

SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

**LONG BRANCH CREEK, MAINSTEM EEL RIVER, 1997**

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

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North Coast Watershed Planning and Coordination Project

## NORTH COAST WATERSHED PLANNING and COORDINATION PROJECT

The North Coast Watershed Planning and Coordination Project (NCWPCP), formerly the Basin Planning Project (BPP), was begun in 1991 to develop salmon and steelhead restoration and enhancement programs in North Coast watersheds for the Department of Fish and Game (DFG). The objectives of the project conform with the goals of California's Salmon and Steelhead Restoration and Enhancement Program of 1988. The Restoration Program strives to enhance the status of anadromous salmonid populations and improve the fishing experience for Californians. The program intends to achieve a doubling of the population of salmon and steelhead by the year 2000. The project is supported by the Sport Fish Restoration Act, which uses sport fishermen's funds to improve sport fisheries.

The NCWPCP conducts stream and habitat inventories according to the standard methodologies discussed in the *California Salmonid stream Habitat Restoration Manual*, (Flosi et.al., 1998). Biological sampling is conducted using electrofishing and direct observation to determine species presence and distribution; selected streams are electrofished for population estimates. Some streams are also sampled for sediment composition. Collected information is used for base-line data, public cooperation development, restoration program planning, specific project design and implementation, and for project evaluation.

The Eel River system was identified as the initial basin for project planning activities. Most anadromous tributaries to the Van Duzen, South Fork Eel, Mainstem Eel, Middle Fork Eel, and the North Fork Eel rivers have been inventoried since 1991. Initial field inventory of the Eel River system should be essentially complete in 1996. NCWPCP personnel have also worked in cooperation with the DFG Salmon Restoration Project's staff to inventory streams on the Mattole River, Mendocino Coast, and Humboldt Bay.

## **STREAM INVENTORY REPORT**

### **Long Branch Creek, Mainstem Eel River**

#### INTRODUCTION

A stream inventory was conducted during the summer of 1997 on Long Branch Creek. 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 Long Branch Creek. 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 Chinook 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

Long Branch Creek is tributary to Tomki Creek, tributary to the Mainstem Eel River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Long Branch Creek's legal description at the confluence with Tomki Creek is T18N R12W S16. Its location is 39°25'25" north latitude and 123°11'55" west longitude. Long Branch Creek is an ephemeral stream according to the USGS Foster Mountain 7.5 minute quadrangle. Long Branch Creek drains a watershed of approximately 3.5 square miles. Elevations range from about 1560 feet at the mouth of the creek to 2600 feet in the headwater areas. Douglas fir and mixed hardwood forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production and rangeland. Vehicle access exists via 101 to Willits. Take Foster Mountain Road to the confluence of Long Branch Creek and Tomki Creek.

#### METHODS

The habitat inventory conducted in Long Branch Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members 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.

## 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 Long Branch Creek 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 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 (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. 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.

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### 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". Long Branch Creek 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 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 Long Branch Creek, 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 unsuited for spawning due to inappropriate substrate particle size, bedrock, 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 Long Branch Creek, 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-

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

## 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 Long Branch Creek. In addition, three sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## 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

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- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Long Branch Creek 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
- Mean 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 \*

The habitat inventory of June 6, to 17, 1997, was conducted by J. Robertson and B. Reisberger (CCC). The total length of the stream surveyed was 20,833 feet.

Flows were not measured on Long Branch Creek.

Long Branch Creek is an F4 channel type for the first 18,398 feet of stream reach surveyed and a B4 channel type for the remaining 2,435 feet of stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. B4 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks, and a gravel dominated substrate.

Water temperatures taken during the survey period ranged from 59° to 78°F. Air temperatures ranged from 64° to 86°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 42% riffle units, 27% flatwater units, 30% pool units, and 1% dry units (Graph 1). Based on total **length** of Level II habitat types there were 43% riffle units, 33% flatwater units, and 24% pool units (Graph 2).

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Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 41%; runs, 26%; and mid-channel pools, 26% (Graph 3). Based on percent total **length**, low gradient riffles made up 42%, runs 31%, and mid-channel pools 22%.

A total of 92 pools were identified (Table 3). Main channel pools were most frequently encountered at 90% and comprised 90% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Fifty-eight of the 92 pools (63%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 91 pool tail-outs measured, 17 had a value of 1 (18.7%); 24 had a value of 2 (26.4%); 30 had a value of 3 (33%); 6 had a value of 4 (7%) and 14 had a value of 5 (15.4%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning. In Long Branch Creek nine of the pool tail-outs which were valued at 5 were unsuitable for spawning due to the tail-outs being comprised of large cobble, boulder, bedrock or wood.

