STREAM INVENTORY REPORT

East Fork of the North Fork Eel River, 1996

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on the East Fork of the North Fork Eel 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 the East Fork of the North Fork Eel 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 the East Fork of the North Fork Eel 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

The East Fork of the North Fork Eel River is tributary to the North Fork Eel River, tributary to the Eel River, located in Trinity County, California. The East Fork of the North Fork Eel River's legal description at the confluence with the North Fork Eel River is T03S R07E S09. Its location is 40°13'50" North latitude and 123°23'12" West longitude. The East Fork of the North Fork Eel River is a first order stream and has approximately 1.5 miles of blue line stream according to the USGS Zenia and Pickett Peak 7.5 minute quadrangles. The East Fork of the North Fork Eel River drains a watershed of approximately 4.4 square miles. Summer base flow is approximately 0.5 cubic feet per second (cfs) at the mouth, but over 10 cfs is not unusual during winter storms. Elevations range from about 2,100 feet at the mouth of the creek to 3,200 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily National Forest and is managed for timber production, rangeland, and dispersed recreation. Vehicle access exists via the Zenia Road from the Zenia fire station south towards Double Gate Ridge. Take U.S.F.S. Road 3S15 to the north. Follow a pack trail to the mouth of The East Fork of the North Fork Eel River.

METHODS

The habitat inventory conducted in The East Fork of the North

East Fork of the North Fork Eel River, 1996

Fork Eel River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The Pacific Coast Fisheries, Wetlands, and Wildlife Restoration Association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). The East Fork of the North Fork Eel River personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. 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 The East Fork of the North Fork Eel 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". The East Fork of the North Fork Eel 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 (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 the East Fork of the North Fork Eel 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 the East Fork of the North Fork Eel 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 the East Fork of the North Fork Eel 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 the East Fork of the North Fork Eel 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 the East Fork of the North Fork Eel River fish presence was observed from the stream banks. This sampling technique is discussed in the

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes: 25.4, 12.5, 4.7, 2.37, and 0.85 mm (Valentine, 1995).

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 the East Fork of the North Fork Eel 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 *

East Fork of the North Fork Eel River, 1996

The habitat inventory of July 24, 1996, was conducted by Greg Mullins and Frank Humphrey (PCFWWRA). The total length of the stream surveyed was 4,711 feet with no additional feet of side channel.

Flow was estimated to be 0.5 cfs during the survey period.

The East Fork of the North Fork Eel River is an F3 channel type for the entire 4,711 feet of stream reach surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 65 to 79 degrees Fahrenheit. Air temperatures ranged from 73 to 92 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 35% flatwater units, 31% riffle units, and 28% pool units (Graph 1). Based on total **length** of Level II habitat types there were 45% flatwater units, 26% riffle units, and 19% pool units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 31%; step runs, 20%; and runs, 15% (Graph 3). Based on percent total **length**, step runs made up 38%, low gradient riffles 26%, and mid-channel pools 11%.

A total of thirty-one pools were identified (Table 3). Main channel pools were most frequently encountered at 58% and comprised 66% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat type. Pool quality for salmonids increases with depth. Eleven of the 31 pools (35%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 31 pool tail-outs measured, seven had a value of 1 (23%); 15 had a value of 2 (48%); nine had a value of 3 (29%); and none had a value of 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 of 60, and flatwater habitats had a mean shelter rating of 23 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 64. Main channel pools had a mean shelter

rating of 53 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in the East Fork of the North Fork Eel River and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in the East Fork of the North Fork Eel River.

Table 6 summarizes the dominant substrate by habitat type. Boulder was the dominant substrate observed in all of the low gradient riffles measured (100%) (Graph 8).

The mean percent canopy density for the stream reach surveyed was 66%. The mean percentages of deciduous and coniferous trees were 97% and 3%, respectively. Graph 9 describes the canopy in the East Fork of the North Fork Eel River.

For the stream reach surveyed, the mean percent right bank vegetated was 36%. The mean percent left bank vegetated was 31%. The dominant elements composing the structure of the stream banks consisted of 26.5% bedrock, 55.9% boulder, 17.7% cobble/gravel, and 0% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 35% of the units surveyed. 50% of the units surveyed had deciduous trees as the dominant vegetation type, and 0% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Due to the geographic isolation of this area, no sites were electrofished in the East Fork of the North Fork Eel River. Young-of-the-year (YOY) steelhead rainbow trout were observed from the streambanks by the surveyors.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on the East Fork of the North Fork Eel River.

DISCUSSION

The East Fork of the North Fork Eel River is an F3 channel type for the entire 4,711 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is good for bank-placed boulders, and single and opposing wing deflectors; fair for low-stage weirs, boulder clusters, and

channel constrictors; and poor for medium-stage weirs.

The water temperatures recorded on the survey day July 24, 1996, ranged from 65 to 73 degrees Fahrenheit. Air temperatures ranged from 73 to 92 degrees Fahrenheit. This is a warm water temperature range for salmonids. Temperatures of 73° F, if sustained, is at the threshold stress level for salmonids. This seems to be the case here, and further temperature monitoring during the summer months is recommended.

Flatwater habitat types comprised 45% of the total **length** of this survey, riffles 26%, and pools 19%. The pools are relatively shallow, with only 11 of the 31 (35%) 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 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.

Nine of the 31 pool tail-outs measured had embeddedness ratings of 3 or 4. Only seven 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 the East Fork of the North Fork Eel 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 60. The shelter rating in the flatwater habitats was slightly lower at 23. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, bedrock ledges 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.

All of the low gradient riffles had boulders as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean percent canopy density for the stream was 66%. This is a relatively moderate percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 36% and 31%, 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) The East Fork of the North Fork Eel River should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are above 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) Increase the canopy on the East Fork of the North Fork Eel River by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

5) 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.

PROBLEM SITES AND LANDMARKS

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

the survey reach.

0' Begin survey at confluence with North Fork Eel River. Channel type is an F3 for the entire 4,711' of stream surveyed.

22' Young-of-the-year (YOY) steelhead trout observed from the streambanks.

532' Small tributary enters from the left bank (LB). Temperature is 73°F.

3122' Small tributary enters from LB. Temperature is 68°F.

4690' Very large (>20') boulders in stream channel. Fish observed in pools at bottom of the boulder roughs.

4711' Very large boulders are obstructing stream channel. Probable fish barrier. No fish observed above boulders. End of survey.

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.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, 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