SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

WHITE ROCK CREEK, MAINSTEM EEL RIVER, 1998

CALIFORNIA DEPARTMENT OF FISH AND GAME

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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 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

White Rock Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on White Rock Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in White Rock 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

White Rock Creek is a tributary to Woodman Creek, tributary to the mainstem Eel River, located in Mendocino County, California (Map 1). White Rock Creek's legal description at the confluence with Woodman Creek is T22N R14W S16. Its location is 39°45′51″ North latitude and 123°25′58″ West longitude. White Rock Creek is a second order stream and has approximately 7.0 miles of blue line stream, according to the USGS Iron Peak 7.5 minute quadrangle, draining a watershed of approximately 11.4 square miles. Elevations range from about 1,240 feet at the mouth of the creek to 3,200 feet in the headwater areas. There is one lake in the watershed. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned. Vehicle access exists via Wilson Road in Laytonville to an unpaved road that follows Woodman Creek and passes near the confluence of Woodman Creek and White Rock Creek.

METHODS

The habitat inventory conducted in White Rock Creek follows 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.

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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 White 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 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.

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4. Habitat Type:

Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types defined by McCain and others (1988). Dewatered units are labeled "dry". White Rock Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit 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 cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In White 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, occurrence of 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 which 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 White 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:

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 White 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 White 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 was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In White Rock 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

White Rock Creek

Graphics are produced from the tables using Quattro Pro. Graphics developed for White Rock 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 13, 1999, was conducted by J. Wooster and S. McMorrow (WSP). The total length of the stream surveyed was 2,527 feet with an additional 156 feet of side channel.

Flows were not measured on White Rock Creek.

White Rock Creek is an A1 channel type for the entire 2,527 feet of stream reach surveyed. A1 channels are steep, narrow, cascading, step-pool bedrock channel streams that are very stable; they have high energy/debris transport associated with depositional soils.

Water temperatures taken during the survey period ranged from 66° to 68° F. Air temperatures ranged from 74° to 84° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 32% riffle units, 28% flatwater units, and 40% pool units (Graph 1).

Based on total length of Level II habitat types there were 41% riffle units, 29% flatwater units, and 29% pool units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 30%; mid-channel pools, 26%; and runs, 22% (Graph 3). Based on percent total length, low gradient riffles made up 40%, runs, 20%, and mid-channel pools, 19%.

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A total of twenty pools were identified (Table 3). Main channel pools were most frequently encountered at 85% and comprised 93% 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. Sixteen of the twenty pools (80%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the twenty pool tail-outs measured, zero had a value of 1; thirteen had a value of 2 (65%); five had a value of 3 (25%); zero had a value of 4 and two had a value of 5 (10%) (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 24, flatwater habitat types had a mean shelter rating of 15, and pool habitats had a mean shelter rating of 10 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 13. Main channel pools had a mean shelter rating of 9 (Table 3).

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

Table 6 summarizes the dominant substrate in pool habitat types. Gravel was the dominant substrate observed in 10 of the 20 pool tail-outs measured (50%). Large cobble was the next most frequently observed dominant substrate type and occurred in 25% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 74%. The mean percentages of conifer and deciduous trees were 1% and 99%, respectively. Graph 9 describes the canopy in White Rock Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 35.8%. The mean percent left bank vegetated was 33.2%. The dominant elements composing the structure of the stream banks consisted of 19.44% bedrock, 30.56% boulder and, 50% cobble/gravel (Graph 10). Deciduous trees are the dominant bank vegetation type observed in 97% of the units surveyed (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No biological inventory was performed on White Rock Creek. Surveyors observed juvenile salmonids from stream bank during the survey.

DISCUSSION

White Rock Creek

White Rock Creek is an A1 channel type for the entire 2,527 feet of stream surveyed. A1 channel types have stable streams banks but are generally not suitable for fish habitat improvement structures due to high energy and poor gravel retention capabilities.

The water temperatures recorded on the survey day July 13, 1999, ranged from 66° to 68° F. Air temperatures ranged from 74° to 84° F. This is a fair water temperature range for steelhead. 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 29% of the total length of this survey, riffles 41%, and pools 29%. The pools are relatively deep, with sixteen of the 20 (80%) 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 total stream habitat length. In first and second order streams, a primary pool is defined as having a maximum depth of at least two feet, occupying at least half the width of the low flow channel, and being as long as the low flow channel width. Primary pools comprise 23% of the total length of the stream habitat surveyed. Installing structures that will increase or deepen pool habitat is not recommended due to high energy and poor gravel retention capabilities of A1 channels.

None of the twenty tail-outs measured had an embeddedness rating of 1, 65% had a rating of 2, 25% had ratings of 3 or 4, and 10% had a rating of 5 and were considered unsuitable for spawning due to the dominant substrate being boulders and bedrock. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

The mean shelter rating for pools was 10. The shelter rating in the flatwater habitats was 15. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris, white water, and boulders in all habitat types. Additionally, large woody debris 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 reducing density related competition.

Thirteen of the twenty (65%) 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 74%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 35.8% and 33.2%, 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) White Rock Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are nearing the threshold stress level for juvenile steelhead. However, 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) 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 Woodman Creek. Channel type is A1 for the entire stream length surveyed.

338' Channel gradient is approximately 10%.

450' Eight foot plunge through bedrock. May divert around at higher flows.

502' Six foot drop at top of unit.

2,175' Six inch steelhead observed.

2,527' End of survey. Access denied by landowner.

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