STREAM INVENTORY REPORT

EAST BRANCH SOUTH FORK EEL RIVER

INTRODUCTION

A stream inventory was conducted during the fall of 1993 on East Branch South Fork Eel River (East Branch) 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 East Branch. 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 sqawning surveys having been conducted on East Branch. 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.

WATERSHED OVERVIEW

East Branch is tributary to the South Fork Eel River, tributary to the Eel River, located in Humboldt County, California (Figure 1). The legal description at the confluence with the South Fork Eel River is T4S R3E S36. Its location is 40°04'03" N. latitude and 123°47'25" W. longitude. East Branch is a third order stream and has approximately 21 miles of blue line stream, according to the USGS Bell Springs, Garberville, Harris, Jewett Rock, and Noble Butte 7.5 minute quadrangles. East Branch and its tributaries drain a basin of approximately 77 square miles, and the system has a total of 68 miles of blue line stream. Summer base flow is approximately 4.9 cfs at the eleven mile mark. Summer flows become intermittent in the lower reaches due to aggradation. Elevations range from about 360 feet at the mouth of the creek to 3,700 feet in the headwater areas. Oak and grassland dominate the watershed. The watershed is primarily privately owned and is managed for grazing and timber harvest. Year round vehicle access exists from U.S. Highway 101 at Benbow.

METHODS

The habitat inventory conducted in East Branch follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) and contract seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). East Branch personnel were trained in June 1993, by Gary Flosi and Scott Downie. This inventory was conducted by a two person team.

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 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 by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are taken and recorded at each tenth unit typed. The time of the measurement is also recorded. Temperatures are taken in fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

East Branch South Fork Eel River

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 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 East Branch, 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 East Branch, 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.

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 East Branch, 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:

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, the dominant composition type in both the right and left banks was selected from a list of eight options on 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 East Branch to document the fish species composition and distribution. Five sites were electrofished in East Branch 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.

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 0.85mm).

During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, then taken to the laboratory for final processing.

In the laboratory the samples are wet sieved using standard Tyler screens. All particles greater than 0.85 mm diameter are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.85 mm is measured following one hour of settling in graduated cylinders or Imhoff cones. The fines measured in the field are added to these results.

Gravel sampling is conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles at the tail-outs of pools. The higher the percent of fine sediment, the lower the probability for eggs to survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following tables:

- Riffle, flatwater, and pool habitat types

East Branch South Fork Eel River

- 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 East Branch South 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

HABITAT INVENTORY RESULTS

• ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT •

The habitat inventory of September 14-30 and October 4-6, 1993, was conducted by Chris Coyle and Brian Michaels (CCC and contract seasonal). The survey began at the confluence with the South Fork Eel River and extended upstream to the confluence of Cruso Cabin and Elkhorn Creeks. The total length of the stream surveyed was 109,969 feet, with an additional 14,023 feet of side channel. A flow of 4.9 cfs was measured on September 7, 1993 at habitat unit 449 with a Marsh-McBirney Model 2000 flowmeter.

This section of East Branch has six channel types: from the mouth to 36,636' a C2; next 12,932' an F2; next 10,974' a C2; next 835' a B1-1; next 21,902' a C2; next 11,843' a B2; next 5,554' an A2; next 863' a B3; next 1,235' an A2, and the upper 7,195' a B3. C2 streams have gentle gradient (<1%), terraced, cobble/gravel channels, often oversized by historic geomorphic events. F2 channels are low gradient (<1%), totally confined, boulder channels. B1-1 channels are moderate gradient (2.5-4.0%), moderately confined, bedrock-controlled channels. B2

channels are moderate gradient (1.0-2.5%), moderately confined, large cobble/boulder channels. B3 channels are moderate gradient, cobble/gravel channels with unstable, regenerating slopes. A2 channels are high gradient (>4%), boulder channels.

