trees were the dominant vegetation type noted in 52% of the units surveyed. Additionally, 13% of the units had coniferous trees as the dominant vegetation type, including downed trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on June 23 and 24, 1994 in North Branch North Fork Elk River. The units were sampled by Chris Coyle, Craig Mesman, Jason MacDonnell, and Charles Bartolotta (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was Habitat Units #003 and #004, a riffle/mid-channel pool combination approximately 79 feet from the confluence with North Fork Elk River. This site had an area of 713 square feet and a volume of 714 cubic feet. The unit yielded 20 steelhead ranging from 32 to 175 mm, five coho ranging from 47 to 56 mm, and four Pacific giant salamanders.

The second site was Habitat Units #093, #094, and #095, a mid-channel pool/riffle/run combination located approximately 2,894 feet above the creek mouth. This site had an area of 605 square feet and a volume of 423 cubic feet. The site yielded nine steelhead ranging from 84 to 153 mm, two red-legged frogs, and seven Pacific giant salamanders.

The third site sampled was Habitat Units #289 and #290, a log enhanced lateral scour pool and low gradient riffle located approximately 8,529 feet above the creek mouth and just downstream from a 6 foot diameter log which is a suspected barrier. The site had an area of 448 square feet and a volume of 229 cubic feet. The site yielded one steelhead 103 mm long, one unidentified frog, and two Pacific giant salamanders.

The fourth site sampled was Habitat Units #299 through #304, a mid-channel pool/low gradient riffle/run/log enhanced lateral scour pool/low gradient riffle/mid-channel pool combination located approximately 8,769 feet above the creek mouth and just upstream from the suspected log barrier. The site had an area of 1,131 square feet and a volume of 436 cubic feet. No fish were collected.

DISCUSSION

North Branch North Fork Elk River has two channel types: F3 and F4. F3 channels are considered good for bank-placed boulders and single and opposing wing deflectors; fair for low-stage weirs, random boulder placement, channel constrictors, bank cover, and log cover structures; and poor for medium-stage weirs. F4 channels are considered good for bank-placed boulders; fair for low-stage weirs, single and opposing wing deflectors, channel constrictors, bank cover, and log cover structures; and poor for medium-stage weirs and random boulder placement.

The water temperatures recorded on the survey days May 23 through June 16, 1994 ranged from 52 to 56 degrees Fahrenheit. Air temperatures ranged from 55 to 72 degrees Fahrenheit. This is

an excellent water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 35% of the total length of this survey, riffles 30%, and pools 35%. The pools are relatively deep, with 83 of the 155 pools having a maximum depth greater than two feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total 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 increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Twenty-nine of the 146 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 25 had an embeddedness rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In North Branch North Fork Elk River, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was moderate with a rating of 49. The shelter rating in the flatwater habitats was lower at 17. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, small woody debris and undercut banks contribute 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.

Ninety-six of the 98 low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 83%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

The percentage of right and left bank covered with vegetation was high at 91% and 93%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

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RECOMMENDATIONS

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

2) Increase woody cover in the pools and flatwater habitat units. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

3) Where feasible, design and engineer pool enhancement structures to increase the number of pools or the depth of existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

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

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.

6) There are several log debris accumulations present on North Branch North Fork Elk River that are retaining large quantities of gravel. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

PROBLEM SITES AND LANDMARKS

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

Position (ft):	Comments:
0'	Start of survey at the confluence with North Fork Elk River. Channel type is F3.
138'	Right bank erosion site measures 8' high x 20' long and is contributing fine sediment to the channel.
436'	Small log jam with no jump clearance. Reduced numbers of fish observed above this point.
965'	Collapsed log stringer bridge.
1092'	Left bank erosion site measures 8' high x 20' long and is contributing fine sediment to the channel.

1473' Right bank tributary. Inaccessible to fish.

1793' Loosely consolidated log debris accumulation (LDA) measures 4' high x 10' wide x 20' long. It is not retaining sediment.

2183' LDA measures 8' high x 40' wide x 10' long. It is retaining a volume of gravel measuring 3' deep x 40' long.

2505' LDA measures 5' high x 15' wide x 15' long. It is not retaining sediment.

3670' Doe Creek enters right bank.

5941' Left bank slump measures 12' high x 25' long.

6309' Left bank tributary. No fish observed in first 50'.

6522' Collapsed log stringer bridge.

6958' Slump measures 10' high x 30' long and contributing fine sediment to the channel.

7074' Right bank tributary. No fish observed in first 100'.

8972' LDA measures 10' high x 20' wide x 10' long.

8981' Left bank erosion site measures 6' high x 20' long and is contributing gravel to the channel.

9054' Right bank erosion site measures 4' high x 48' long and is contributing sand and gravel to the channel.

9403' Channel type changes to F4.

9600' LDA measures 5' high x 35' wide x 50' long. It is retaining gravel. Right bank slump is contributing sand to the channel.

9862' End of survey. End of suitable anadromous fish habitat.

LEVEL III and LEVEL IV HABITAT TYPE KEY

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