SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

WATERSHED PLANNING and COORDINATION PROJECT

STREAM INVENTORY REPORT

MARTIN CREEK, MAINSTEM EEL RIVER, 2000

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 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.

Martin Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2000 on Martin 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 Martin 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

Martin Creek is tributary to the Larabee Creek, tributary to the Eel River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Martin Creek's legal description at the confluence with Larabee Creek is T01S R04E S21. Its location is 40°21′57″ north latitude and 123°44′3.69″ west longitude. Martin Creek is a third order stream and has approximately 3.3 miles of blue line stream according to the USGS Blocksburg 7.5 minute quadrangle. Martin Creek drains a watershed of approximately 2.9 square miles. Elevations range from about 960 feet at the mouth of the creek to 3,200 feet in the headwater areas. Douglas fir, mixed hardwood forests and grassland dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists from U.S. Highway 101 via Highway 36 East. From Highway 36 make a right onto Alderpoint Road at Bridgeville. Follow Alderpoint Rd. approximately 10.5 miles to Martin Creek.

METHODS

The habitat inventory conducted in Martin 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. 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 Martin 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". Martin 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 Martin 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 Martin 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 Martin 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 Martin 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 Martin Creek fish presence was observed from the stream banks, and two 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
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Martin 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
- 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 31, September 1, 5, and 7, 2000, was conducted by Chris Glenney, Gordon Johnson, and Johanna Schussler (WSP). The total length of the stream surveyed was 4,768 feet with an additional 160 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.16 cfs on September 8, 2000.

Martin Creek is an F3 channel type for the first 4,768 feet of stream reach surveyed and an F4 for the remaining 2,049 feet of stream surveyed. F3 channel types are entrenched meandering riffle/pool cobble dominated channels on low gradients with high width/depth ratio. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 55° to 59° F. Air temperatures ranged from 64° to 72° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% riffle units, 35% flatwater units, and 27% pool units (Graph 1). Based on total length of Level II habitat types there were 45% riffle units, 40% flatwater units, and 15% pool units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 29%; runs and step runs, 17%; and mid-channel pools, 14% (Graph 3). Based on percent total length, low gradient riffles made up 35%; step runs, 27%; and runs,13%.

A total of thirty-seven pools were identified (Table 3). Main channel pools were most frequently encountered at 57% and comprised 63% 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. Twenty-one of the thirty-seven pools (56.7%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the thirty-five pool tail-outs measured, seven had a value of 1 (20%); eight had a value of 2 (23%); four had a value of 3 (11%); one had a value of 4 (3%) and fifteen had a value of 5 (43%) (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 25, flatwater habitat types had a mean shelter rating of 17, and pool habitats had a mean shelter rating of 42 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 49. 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 Martin Creek. Graph 7 describes the pool cover in Martin Creek.

Table 6 summarizes the dominant substrate in pool habitat types. Small cobble was the dominant substrate observed in ten of the thirty-five (28%) pool tail-outs measured. Boulders and bedrock were the next most frequently observed dominant substrates types, each occurred in 26% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 79%. The mean

percentages of conifer and deciduous trees were 11% and 89%, respectively. Graph 9 describes the canopy in Martin Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 70.0%. The mean percent left bank vegetated was 78.4%. The dominant elements composing the structure of the stream banks consisted of 25% bedrock, 16.2% boulder, 13.2% cobble/gravel, and 45.6% sand/silt/clay (Graph 10). Deciduous trees were the dominant bank vegetation type observed in 77.9% of the units surveyed. Additionally, 11.8% of the units surveyed had coniferous trees as the dominant bank vegetation, including down trees, logs, and root wads, and 5.9% of the units were not vegetated (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on October 11,12, 2000, in Martin Creek. The sites were sampled by Glenn Yoshioka (DFG) and Gordon Johnson (WSP).

The first site sampled included habitat units 005-007, 009, and 013, approximately 350 feet from the confluence with Larabee Creek. These units included a low gradient riffle, run, plunge pool, mid-channel pool, and root wad enhanced lateral scour pool, respectively. This site yielded 32 juvenile steelhead rainbow trout. Based upon visually estimated lengths, the probable distribution of steelhead age classes was 29 age 0+, and 3 age 1+.

The second site included habitat units 083, 084, 087, 092, and 105, located approximately 2,719 feet above the creek mouth. These units included a low gradient riffle, step run, and three mid-channel pools, respectively. This site yielded 40 juvenile steelhead rainbow trout. Based upon visually estimated lengths, the probable distribution of steelhead age classes was 25 age 0+, 13 age 1+, and 2 age 2+.

