SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

**LITTLE ROCK CREEK, SOUTH FORK EEL RIVER, 1996**

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

1996

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 standart methodologies discussed in the *California Salmonid stream Habitat Restoration Manual,* (Flosi et.al., 1998). Biological sampling is conducted using electrofishbing 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, restoraion 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

**Little Rock Creek, South Fork Eel River**

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Little Rock Creek. The survey began at the confluence with the South Fork Eel River and extended upstream  0.82 miles.

The Little Rock Creek inventory was conducted in two parts:  habitat inventory and biological inventory.  The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Little Rock 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, 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

Little Rock Creek is tributary to the South Fork Eel River, tributary to the Eel River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1).  Little Rock Creek's legal description at the confluence with South Fork Eel River is T21S R15W S32.  Its location is 39°37′32″ north latitude and 123°34′21″ west longitude.  Little Rock Creek is a first order stream and has approximately 1.4 miles of blue line stream according to the USGS Cahto 7.5 minute quadrangle.  Little Rock Creek drains a watershed of approximately 0.6 square miles.  Elevations range from about 1,720 feet at the mouth of the creek to 3,120 feet in the headwater areas. Mixed conifer forest dominates the watershed.  The watershed is entirely privately owned and is managed for timber production.  Vehicle access exists via Branscomb Road.  Drive approximately four miles west of the town of Branscomb to Little Rock Creek.  Park and walk downstream about 100 feet to the mouth of Little Rock Creek.

METHODS

The habitat inventory conducted in Little Rock Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1994).  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 Little Rock 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".  Little Rock 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 Little Rock 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 Little Rock 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-outs is recorded for each pool.

8.  Canopy:

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Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Little Rock 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 Little Rock 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 Little Rock Creek. In addition, one site was 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
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Little Rock Creek include:

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- 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 August 22 to 27, 1996, was conducted by Kelly Garret and Todd Kraemer (WSP/Americorps).  The total length of the stream surveyed was 4,337 feet with an additional 45 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.2 cfs on September 9, 1996.

Little Rock Creek is a B3 channel type for the entire 4,337 feet of stream reach surveyed.  B3 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools; very stable plan and profile; stable banks; cobble channel.

Water temperatures taken during the survey period ranged from 55° to 62°F.  Air temperatures ranged from 63° to 74°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types.  Based on frequency of **occurrence** there were 45% pool units, 41% flatwater units, 11% riffle units, 2% culvert units, and 1% dry (Graph 1).  Based on total **length** of Level II habitat types there were 79% flatwater units, 13% pool units, 4% riffle units units, and 4% culvert units (Graph 2).

Eight Level IV habitat types were identified (Table 2).  The most frequent habitat types by percent **occurrence** were step runs, 37%; mid-channel pools, 33%; and low gradient riffles, 10% (Graph 3).  Based on percent total **length**, step runs made up 76%, mid-channel pools 9%, and culverts 4%.

A total of forty-two pools were identified (Table 3).  Main channel pools were most frequently encountered at 79% and comprised 79% of the total length of all pools (Graph 4).

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Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eight of the 42 pools (19%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 42 pool tail-outs measured, none had a value of 1; two had a value of 2 (5%); one had a value of 3 (2%); 13 had a value of 4 (31%) and 26 had a value of 5 (62%) (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. Flatwater habitat types had a mean shelter rating of 101, and pool habitats had a mean shelter rating of 40 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 45. Scour pools had a mean shelter rating of 35 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Little Rock Creek. Graph 7 describes the pool cover in Little Rock Creek.

Table 6 summarizes the dominant substrate by habitat type. Large cobble 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 97%. The mean percentages of deciduous and coniferous trees were 82% and 18%, respectively. Graph 9 describes the canopy in Little Rock Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 85%. The mean percent left bank vegetated was 91%. The dominant elements composing the structure of the stream banks consisted of 7.1% boulder, 82.1% cobble/gravel, and 10.7% sand/silt/clay (Graph 10). Deciduous trees was the dominant vegetation type observed in 78.6% of the units surveyed. Additionally, 7% of the units surveyed had grass as the dominant vegetation type, and 14.3% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on September 17, 1996, in Little Rock Creek. The sites were sampled by Ruth Goodfield (DFG) and Todd Kraemer (CCC).

The site sampled included habitat units 006-007, a run/pool sequence approximately 273 feet from the confluence with the South Fork Eel River. This site had an area of 998 sq ft and a volume of 990 cu ft. The site yielded five young-of-the-year (YOY) steelhead rainbow trout.

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<u>DISCUSSION</u>

Little Rock Creek is a B3 channel type for the entire 4,337 feet of stream surveyed. The suitability of B3 channel types for fish habitat improvement structures is as follows: excellent for plunge weirs; boulder clusters and bank placed boulder; single and opposing wing-deflectors; log cover.

The water temperatures recorded on the survey days August 22 to 27, 1996, ranged from 55° to 62°F. Air temperatures ranged from 63° to 74°F. This is a good water temperature range 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 79% of the total **length** of this survey, riffles 4%, culverts 4%, and pools 13%. The pools are relatively shallow, with only eight of the 42 (19%) 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.

Fourteen of the 42 pool tail-outs measured had an embeddedness rating of 3 or 4. None had a 1 rating. Twenty-six had an embeddedness rating of 5. 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 Little Rock 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 40. The shelter rating in the flatwater habitats was 101. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, terrestrial vegetation 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.

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

The mean percent canopy density for the stream was 97%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 85% and 91%, 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.

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RECOMMENDATIONS

1)      Little Rock Creek should be managed as an anadromous, natural production
        stream.

2)      Increase woody cover in the pools and flatwater habitat units.  Most of the
        existing cover is from boulders.  Adding high quality complexity with woody cover
        is  desirable.

3)      Where feasible, design and engineer pool enhancement structures to increase
        the number of pools.  This must be done where the banks are stable or in
        conjunction with stream bank armor to prevent erosion.

4)      The limited water temperature data available suggest that maximum
        temperatures are within 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.

5)      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.

6)      Suitable size spawning substrate on Little Rock Creek is limited to relatively few
        reaches.  Projects should be designed at suitable sites to trap and sort spawning
        gravel.

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 the South Fork Eel River.  Channel type is a B3.

  78'  Corrugated metal pipe (CMP), 7.5' diameter, in stream channel.  Washington baffles in
       CMP appeared to be in condition repair with little sediment build-up.

 273'  Electrofishing site; September 19, 1996.

 724'  Slope failure on left bank; approximately 80' long X 100' high.

1,283'  Log debris accumulation (LDA) in stream channel; approximately 22' long X 10' wide X
        8' high.  Not a barrier to migrating salmonids.

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2,368'  Failure on left bank; approximately 100' long X 90' high.

3,333'  Slope failure on right bank; approximately 100' long X 80' high.

4,337'  Large bedrock cascade in stream channel.  End of anadromy.  End of survey.

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 |
|---|---|---|
| **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 |