Water temperatures ranged from 54 to 77 degrees fahrenheit. Air temperatures ranged from 46 to 87 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 34.9% of the units surveyed, riffles 33.4%, and flatwater types 31.5% (Graph 1). Flatwater habitat types made up 36.4% of the total survey **length**, riffles 36.4%, and pools 26.9% (Graph 2).

Twenty-three 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, 28.4%; mid-channel pools, 17.7%; runs, 15.4%; and step runs, 9.7% (Graph 3). By percent total **length**, low gradient riffles made up 34.1%, step runs 13.7%, mid-channel pools 12.0%, and runs 11.6%.

Four hundred twenty-six pools were identified (Table 3). Main channel pools were most often encountered at 54.9% and comprised 48.7% 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. Two hundred forty-three of the 426 pools (57%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 408 pool tail-outs measured, 183 had a value of 1 (44.8%); 94 had a value of 2 (22.9%); 55 had a value of 3 (13.6%); and 76 had a value of 4 (18.7%). On this scale, a value of one is 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. Riffle types had the highest shelter rating at 40.1. Flatwater types had the lowest rating with 28.2 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 42.3, backwater pools rated 37.6, and scour pools 27.1 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in East Branch and are extensive. Bedrock ledges are the next most common cover type. Graph 7 describes the pool cover in East Branch.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 152 of the 346 low gradient riffles (43.9%). Small cobble was the next most frequently observed dominant substrate type and occurred in 29.5% of the low gradient riffles (Graph 8).

95.4% of East Branch lacked shade canopy. Of the 4.6% that was canopied, 80.1% consisted of deciduous trees and 19.9% consisted of coniferous trees. Graph 9 describes the canopy in East Branch.

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 36.0%. The mean percent left bank vegetated was 37.6%. The dominant elements composing the structure of the stream banks consisted of 24.7% bedrock, 23.7% boulder, 30.0% cobble/gravel, 9.8% bare soil, 2.5% grass, and 1.0% brush. Additionally, 7.3% of the banks were covered with deciduous trees and 1.0% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Five sites were electrofished on Sept. 7, 9, and 30, and Oct. 7, 1993, in East Branch. The units were sampled by Chris Coyle, Craig Mesman, Jason MacDonnell, Ruth Goodfield, and Warren Mitchell (CCC and contract seasonals). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 93, a run, approximately 14,815 feet from the confluence with the South Fork Eel River and just upstream from the confluence of Buck Mountain Creek. The site had an area of 2,466 sq ft and a volume of 1,973 cu ft. The fish sampled were not held for measurement due to high water temperatures. The sample included 91 California roach, 40

East Branch South Fork Eel River

Sacramento squawfish, 139 Sacramento suckers, 1 green sunfish,

all juveniles; and 1 Pacific lamprey ammocete. Additionally, one 1+ age class juvenile steelhead was observed.

The second sample site was habitat unit 352, a run, approximately 47,448 feet from the confluence with the South Fork Eel River and just upstream from the confluence of Tom Long Creek. The site had an area of 320 sq ft and a volume of 224 cu ft. The site yielded 23 steelhead, 75 to 154 mm, and 9 California roach, 27 to 57 mm.

The third sample site was habitat unit 449, a step run, approximately 58,938 feet above the confluence with the South Fork Eel River and just upstream from the summer crossing at mile 11. This site had an area of 6,016 sq ft and a volume of 4,813 cu ft. The fish sampled were not held for measurement due to high water temperatures. The sample included 25 young-of-the-year steelhead, six 1+ age class juvenile steelhead, four 2+ age class juvenile steelhead, and five juvenile California roach.

The fourth site included habitat units 723-724, a step run and low gradient riffle, approximately 86,972 feet from the confluence with the South Fork Eel River. This site had an area of 2,214 sq ft and a volume of 1,764 cu ft. The sample consisted of 95 steelhead, ranging from 65 to 175 mm.

