

STREAM INVENTORY REPORT

Little North Fork Elk River

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Little 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 Little 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 adult spawning surveys having been conducted on Little 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

Little North Fork Elk River is tributary to the North Branch North Fork Elk River, a 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. Little North Fork Elk River's legal description at the confluence with North Branch North Fork Elk River is T04N R01E S36. Its location is 40.6881 degrees north latitude and 124.0119 degrees west longitude. Little North Fork Elk River is an intermittent stream according to the USGS McWhinney Creek and Iaqua Buttes 7.5 minute quadrangles. Little North Fork Elk River drains a watershed of approximately 0.5 square miles. Elevations range from about 510 feet at the mouth of the creek to 2,000 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. Foot access is available from the terminus of Wrigley Road approximately 1.5 miles north-east to the mouth of Little North Fork Elk River.

METHODS

The habitat inventory conducted in Little 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). Little 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.

Little North Fork Elk River

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 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 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 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 Little 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).

Little North Fork Elk River

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 Little 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 densimeters and is a measure of the water surface shaded during periods of high sun. In Little 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 Little North Fork Elk River, the dominant 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 Little North Fork Elk River to document the fish species composition and distribution. One site was electrofished in Little North Fork Elk River using a

Little North Fork Elk River

Smith-Root Model 12 electrofisher. The site was end-blocked with nets to contain the fish within the sample reach. Fish from the 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 Little 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 June 24 and June 27, 1994 was conducted by Jason MacDonnell and Charles Bartolotta (CCC). The total length of the stream surveyed was 1,790 feet.

Flow was not measured on Little North Fork Elk River.

Little North Fork Elk River is an F4 channel type for the entire 1,790 feet of stream reach surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel substrates.

Little North Fork Elk River

Water temperatures ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 57 to 63 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, pools made up 39%, riffles 33%, and flatwater 29% (Graph 1). Riffle habitat types made up 38% of the total survey length, flatwater 37%, and pools 24% (Graph 2).

Ten 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, 26%; mid-channel pools, 23%; and step runs, 18% (Graph 3). By percent total length, step runs made up 29%, low gradient riffles 26%, and mid-channel pools 13%.

Thirty-one pools were identified (Table 3). Main channel pools were most often encountered at 74% and comprised 74% 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. Nine of the 31 pools (29%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 28 pool tail-outs measured, six had a value of 2 (21%); eight had a value of 3 (29%); and 14 had a value of 4 (50%). 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 46. Riffle habitats followed with a rating of 39 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 84. Backwater pools had a mean shelter rating of 57 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 15 of the 21 low gradient riffles (71%). Sand was the next most frequently observed dominant substrate type and occurred in 24% of the low gradient riffles (Graph 8).

Six percent of the survey reach lacked shade canopy. Of the 94% of the stream covered with canopy, 42% was composed of deciduous trees, and 58% was composed of coniferous trees. Graph 9 describes the canopy in Little 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 94%. The mean percent left bank vegetated was 95%. The dominant elements composing the structure of the stream banks consisted of 92% sand/silt/clay, 7% cobble/gravel, and 1% boulders (Graph 10). Deciduous trees were the dominant vegetation type observed in 44% of the units surveyed. Additionally, 36% of the units surveyed had coniferous trees, including downed

Little North Fork Elk River

trees, logs, and root wads, as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on June 24, 1994 in Little North Fork Elk River. The unit was sampled by Chris Coyle and Craig Mesman (CCC). All measurements are fork lengths unless noted otherwise.

The site sampled was Habitat Units #022-#023, a run/mid-channel pool combination approximately 345 feet from the confluence with North Branch North Fork Elk River. This site had an area of 174 square feet and a volume of 90 cubic feet. The unit yielded four steelhead between 103 and 143 mm.

DISCUSSION

F4 channel types 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 June 24 and June 27, 1994 ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 57 to 63 degrees Fahrenheit. This is a good 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 37% of the total length of this survey, riffles 38%, and pools 24%. The pools are relatively shallow, with only nine of the 31 pools having a maximum depth greater than two feet. In coastal coho salmon 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. Gravel retention features may need to be developed prior to any LDA modification.

Twenty-two of the 28 pool tail-outs measured had embeddedness ratings of 3 or 4. None had an embedded value 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 Little North Fork Elk 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 46. The shelter rating in the flatwater habitats was lower at 35. A pool shelter rating of approximately 100 is desirable. The relatively

Little North Fork Elk River

small amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

Sixteen of the 21 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 94%. 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 94% and 95%, 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.

RECOMMENDATIONS

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

Little North Fork Elk River

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 Comments:
(ft):

0'	Start of survey at the confluence with North Branch North Fork Elk River. Channel type is F4.
30'	Right bank erosion site measures 8' high x 15' long. It is contributing fine sediment to the channel.
114'	Right and left bank erosion sites contributing fine sediment.
182'	Right and left bank erosion sites contributing fine sediment and gravel to the channel.
386'	Trail crossing.
582'	Young-of-the-year salmonid observed. Channel is choked with debris overgrown with alders.
904'	Small log and debris accumulation (LDA).
1103'	LDA.
1205'	LDA measures 2' high x 5' wide x 10' long.
1380'	LDA measures 6' high x 10' wide x 20' long.
1455'	Erosion site measures 30' high x 20' long and is contributing fine sediment and gravel to the channel.
1743'	LDA measures 3' high x 8' wide x 15' long.
1790'	End of survey. Remaining stream channel characterized by lack of anadromous fish habitat and frequent dry channels associated with LDA's.

Little North Fork Elk River

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

Little North Fork Elk River

