

STREAM INVENTORY REPORT

North Fork Elk River

INTRODUCTION

A stream inventory was conducted from July 10 to July 16, 1990 on North Fork Elk River. The survey began at the confluence with South Branch North Fork Elk River and extended upstream 1.4 miles.

The North Fork Elk 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 North Fork Elk 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 Elk River is a tributary to Elk River, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). North Fork Elk River's legal description at the confluence with Elk River is T04N R01E S26. Its location is 40.7025 degrees north latitude and 124.1525 degrees west longitude, LLID number 1241512407026. North Fork Elk River is a second order stream and has approximately 12.1 miles of blue line stream according to the USGS Fields Landing 7.5 minute quadrangle. North Fork Elk River drains a watershed of approximately 22.5 square miles. Elevations range from about 40 feet at the mouth of the creek to 600 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Yager Camp on Road 10 which runs along the ridge of the North Fork Elk River.

METHODS

The habitat inventory conducted in North Fork Elk River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) personnel 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.

North Fork Elk River

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 North Fork Elk River to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near 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 (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 (1990). 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 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. All measurements are in feet to the nearest tenth. Habitat characteristics are

North Fork Elk River

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 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. 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 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 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 densimeters 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 Elk 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 hardwood 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 Elk 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

North Fork Elk River

vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

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 North Fork Elk River. In addition, six sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

HABITAT INVENTORY RESULTS

The habitat inventory of July 10 through July 16, 1990 was conducted by M. Long and T. Sartori (CCC). The total length of the stream surveyed was 7,587 feet with an additional 914 feet of side channel.

Stream flow was not measured on North Fork Elk River.

North Fork Elk River is a B2 channel type for 3,600 feet of stream surveyed (Reach 1), a B1 channel type for 2,600 feet of stream surveyed (Reach 2), and a B2 channel type for 1,387 feet of stream surveyed (Reach 3). B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and boulder-dominant substrates. B1 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and bedrock-dominant substrates.

North Fork Elk River

Water temperatures taken during the survey period ranged from 53 to 59 degrees Fahrenheit. Air temperatures ranged from 60 to 73 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 34% flatwater units, 34% riffle units, and 31% pool units. Based on total length of Level II habitat types there were 44% flatwater units, 31% pool units, and 24% riffle units.

Nineteen Level IV habitat types were identified. The most frequent habitat types by percent occurrence were low gradient riffle units, 21%; step run units, 20%; and run units, 13%.

A total of 86 pools were identified. Scour pools were the most frequently encountered at 57% and comprised 60% of the total length of all pools.

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. The maximum depth for 63 of the 86 pools was between one and three feet. Fifteen of the pools had a maximum depth of over four feet.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 86 pool tail-outs measured, 83 had an embeddedness value of 3 (97%). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

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. Of the pool types, the backwater pools had the highest mean shelter rating at 102. Scour pools had a mean shelter rating of 84. Main channel pools had a mean shelter rating of 65.

Boulders are the dominant cover type in North Fork Elk River.

Boulders were the dominant substrate observed in 46% of the units surveyed. Large cobble was the dominant substrate observed in 23% of the units surveyed.

The mean percent canopy density for the surveyed length of North Fork Elk River was 75%.

For the stream reach surveyed, the mean percent right bank vegetated was 65%. The mean percent left bank vegetated was 65%. The dominant elements composing the structure of the stream banks consisted of deciduous trees and coniferous trees.

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted an electrofishing survey at six sites for species composition and distribution in North Fork Elk River on August 9 and August 23, 1990. The sites were sampled by M. Long, S. Holzerland, and G. Moody (CCC).

The first unit sample was a mid-channel pool approximately 358 feet from the confluence with South Branch North Fork Elk River. The site yielded three coho salmon ranging from 51

North Fork Elk River

millimeters to 75 millimeters, and 18 steelhead/rainbow trout ranging from 40 millimeters to 116 millimeters.

The second unit sampled was a mid-channel pool approximately 3,894 feet from the confluence with South Branch North Fork Elk River. The site yielded four coho salmon ranging from 60 millimeters to 76 millimeters, 17 steelhead/rainbow trout from 33 millimeters to 115 millimeters, and four coastal cutthroat trout ranging from 48 millimeters to 110 millimeters.

The third unit sampled was a plunge pool approximately 5,082 feet from the confluence with South Branch North Fork Elk River. The site yielded one 77 millimeter coho salmon, and 10 steelhead/rainbow trout ranging from 48 millimeters to 114 millimeters.

The fourth unit sample was a run approximately 5,248 feet from the confluence with South Branch North Fork Elk River. The site yielded eight steelhead/rainbow trout ranging from 43 millimeters to 112 millimeters.

The fifth unit sampled was a mid-channel pool approximately 5,311 feet from the confluence with South Branch North Fork Elk River. The site yielded two coho salmon ranging from 68 millimeters to 74 millimeters, and 17 steelhead/rainbow trout ranging from 41 millimeters to 88 millimeters.

The sixth unit sampled was a mid-channel pool approximately 6,856 feet from the confluence with South Branch North Fork Elk River. The site yielded 13 steelhead/rainbow trout ranging from 48 millimeters to 110 millimeters.

DISCUSSION

North Fork Elk River is a B2 channel type for the first 3,600 feet of stream surveyed, a B1 channel type for the next 2,600 feet and a B2 channel type for the remaining 1,387 feet. The suitability of B2 and B1 channel types for fish habitat improvement structures is as follows: B2 channel types excellent for plunge weirs, single and opposing wing-deflectors, and log cover. B1 channel types are excellent for bank-placed boulders and good for log cover.

The water temperatures recorded on the survey days July 10 through July 16, 1990 ranged from 53 to 59 degrees Fahrenheit. Air temperatures ranged from 60 to 73 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 44% of the total length of this survey, riffles 24%, and pools 31%. The maximum depth for 63 of the 86 pools was between one and three feet. Fifteen of the pools had a maximum depth of over four 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 residual 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

North Fork Elk River

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.

Eight-three of the 86 pool tail-outs measured had embeddedness ratings of 3 or 4. 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 North Fork Elk River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for backwater pools is 102. The mean shelter rating for scour pools is 84. The mean shelter rating for main channel pools is 65. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in North Fork Elk River. Log and root wad cover structures in the pool and flatwater habitats would enhance 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.

The mean percent canopy density for the stream was 75%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 65% and 65%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

- 1) The portion of the North Fork Elk River upstream of the South Branch of the North Fork Elk River should be managed as an anadromous, natural production stream.
- 2) Create additional summer rearing habitat for coho and 1+ steelhead by developing pool habitat. This reach of the North Fork Elk River is lacking pool habitat. Pools make up 31% of the habitat by percent occurrence and 30.5% of the total length of the stream surveyed. This can be accomplished by converting riffle and flatwater habitat into pool habitat.
- 3) Increase woody cover in the pools. Cover in the pools is composed of primarily boulders. There is a lack of woody debris to provide cover throughout this entire stream reach.
- 4) Create additional spawning areas. Spawning areas are limited. The substrate consists primarily of large cobble and boulders. The embeddedness of the pool tail outs is between 51 and 75% for 96.5% of the habitat units. Instream structures to recruit gravel and small cobble for spawning should be constructed.

North Fork Elk River

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.

North Fork Elk River

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

North Fork Elk River