Three size classes of juvenile steelhead rainbow trout were found in Martin Creek. These data can be summarized as follows:

	SHRT Age 0+	SHRT Age 1+	SHRT Age 2+	SHRT Age 3+
Site 1	29	3	0	0
Site 2	25	13	2	0

DISCUSSION

Martin Creek is a F3 channel type for the first 2,719 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors, and log cover. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs,

single and opposing wing-deflectors, channel constrictors and log cover; and poor for boulder clusters.

The water temperatures recorded on the survey days August 31, September 1, 5, 7, 2000, ranged from 55° to 59° F. Air temperatures ranged from 64° to 72° F. This is a good water temperature range for salmonids. Martin Creek seems to have temperatures favorable to salmonids. However, 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 40% of the total length of this survey, riffles 45%, and pools 15%. The pools are relatively deep, with twenty-one of the thirty-seven (56%) 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. Primary pools comprise 25% of the total length of stream habitat surveyed in Martin Creek.
Installing structures that will increase or deepen pool habitat is recommended.

Seven of the thirty-five (20%) pool tail-outs measured had an embeddedness rating of 1, 23%, had a rating of 2, 14% had ratings of 3 or 4, and 43% had a rating of 5 and were considered unsuitable for spawning. All fifteen (100%) with a rating of 5 were unsuitable for spawning due to the dominant substrate being boulders, bedrock or wood. 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 Martin Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Sixteen of the thirty-five (46%) pool tail-outs measured had gravel or small cobble as the dominant substrate. Suitable spawning substrate for salmonids is limited.

The mean shelter rating for pools was 42. The shelter rating in the flatwater habitats was 17. 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, white water 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.

The mean percent canopy density for the stream was 79%. However, canopy density in

the upper reach averaged 59%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 70% and 78.4%, 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) Martin Creek should be managed as an anadromous, natural production stream.

2) 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.

3) Increase the canopy on Martin Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy or bank coverage 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.

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) Primary pools comprise 25% of the total stream length surveyed. 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.

7) 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.

8) Suitable spawning areas are limited on Martin Creek. Structures to trap and sort spawning substrate should be installed.

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 the confluence with Larabee Creek.

185' Young-of-the-year (YOY) steelhead rainbow trout seen.

386' Out of the hydrologic influence of Larabee Creek and its flood prone zone. Begin 100% survey of habitat types by first occurrence.

592' Log debris accumulation (LDA) composed of small woody debris, 12' long x 15' wide x 4' high.

686' Right bank erosion, 15' long x 12' high.

730' Channel widens. Right bank terrace with dry side channel.

798' Left bank erosion, 30' long x 8' high.

931' Right bank erosion, 60' long x 15' high.

982' LDA, 13' long x 7' high x 35' wide, not retaining sediment.

1,146' Twelve foot plunge from the top of the cascade.

1,220' Seep feeding creek from right bank.

1,263' Left bank erosion, 35' long x 12' high.

1,518' Two foot plunge from LDA, 10' long x 11' wide x 6' high, retaining sediment.

1,566' Right bank erosion, 71' long x 15' high.

1,751' Right bank erosion, 45' long x 20' high.

1,868' LWD accumulation, not retaining sediment.

2,101' Gradient increases, channel type possible changes to an A channel, but not long enough to be a new reach.

2,514' Alderpoint Road bridge.

2,724' Left bank erosion, 150' long x 30' high.

2,719' Channel type changes from F3 to F4.

3,018' Left bank erosion starts, 35' high.

3,237' End of the left bank erosion from 3018'. Gradient increases.

3,360' Left bank erosion 40' long x 9' high. Decrease in gradient.

3,402' Right bank failure, 100' long x 10' high.

3,456' Left bank slide, 100' long x 15' high.

3,556' LDA, 10' long x 35' wide x 5' high.

3,615' Left bank erosion, 40' long x 13' high.

3,730' Left bank slide, 50' long x 50' high.

3,857' Right bank erosion, 10' high, left bank slide 35' high.

3,970' LDA, 10' long x 30' wide x 5' high, passing sediment.

4,093' LDA, 20' long x 30' wide x 3' high, retaining sediment.

4,098' Left bank erosion, 150' long x 20' high.

4,351' Right bank tributary, dry.

4,493' Left bank slide, 30' long x 40' high., revegetated with grass and small shrubs.

4,768' Juvenile steelhead trout observed. Series of 10' - 16' waterfalls for the next 0.25 miles. End of survey.

REFERENCES

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. *California Salmonid Stream Habitat Restoration Manual,* 3nd 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