The fifth site was included units 989-990, a low gradient riffle and mid-channel pool, approximately 105,085 feet from the confluence with the South Fork Eel River. This site had an area of 2,592 sq ft and a volume of 3,114 cu ft. The sample included 99 steelhead, 47 to 210 mm; 1 Pacific lamprey ammocete, 85 mm; 2 juvenile Pacific giant salamanders, and 1 juvenile crayfish.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on East Branch.

DISCUSSION

East Branch has six channel types: A2, B1-1, B2, B3, C2, and F2.

East Branch South Fork Eel River

The high-energy and steep-gradient A2 channel type is generally not suitable for instream enhancement structures. The B3 channel type is likewise ill-suited due to poor bank stability. However, even within these reaches many site-specific projects can be designed and implemented, especially to increase pool frequency, volume and pool cover.

There are 69,512 feet of C2 channel in East Branch. Eel River. C2 channels have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective cover for fish. Well- placed and engineered structures that constrict the channel to form pool habitat or cover structures are usually appropriate and have a good chance of success in these channel types.

Boulder-dominated B1-1 channels are considered poor candidates for channel aggrading structures but good to excellent for a variety of boulder and log cover structures. There are 835 feet of B1-1 channel in East Branch.

Moderate gradient and stable channel configuration make the B2 channel type good to excellent for the placement of a wide variety of low and medium stage cover and aggradation structures, including single and double deflectors and constrictors, log cover and scour structures, weirs, and submerged shelters. Low gradient, totally confined F2 channels are also good to excellent for such structures. There are 24,775 feet of these channel types in East Branch.

The water temperatures recorded on the survey days Sept. 14 through Oct. 6, 1993, ranged from 54°F to 77°F. Air temperatures ranged from 46°F to 87°F. The warmer water temperatures were recorded in the lower half of the survey reach. From June 19 through September 24 we monitored water temperatures 3,000' above the mouth of East Branch. Through July and August high temperatures exceeded 79° F on 46 days. Another monitor 12 miles above the confluence with the South Fork Eel recorded water temperatures from September 7 through November 11. Through September and early October temperatures exceeded 70° every day (see attached graphics). These warmer temperatures, if sustained, are above the threshold stress level for salmonids.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the upper, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 36.4% of the total **length** of this survey, riffles 36.4%, and pools 26.9%. The pools are relatively deep with 243 of the 426 pools having a maximum depth greater than 3 feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. In third and fourth order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not jeopardize the unstable stream banks or subject the structures to high stream energy.

Two hundred seventy-seven of the 408 pool tail-outs measured had embeddedness ratings of 1 or 2. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In East Branch, 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 36.6. The shelter rating in the flatwater habitats was lower at 28.2. Riffles rated highest at 40.1. 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 rootwad 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.

Two hundred fifty-four of the 346 low gradient riffles had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

East Branch South Fork Eel River

The mean percent canopy for the survey reach was only 4.6%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures are desirable in East Branch. The large trees required to contribute shade to the wide channel typical of this reach would also eventually provide a long term source of large woody debris needed for instream structure.

RECOMMENDATIONS

1) East Branch South Fork Eel River should be managed as an anadromous, natural production stream.

2) Temperatures in this section of East Branch, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) Increase the canopy on East Branch 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) 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.

5) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations. In a few areas the material is at hand, but woody debris generally is scarce near the stream.

6) 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.

7) 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.

8) There are at least two sections where the stream is being impacted from cattle trampling the riparian zone and defecating in the water. Alternatives should be explored with the grazier, and developed if possible.

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.

0' Begin survey at confluence with South Fork Eel River at point where backflooding from Benbow Lake ceases. Channel type is C2.

3035' Left bank slide 100' high x 400' long. Toe cut 15' high x 100' long. Contributing fines.

3345' Additional slide toe cuttage 20' high x 75' long. Contributing fines.

4450' Blue schist slump earth flow up to 30' high x 430' long.

7171' Right bank erosion 100' high x 2123' long.

