SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

SCOTT CREEK, MAIN STEM EEL RIVER, 1999

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

1999

Scott Downie
Senior Fish Habitat Supervisor

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

Scott Creek, Mainstem Eel River

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Scott Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Scott Creek.

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

Scott Creek is tributary to the Tomki Creek, tributary to the Mainstem Eel River, located in Mendocino County, California (Map 1). Scott Creek's legal description at the confluence with Tomki Creek is T18N R12W S8. Its location is 39°25′28″ North latitude and 123°12′32″ West longitude. Scott Creek is a first order stream and has approximately 2.6 miles of blue line stream according to the USGS Foster Mountain 7.5 minute quadrangle. Scott Creek drains a watershed of approximately 4.05 square miles. Elevations range from about 1,500 feet at the mouth of the creek to 1900 feet in the headwater areas. Douglas fir and mixed hardwood forest dominate the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists from Willits via Commercial Street. Travel east on Commercial Street to Hearst Willets Road, take a left. Follow Hearst Willets to Canyon Road. Follow Canyon Road to the mouth of Cave Creek, the road split here and you will need to take the left hand fork. This jeep trail will take you to Scott Creek.

METHODS

The habitat inventory conducted in Scott Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et.al., 1998). The AmeriCorps Watershed Stewards Project (WSP) 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.

Scott Creek, Mainstem Eel River

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Scott 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 standard flow measuring equipment, if available. In some cases flows are estimated.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from

a standard list of 24 habitat types. Dewatered units are labeled "dry". Scott 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were 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 Scott 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, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Scott 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:

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 Scott 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 Scott 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 was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Scott Creek fish presence was observed from the stream banks. 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 Scott 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

Scott Creek, Mainstem Eel River

- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in the pool tail outs
- 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 July 8, 1999, was conducted by Paul Ferns and Greg Larson (WSP). The total length of the stream surveyed was 6,464 feet with an additional 43 feet of side channel.

Flows were not measured on Scott Creek.

Scott Creek is an F4 channel type for the entire 6,464 feet of stream reach surveyed. F4 channel types have entrenched meandering riffle/pool gravel channels on low gradients with high width/depth ratio.

Water temperatures taken during the survey period ranged from 61° to 72° F. Air temperatures ranged from 73° to 84° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% riffle units, 0% flatwater units, 47% pool units, and 12% dry units (Graph 1). Based on total length of Level II habitat types there were 40% riffle units, 0% flatwater units, 48% pool units, and 12% dry units (Graph 2).

Three Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 47%; low gradient riffles, 41%; and dry, 12% (Graph 3). Based on percent total length, mid-channel pools made up 48%; low gradient riffles, 40%; and dry,12%.

A total of 39 pools were identified (Table 3). Only main channel pools were encountered (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Nineteen of the 39 pools (49%) had a depth of two feet or greater (Graph 5).

Scott Creek, Mainstem Eel River

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 39 pool tail-outs measured, 0 had a value of 1; three had a value of 2 (7.7%); 24 had a value of 3 (61.5%); one had a value of 4 (2.6%) and eleven had a value of 5 (28.2%) (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 Scott Creek, two of the eleven pool tail-outs which were valued at 5 had silt/clay/sand or gravel too small to be suitable for spawning as the substrate. The other tail-outs were unsuitable for spawning due to the tail-outs being comprised of large cobble or bedrock.

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 7, flatwater habitat types had a mean shelter rating of 0, and pool habitats had a mean shelter rating of 8 (Table 1). Of the pool types, main channel pools had the highest mean shelter rating at 8.

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Scott Creek. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Scott Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Gravel was the dominant substrate observed in 20 of the 39 pool tail-outs measured (51.3%). Small cobble was the next most frequently observed dominant substrate type and occurred in 20.5% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 65%. The mean percentages of conifer and deciduous trees were 44% and 56%, respectively. Graph 9 describes the canopy in Scott Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 82.8%. The mean percent left bank vegetated was 46.1%. The dominant elements composing the structure of the stream banks consisted of 22.2% bedrock, 0% boulder, 66.7% cobble/gravel, and 11.1% sand/silt/clay (Graph 10). Grass was dominant bank vegetation type observed in 33.3% of the units surveyed. Additionally, 33.3% of the units surveyed had deciduous trees as the dominant bank vegetation, and 27.8% had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No sites were electrofished during the survey of Scott Creek. Salmonids were observed from the stream banks by the surveyors.

Scott Creek, Mainstem Eel River

DISCUSSION

Scott Creek is a F4 channel type for the entire 6,464 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is: good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, log cover; and poor for boulder clusters.

The water temperatures recorded on the survey days July 8, 1999, ranged from 61° to 72° F. Air temperatures ranged from 73° to 84° F. The upper end of this temperature range is unfavorable for salmon and, 72° F, if sustained, is above 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 0% of the total length of this survey, riffles 40%, pools 48% and 12% was dry. 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. The pools are relatively deep, with 19 of the 39 (49%) pools having a maximum depth greater than 2 feet. Primary pools comprise 24% of the total length of the stream habitat surveyed. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat.

None of the thirty-nine pool tail-outs measured had an embeddedness rating of 1, 8% had a rating of 2, 64% had ratings of 3 or 4, and 28% had a rating of 5 and were considered unsuitable for spawning. Two of the eleven (18%) pool tail-outs that had a rating of 5 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or gravel being 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 Scott 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 8. The shelter rating in the flatwater habitats was 0. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by terrestrial vegetation in all habitat types. Additionally, boulders contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Instream cover created by small and large woody debris provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Twenty-eight of the 39 (72%) 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 65%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 83% and 46%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting native species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) The limited water temperature data available suggest that maximum temperatures are above the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Increase the canopy and bank vegetation on Scott Creek by planting willow, alder or other native riparian trees along the stream where shade canopy or bank vegetation 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) Active and potential sediment sources related to roads systems need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

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

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 is dry. Channel type is F4.

150' Stagnant, algae filled pool. Fish observed, species unknown.

219' Out of the hydrologic influence of Tomki Creek and its flood prone zone. Begin 100% sampling of habitat types by first occurrence.

Scott Creek, Mainstem Eel River

586' Fish observed, but species unknown.
3,199' Right bank tributary.

6,177' Dry tributaries enter from both left and right banks.

6,450' End of survey. No fish observed for last 5,051'.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 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