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 habitat types had a mean shelter rating of 8, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 15 (Table 1). Of the pool types, the main pools had the highest mean shelter rating at 17. Scour pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Long Branch Creek. Large woody debris is lacking in nearly all habitat types. Graph 7 describes the pool cover in Long Branch Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 47 of the 91 pool tail outs measured (52%). Small cobble was the next most frequently observed dominant substrate type and occurred in 35% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 39%. The mean percentages of deciduous and coniferous trees were 73% and 28%, respectively. Graph 9 describes the canopy composition in Long Branch Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 62.9%. The mean percent left bank vegetated was 60.8%. The dominant elements composing the structure of the stream banks consisted of 17.5% bedrock, 10% boulder, 53.8% cobble/gravel, and 18.8% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 56.3% of the units surveyed. Additionally, 30% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had coniferous trees as the dominant vegetation, including down trees,

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logs, and root wads (Graph 11).

### BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on June, 1997, in Long Branch Creek. The sites were sampled by Scott Downie (DFG).

The first site sampled included habitat units 117, 118, and 119, a run riffle and run approximately 60 feet above the lower river ford. This site had an area of 2,244 sq ft and a volume of 898 cu ft. The site yielded 3 young-of-the-year steelhead and 1 cyprinid.

The second site had an area of 600 sq ft and a volume of 1,200 cu ft. The site yielded 2 steelhead.

The third site sampled included habitat units 235, 236, and 239, a riffle, run, and pool located approximately 50 feet above the upper river ford. The site had an area of 295 sq ft and a volume of 207 cu ft. The site yielded 6 steelhead.

### DISCUSSION

Long Branch Creek is an F4 channel type for the first 18,398 feet of stream surveyed and a B4 for the remaining 2,435 feet. The suitability of F4 and B4 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulder; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; and poor for boulder clusters. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days June 9, 10, 11, 12, 16, and 17, 1997, ranged from 59° to 78°F. Air temperatures ranged from 64° to 86°F. This is a unfavorable water temperature range for salmonids. A water temperature of 68° F, if sustained, is near the threshold stress level for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 33% of the total length of this survey, riffles 43%, and pools 24%. The pools are relatively deep, with 58 of the 92 (63%) 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

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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.

Seventeen of the 91 pool tail-outs measured had an embeddedness rating of 1. Thirty-six of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen of the pool tail-outs had a rating of 5 or were considered unsuitable for spawning. All were unsuitable for spawning due to the dominant substrate being large cobble, bedrock or boulders too small to be suitable. 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 Long Branch Creek, 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 15. The shelter rating in the flatwater habitats was 6. 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, root mass contributes 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.

Seventy-nine of the 91 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 39%. This is a low percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 62.9% and 60.8%, 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) Long Branch Creek should be managed as an anadromous, natural production stream.
- 2) Increase the canopy on Long Branch Creek by planting willow, alder and other native riparian tree species 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

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upslope erosion control projects.

- 3) 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.
- 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) 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.
- 6) 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.

### COMMENTS AND LANDMARKS

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

0'Begin survey at confluence with Tomki Creek. Channel type is F4.

395'No longer under the influence of Tomki Creek.

845'Juvenile steelhead observed.

9,356'Channel type taken F4.

9,500'Ford crosses creek.

12,968'Juvenile steelhead observed.

14,468'Tributary enters from the right bank.

15,150'Ford crosses creek.

15,893'Tributary, contributing 50% of flow, enters from the right bank.

16,030'Ford crosses creek.

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16,829' Landslide contributing fine sediment to creek.

16,866' Ford crosses creek.

18,423' Channel type changes from an F4 to a B4.

18,501' Dry tributary enters from the left bank.

19,076' Right bank slide, 20' high and 50' long.

19,488' Juvenile salmonids observed.

20,486' Tributary enters from the right bank.

20,833' End of survey. Flow is intermittent above this point and no fish have been observed for 367' below this point.

### 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.

## LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
<b>RIFFLE</b>		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
<b>CASCADE</b>		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
<b>FLATWATER</b>		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
<b>MAIN CHANNEL POOLS</b>		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
<b>SCOUR POOLS</b>		
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
<b>BACKWATER POOLS</b>		
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