7989' Panther Canyon enters right bank. Flow estimated at <1 gallon per minute (gpm). Not accessible to anadromous fish due to low flow and steep gradient.

8466' Left bank earthen terrace 8' high x 400' long. Contributing fines.

East Branch South Fork Eel River

10080' Right bank bluffs, with areas of bare soil, 100' high x 860' long. Contributing fines, cobbles, and boulders.

10359' Left bank earthen terrace 9' high x 200' long. Contributing fines.

11294' Right bank bedrock bluffs 150' high x 520' long. Contributing fines.

11812' Left bank earthen terrace 10' high x 100' long. Contributing fines.

13771' Buck Mountain Creek enters right bank. Flow estimated at ~1-2 gpm. Temperature 63°F. Possible anadromous fish habitat.

14185' Two right bank erosion sites each 30' high x 70' long. Contributing fines and cobbles.

14604' Seasonal flatcar bridge.

14815' Footbridge with 18' clearance. Bioinventory site 1.

14952' Left bank cut 10' high x 250' long. Contributing fines.

15354' Left bank erosion 12' high x 100' long. Contributing fines and gravel.

16181' Right bank cut up to 20' high x 440' long.

17236' Left bank erosion 10-12' high x 175' long. Contributing fines and cobble. Left bank is rip-rapped for 680' upstream.

18625' Right bank cut 6' high x 1000' long. Contributing fines.

19045' Left bank erosion 50' high x 200' long. Contributing fines.

19652' Right bank erosion 80' high x 200' long. Contributing fines.

East Branch South Fork Eel River

19900' Dry right bank tributary.

20659' Right bank cut 7' high x 250' long. Left bank cut 10' high x 250' long. Active channel widens to ~300'. Stream appears to have abandoned historical channel at this point.

21269' Barbed-wire fence crosses channel. Cattle activity in stream channel on upstream side.

21479' Squaw Creek enters right bank. Dry from mouth upstream for an unknown distance. Anecdotal evidence exists of Squaw Creek's historical use as salmonid habitat.

21805' A ford crosses the stream. Right bank erosion 100' high x 80' long. Contributing fines.

23021' Left bank erosion up to 20' high x 675' long.

24084' Right bank erosion 40' high x 200' long. Contributing fines.

24411' Horse Pasture Creek enters left bank. Mouth dry. Upstream flow estimated at ~1-2 gpm. Temperature 57°F. Juvenile cyprinids, suckers, and stickleback observed in Horse Pasture Creek.

25169' Left bank erosion 15' high x 770' long. Contributing fines.

27263' Right bank erosion 15' high x 300' long. Contributing fines.

27680' Rancheria Creek enters right bank. Mouth dry; wetted upstream. ~1000' up Rancheria Creek is an impassable boulder cataract.

28541' Left bank erosion 10' high x 70' long. Toe of old, revegetated slide.

28871' Right bank toe of old, revegetated slide cut 15' high x 200' long. Contributing fines.

East Branch South Fork Eel River

29911' Left bank erosion 70' high x 300' long. Contributing fines.

31064' Right bank erosion 150' high x 630' long. Contributing fines and boulders.

31613' Left bank erosion 70' high x 420' long. Contributing fines, cobbles, and boulders.

32549' Right bank bare soil/bedrock 200' high x 400' long. Contributing gravel.

34895' Right bank erosion 100' high x 200' long. Contributing fines.

35256' Rays Creek enters right bank. Flow estimated at ~0.2 cubic feet per second (cfs). Cyprinids observed in lower reach.

35578' Old, revegetated right bank erosion 100' high x 250' long. Contributing fines.

36636' Terminus of old road on right bank. Begin bedrock gorge. Channel type changes to F2.

37379' Many 2+ age class steelhead observed. Many steelhead of this size observed throughout remainder of survey.

41011' Left bank tributary enters over 40' falls.

42891' Left bank erosion 150' high x 200' long. Contributing fines and boulders.

