SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

Unnamed Tributary #2 to Sulphur Creek, Mattole River, 1999

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

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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 Restoraion 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

Unnamed Tributary #2 Sulphur Creek, Mattole River 1999

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Unnamed Tributary #2 Sulphur Creek beginning at the confluence with Sulfer 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 Unnamed Tributary #2 Sulphur 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

Unnamed Tributary #2 Sulphur Creek is tributary to the Sulphur Creek, tributary to the Mattole River, located in Humboldt County, California (Map 1). Unnamed Tributary #2 Sulphur Creek's legal description at the confluence with Sulfer Creek is T01S R01W S27. Its location is 40°21′ 11.5″ north latitude and 124°09′50″ west longitude. Unnamed Tributary #2 Sulphur Creek is a first order stream and has approximately 1.2 miles of blue line stream according to the USGS Buckeye Mt. 7.5 minute quadrangle. Unnamed Tributary #2 Sulphur Creek drains a watershed of approximately 0.85 square miles. Elevations range from about 1190 feet at the mouth of the creek to 2120 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists from Monument Ridge, on private road controlled by Pacific Lumber Co., cross Bear River Bridge near Beer Bottle Creek, continue for eight miles to a trailhead. Foot access to Sulfer Creek is available from the trailhead about a half a mile to the Sulphur Creek confluence with the East branch of the lower North fork of the Mattole River.

METHODS

The habitat inventory conducted in Unnamed Tributary #2 Sulphur 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.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1995). 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 methodology and data sheet has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This protocal was used in Unnamed Tributary #2 Sulphur Creek to record measurements and observations. There are nine components to the inventory datasheet. For specific information on the methods used see the parent creek report.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Unnamed Tributary #2 Sulphur Creek fish presence was observed from the stream banks. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

SUBSTRATE SAMPLING

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

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Unnamed Tributary #2 Sulphur 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 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 08, 1999, was conducted by Donn Rehburg and Michelle Anderson (WSP). The total length of the stream surveyed was 2,632 feet with an additional 23 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.3 cfs on July 07, 1999.

Unnamed Tributary #2 Sulphur Creek is a B4 channel type for the entire 2,632' of stream reach surveyed. B4 channel types are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools; very stable plan and profile; stable banks; gravel channel.

Water temperatures taken during the survey period ranged from 60° to 63° F. Air temperatures ranged from 57° to 65° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% riffle units, 35% flatwater units, and 21% pool units (Graph 1). Based on total length of Level II habitat types there were 44% riffle units, 48% flatwater units, and 8% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 43%; run, 20%; and step run, 15% (Graph 3). Based on percent total length, low gradient riffle made up 43%, step run 32%, and run 16%.

A total of sixteen pools were identified (Table 3). Main channel pools were most frequently encountered at 63% and comprised 60% 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. Seven of the sixteen pools (44%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the fifteen pool tail-outs measured, one had a value of 1 (7%); eight had a value of 2 (53%); four had a value of 3 (27%); zero had a value of 4 (0%) and two had a value of 5 (13%) (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.

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 5, flatwater habitat types had a mean shelter rating of 17, and pool habitats had a mean shelter rating of 41 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 80. Main channel pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Unnamed Tributary #2 Sulphur Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Unnamed Tributary #2 Sulphur Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Small cobble was the dominant substrate observed in twenty-two of the forty-two pool tail outs measured (52.3%). Gravel was the next most frequently observed dominant substrate type and occurred in 35.7% of the pool tail outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 64%. The mean percentages of conifer and deciduous trees were 44% and 56%, respectively. Graph 9 describes the canopy in Unnamed Tributary #2 Sulphur Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 52.0%. The mean percent left bank vegetated was 97.3%. The dominant elements composing the structure of the stream banks consisted of 13.3% bedrock, 53.3% cobble/gravel, and 33.3% sand/silt/clay (Graph 10). Coniferous trees were the dominant bank vegetation type observed in 40% of the units surveyed. Additionally, 20% of the units surveyed had deciduous trees as the dominant bank vegetation. (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No biological inventory was done on Unnamed Tributary #2 Sulphur Creek. Fish presence was observed from the stream banks by habitat inventory survey team. Young of the year salmonids were observed.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Unnamed Tributary #2 Sulphur Creek.

DISCUSSION

Unnamed Tributary #2 Sulphur Creek is a B4 channel type for the entire 2,632 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: Excellent for low-stage plunge weirs; boulder clusters; bank placed boulders; single and opposing wing-deflectors; log cover.

The water temperatures recorded on the survey day July 07, 1999, ranged from 60° to 63° F. Air temperatures ranged from 57° to 65° F. This is a good water temperature range for salmonids and Unnamed Tributary #2 Sulphur Creek seems to have temperatures favorable to 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 48% of the total length of this survey, riffles 44%, and pools 8%. However, only seven of the sixteen (43.7%) pools have maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is

defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with any needed modification of the log debris accumulations (LDA's) in the stream. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

One of the fifteen pool tail-outs measured had an embeddedness rating of 1 (7%). Eight of the pool tail-outs had embeddedness ratings of 2 (53%). Four (27%) of the pool tail-outs had embeddedness ratings of 3 or 4. Two of the pool tail-outs had a rating of 5 (13%) were considered unsuitable for spawning because the dominant substrate was sand 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 Unnamed Tributary #2 Sulphur 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 low with a rating of 41. The shelter rating in the flatwater habitats was slightly lower at 17. 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, terrestrial vegetation contributes 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.

Thirty-seven of the forty-two 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 64%. This is a moderate 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 low to high at 52% and 97.3%, 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) Unnamed Tributary #2 Sulphur Creek should be managed as an anadromous, natural

production stream.

2) 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.

3) 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.

4) 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.

5) 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.

6) Increase the canopy on Unnamed Tributary #2 Sulphur Creek 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.

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' Survey begins at the confluence with Sulphur Creek. Channel type is B4.

13' YOY observed.

264' 7' into unit, left bank trib dry.

382' Three large logs in channel. Two wedged against boulder, one on the bank resting on the other two.

502' Right bank erosion.

664' Right bank trib 25' into unit, 56° F.

884' YOY seen.

971' Side channel originates from sub surface flow.

1085' Right bank slide.

1560' Right bank slopes failure 60' H x 120' (or more) L 2+ observed.

1657' Large debris accumulation spans the width of the channel, gravel wedge 2.5' high

1833' YOY observed.

2395' Right bank slide, 80' H x 120' L

2632' LDA spaning the width of the channel is retaining gravel and other debris. Debris has created a 7' plunge. End of survey

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.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

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

LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5