43155' Left bank tributary. Flow estimated at <1 gpm. Not accessible to anadromous fish due to high gradient. Right bank erosion 100' high x 200' long. Contributing fines.

43867' Right bank terrace 15' high x 400' long. Contributing cobbles and fines.

44536' Left bank erosion 200' high x 100' long. Contributing

gravel and boulders.

44795' Right bank erosion 100' high x 150' long. Contributing fines.

44952' Left bank terrace 10' high x 150' long. Contributing gravel and sand.

45550' Begin 390' long boulder cataract. Likely barrier to squawfish colonization.

45623' Blockage formed by ~20' diameter boulders. Current forced beneath and between boulders forming high-velocity chute.

46249' Left bank erosion 150' high x 150' long. Contributing fines.

46273' Right bank erosion 100' high x 150' long. Contributing fines.

46653' Right bank erosion 15' high x 200' long. Contributing fines. Left bank erosion 100' high x 350' long. Contributing gravel.

47166' Right bank erosion 100' high x 200' long. Contributing fines.

47391' Tom Long Creek enters from right bank. Mouth wetted and accessible to anadromous fish. Flow estimated at ~1.5-2.0 cfs.

47448' CCC biological inventory site 2.

48161' Right bank erosion 75' high x 100' long. Contributing fines. Left bank terrace 15' high x 200' long. Contributing gravel.

48324' Right bank erosion 20' high x 100' long. Contributing fines.

48557' Right bank erosion 8' high x 75' long. Contributing

cobbles.

48869' Left bank erosion 50' high x 40' long. Contributing fines.

48915' Tributary enters right bank. Flow estimated at ~0.5 cfs. Not accessible to anadromous fish due to steep gradient.

48944' Left bank erosion 40' high x 75' long. Contributing fines and boulders.

49006' Right bank erosion 40' high x 100' long. Contributing fines.

49270' Left bank erosion 20' high x 70' long. Contributing fines. Right bank erosion 6' high x 150' long. Contributing fines.

49568' End bedrock gorge. Channel type reverts back to C2. Left bank erosion 200' high x 100' long. Contributing fines and cobbles.

49697' Tributary enters left bank. Flow estimated at ~1-2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

50701' Right bank cut 15' high x 500' long. Contributing fines and cobbles.

51280' Access road on left bank. Left bank erosion 50' high x 500' long. Contributing fines.

51548' Right bank terrace cut 10' high x 1350' long. Contributing fines.

52263' Tributary enters left bank. Flow estimated at ~0.5 cfs. Not accessible to anadromous fish due to steep gradient. Landslide on tributary 150' high x 300' long is contributing fines and cobbles to East Branch.

52331' Left bank erosion 40' high x 300' long. Contributing fines.

East Branch South Fork Eel River

52842' Left bank erosion 200' high x 350' long. Contributing fines and gravel.

53403' Right bank erosion 100' high x 400' long. Contributing fines.

53757' Left bank erosion 200' high x 400' long. Contributing fines. Right bank erosion 50' high x 200' long. Contributing fines.

54506' Left bank erosion 100' high x 150' long. Contributing fines.

54725' Left bank erosion 1130' long by unspecified height. Contributing fines.

55873' Right bank erosion 15' high x 200' long. Contributing fines.

56005' Left bank erosion 100' high x 200' long. Contributing fines.

56395' Left bank erosion 50' high x 250' long. Contributing fines.

56556' Right bank erosion 50' high x 600' long. Contributing fines.

57598' Left bank erosion 70' high x 200' long. Contributing fines.

57771' Tributary enters left bank. Flow estimated at ~2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

57856' Right bank erosion 50' high x 300' long. Contributing fines.

58740' Eel River Sawmills haul road summer crossing. Gravel fill with dual 2' x 20' corrugated pipe culverts. Culverts are passable to migrating fish.

East Branch South Fork Eel River

58762' Left bank erosion 50' high x 500' long. Contributing fines.

58938' CCC bioinventory site 3.

60061' Left bank erosion 200' high x 300' long. Replanted with fir seedlings. Contributing fines.

60134' Right bank erosion 30' high x 200' long. Replanted with fir seedlings. Contributing fines. Tributary enters right bank. Flow estimated at ~0.3 cfs. Possible anadromous fish habitat.

60542' Old bridge site; only footings remain. Begin second bedrock gorge. Channel type changes to B1-1.

61377' End bedrock gorge. Channel type reverts back to C2. Left bank cut 10' high x 100' long. Contributing fines. Right bank erosion 20' high x 250' long. Contributing fines.

61640' Left bank erosion up to 100' high by 600' long, partly revegetated, then 300' high by an additional 600' long. Both contributing fines.

62019' Road access on right bank.

62340' Left bank tributary. Flow estimated at ~1-2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

63305' Right bank erosion 150' high x 200' long. Contributing fines.

63588' Small 100' high x 70' long left bank slide has felled ~6 small oak and fir into channel and contributed fines.

63816' Left bank tributary. Flow estimated at <1 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

63965' Right bank road access. Left bank erosion 100' high x 350' long. Contributing fines.

East Branch South Fork Eel River

64245' Left bank tributary enters dry overflow channel. Flow estimated at ~1-2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

64409' Standing stumps give evidence of historical channel being oversized by about a factor of four (100' increased to 400').

64751' Right bank cut 6' high x 250' long. Contributing cobbles.

65033' Left bank road access.

65239' Right bank erosion 100' high x 175' long. Contributing fines.

65417' Dry right bank tributary. Fresh right bank road cut from residence to stream channel.

65551' Left bank cut 10' high x 550' long. Contributing fines.

66244' Left bank revegetated slide 300' high x 400' long.

66446' Right bank erosion 20' high x 100' long. Contributing fines.

66628' Left bank cobble terrace 5' high x 400' long.

66700' Left bank dry tributary. Right bank erosion 100' high x 300' long. Contributing fines and cobbles.

66991' Left bank erosion 200' high x 350' long. Contributing fines.

67583' Right bank erosion 75' high x 350' long. Contributing fines.

68232' Left bank erosion 100' high x 300' long. Contributing fines.

68398' Residence with road access on right bank.

East Branch South Fork Eel River

69061' Left bank erosion 70' high x 40' long. Contributing fines.

69381' Right bank erosion 50' high x 150' long. Contributing fines.

69518' Left bank erosion associated with old road cut. 50' high x 200' long. Contributing fines.

70166' Right bank erosion 100' high x 250' long. Contributing fines and cobbles.

70166' Left bank tributary. Flow estimated at ~0.3 cfs. Young-of-the-year salmonids observed in lower reach, but upstream passage blocked ~100' upstream from confluence by 50' falls.

70673' Right bank erosion 100' high x 300' long. Contributing fines.

71644' Left bank erosion 100' high x 200' long. Contributing fines.

72173' Left bank erosion 100' high x 200' long. Contributing fines.

72471' Right bank erosion 75' high x 250' long. Contributing fines.

73089' Right bank erosion 50' high x 150' long. Contributing fines.

73202' Left bank tributary. Flow estimated at ~0.3 cfs. Temperature 59°F. Young-of-the-year salmonids observed in tributary.

73931' Right bank erosion 200' high x 400' long, mostly revegetated. Contributing fines.

74177' Right bank tributary. Flow estimated at ~2 gpm. Not accessible to anadromous fish due to low flow.

East Branch South Fork Eel River

74697' Left bank erosion 100' high x 200' long.

75092' Left bank erosion 100' high x 200' long. Contributing fines.

75487' Right bank erosion 80' high x 175' long. Contributing fines.

76053' Left bank erosion 125' high x 500' long. Contributing fines, boulders, and gravel.

76400' Rock weir. Residence on right bank.

76893' Left bank erosion up to 150' high x ~1500' long. Contributing fines.

78505' Right bank erosion 100' high x 200' long. Contributing boulders.

78654' Next 2055' of channel impacted by boulders and rubble from Noble Butte slide, causing an B1-1 type channel.

78785' Right bank terrace caused by debris from Noble Butte slide. 15' high x 1150' long. Contributing cobble and boulders.

78870' Left bank erosion 200' high x 1070' long. Contributing fines.

79389' Left bank spring. Fresh silt flows on left bank.

79940' Noble Butte slide. 800' high x 760' long. Contributing fines, cobbles, and boulders.

80200' Left bank erosion 100' high x 510' long. Contributing boulders.

80439' Right bank spring.

80875' Left bank erosion 200' high x unspecified length. Contributing fines.

81015' Left bank tributary. Flow estimated at ~1-2 gpm. Not accessible to anadromous fish due to low flow and steep

gradient.

81516' Left bank tributary. Flow estimated at ~1-2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

82011' Right bank erosion 150' high x 250' long. Contributing fines and boulders.

82319' Right bank erosion 70' high x 150' long. Contributing fines and boulders.

82589' Pair of right bank erosion sites, 75' high x 125' long and 75' high x 50' long. Contributing fines.

82813' Left bank tributary. Flow estimated at ~1-2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

83035' Left bank erosion 50' high x 150' long. Contributing fines.

83091' Left bank tributary. Flow estimated at ~2 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

83279' Channel type changes to B2.

83590' Left bank erosion 200' high x 450' long. Contributing fines and boulders.

84270' Right bank erosion 150' high x 310' long. Contributing fines.

84612' Right bank tributary. Mouth dry. Not accessible to anadromous fish due to low flow and steep gradient.

84871' Right bank erosion 100' high x 200' long. Contributing fines and boulders.

85126' Left bank erosion 60' high x 100' long. Contributing fines.

85161' Right bank erosion 70' high x 70' long. Contributing

fines and boulders.

85626' Right bank erosion 150' high x 250' long. Contributing fines and boulders.

85720' Left bank erosion 70' high x 390' long. Contributing fines and boulders.

86113' Left bank spring.

86694' Right bank erosion 150' high x 100' long. Contributing fines and boulders. Toe is revegetated.

86972' CCC bioinventory site 4.

87216' Right bank erosion 100' high x 150' long. Contributing cobble.

87307' Left bank erosion 100' high x 100' long. Contributing fines.

88017' Left bank erosion 80' high x 200' long. Contributing fines and cobbles.

88900' Little Butte

89173' Left bank erosion 150' high x 300' long. Contributing fines and boulders.

89232' Left bank tributary. Flow estimated at ~2 gpm. Not accessible to anadromous fish due to low flow.

89442' Left bank cut 10' high x 250' long. Right bank cut 15' high x 250' long. Both contributing fines.

89929' Next 3688' of channel consists of an area of active serpentine clay/boulder slump earth flows. Left bank slide 50' high x 465' long. Contributing fines.

90286' Right bank slide up to 100' high x 800' long. Contributing fines and boulders.

90735' Left bank slide up to 200' high x 330' long.

East Branch South Fork Eel River

Contributing fines and boulders.

90991' Left bank tributary. Flow estimated at ~0.2 cfs. Not accessible to anadromous fish due to steep gradient.

91081' Right bank slump 100' high x 500' long. Contributing fines.

91592' Left bank slide up to 100' high x 400' long. Contributing fines and boulders.

91948' Right bank slide up to 175' high x 480' long. Contributing fines and boulders.

92401' Left bank slide 80' high x 300' long. Contributing boulders and fines.

92607' Right bank slide 100' high x 1010' long. Contributing fines and boulders.

92915' Right bank slide pushing boulders against left bank bedrock. Channel constricted to ~30'.

93157' Right bank slide impinges directly on left bank. Not a barrier.

93397' Rock weir.

93620' Dry right bank tributary.

93926' Left bank erosion 50' high x 100' long. Contributing fines and boulders.

94478' Left bank slide 300' high x 510' long. Mostly revegetated. Contributing fines, cobbles, and boulders.

94753' Right bank erosion 70' high x 200' long. Contributing fines.

94880' Right bank erosion 30' high x 100' long. Contributing fines and cobbles.

95122' Channel type changes to A2.

East Branch South Fork Eel River

95245' Right bank erosion 100' high x 150' long. Contributing fines.

95706' Left bank tributary. Flow estimated at ~1 cfs. Not accessible to anadromous fish due to steep gradient.

95853' Old, mostly revegetated left bank slide 100' high x 500' long. Toe cut 15' high x 400' long. Contributing fines and cobbles.

95976' Right bank erosion 150' high x 380' long. Contributing fines and cobbles.

96497' Left bank erosion 100' high x 200' long. Contributing fines.

96955' Left bank slide 200' high x 300' long. Contributing fines and boulders.

97191' Left bank erosion 100' high x 100' long. Contributing fines and cobbles.

97325' Right bank erosion 100' high x 150' long. Contributing fines and boulders.

97729' Right bank erosion 50' high x 100' long associated with old road cut. Contributing fines. Left bank erosion 50' high x 100' long. Contributing fines and boulders.

98265' Right bank erosion 100' high x 150' long. Contributing fines and gravel.

98409' Bedrock constriction.

98660' Dry left bank tributary.

99323' Right bank erosion 70' high x 200' long. Contributing fines.

100272' Right bank erosion 70' high x 250' long. Contributing fines and gravel.

100676' Channel type changes to B3.

East Branch South Fork Eel River

101161' Dry left bank tributary.

101324' Right bank erosion 80' high x 250' long. Partly revegetated. Contributing fines.

101492' Left bank erosion 50' high x 200' long. Contributing fines.

101539' Channel type reverts to A2.

102136' Left bank erosion 30' high x 100' long. Contributing fines. Right bank erosion 50' high x 200' long. Contributing fines.

102378' Left bank erosion 80' high x 150' long. Contributing fines.

102502' Left bank tributary. Flow estimated at <1 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

102774' Channel type changes to B3.

103092' Left bank erosion 20' high x 100' long. Contributing fines.

103357' Right bank erosion 25' high x 750' long. Contributing fines.

103898' Dry right bank tributary.

104382' Left bank tributary. Flow estimated at <1 gpm. Not accessible to anadromous fish due to low flow and steep gradient.

104559' Left bank access road. Flagged: CN 1/16 S9 B1 R1 1954.

105085' CCC bioinventory site 5.

105212' Right bank erosion 10' high x 400' long. Contributing fines.

East Branch South Fork Eel River

105697' Left bank erosion 100' high x 50' long. Contributing fines.

106197' Dry right bank tributary.

106769' Right bank slump 30' high x 70' long. Contributing fines.

107086' Left bank erosion 70' high x 150' long. Contributing fines and boulders.

107128' Right bank erosion 20' high x 70' long. Contributing fines.

107457' Left bank erosion 20' high x 50' long. Contributing fines.

107858' Left bank erosion 70' high x 200' long. Mostly revegetated. Contributing fines and cobbles.

108689' Left bank erosion 30' high x 100' long. Contributing fines.

108912' Right bank erosion 100' high x 40' long. Contributing fines.

109058' Start of 400' long boulder cataract. Not a barrier.

109110' Left bank slide 150' high x 150' long. Mostly revegetated. Contributing fines.

109255' Left bank erosion 80' high x 150' long. Contributing fines and boulders.

109509' Right bank erosion 20' high x 200' long. Contributing fines.

109969' End of survey at confluence of Elkhorn and Cruso Cabin Creeks. Flows estimated at ~0.3 cfs for Cruso Cabin Creek and ~2 cfs for Elkhorn Creek. Young-of-the-year salmonids observed in both creeks.

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