SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

BASIN PLANNING PROJECT

STREAM INVENTORY REPORT

Woodman Creek, Eel River, 1998

CALIFORNIA DEPARTMENT OF FISH AND GAME

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NORTH COAST BASIN PLANNING PROJECT

The North Coast 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's goal has been to achieve a doubling of the population of salmon and steelhead by the year 2000. The BPP is supported by the Sport Fish Restoration Act, which uses sport fishermen's funds to improve sport fisheries.

The project 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, and some selected streams are electrofished for population estimates. A few streams are also sampled for substrate 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 North Fork Eel rivers have been inventoried since 1991. BPP personnel have also completed inventories of most Mattole River tributaries, and a few Mendocino County coastal streams, and tributaries to Humboldt Bay.

STREAM INVENTORY REPORT

WOODMAN CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Woodman Creek. The survey began at the confluence with the Eel River and extended upstream 4.3 miles. The Woodman 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 Woodman 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 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

Woodman Creek is tributary to the mainstem Eel River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Woodman Creek's legal description at the confluence with the mainstem Eel River is T22N R14W S11. Its location is 39°46′37″ north latitude and 123°23′26″ west longitude. Woodman Creek is a third order stream and has approximately 6.9 miles of blue line stream according to the USGS Iron Peak and Laytonville 7.5 minute quadrangles. Woodman Creek drains a watershed of approximately 24.4 square miles. Elevations range from about 760 feet at the mouth of the creek to 3,100 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is privately owned and is managed for rural residence. Vehicle access exists via the Northwestern Pacific Railroad or Wilson Road in Laytonville to an unimproved road that follows the creek.

METHODS

The habitat inventory conducted in Woodman 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 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 protocol was used in Woodman Creek to record measurements and observations. There are nine components to the inventory data sheet.

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". Woodman 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 Woodman 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 Woodman 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 Woodman 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 Woodman 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 the stream inventory is used to determine fish species and their distribution in the stream. In Woodman Creek, fish presence was observed from the stream banks. 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 Woodman 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 July 7-14, 1998, was conducted by Caroline Jezierski, Kathleen Turner, Stewart McMorrow, and John Wooster (WSP). The total length of the stream surveyed was 22,654 feet with an additional 4,249 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh. McBirney Model 2000 flowmeter at 5.0 cfs on July 6, 1998.

Woodman Creek was an A2 channel type for the first 2,295 feet of stream surveyed, a C4 for the next 3,772 feet, a B1 channel type for the next 1,931 feet of stream surveyed, an F1 for the next 4,795 feet, an F4 channel type for the next 9,318 feet surveyed, and an A1 channel type for the final 543 feet of stream surveyed. A2 channel types are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils and have boulder channels. C4 channels are low gradient, meandering point-bar, riffle/pool, gravel-dominated alluvial channels with a broad well defined floodplain. B1 channels are moderately entrenched, moderate gradient, riffle dominated bedrock channels with infrequently spaced pools, very stable plan and profile, and stable banks. F1 channels are entrenched meandering riffle/pool bedrock channels on low gradients with high width/depth ratios. They are very stable bedrock controlled channels. F4 channels are entrenched, meandering riffle/pool gravel channels on low gradients with high width/depth ratios. A1 channel types are steep, narrow, very stable bedrock channels with cascading step pools and high energy/debris transport associated with depositional soils. Water temperatures taken during the survey period ranged from 60° to 70° F. Air temperatures ranged from 69° to 90° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 34% riffle units, 34% flatwater units, and 32% pool units (Graph 1). Based on total length of Level II habitat types there were 29% riffle units, 45% flatwater units, and 26% pool units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low grade riffles, 28%; mid-channel pools, 28%; and step runs, 17% (Graph 3). Based on percent total length, step runs made up 28%, low grade riffles 25%, and mid-channel pools, 22%.

A total of 134 pools were identified (Table 3). Main channel pools were most frequently encountered at 91% (Graph 4) and comprised 93% of the total length of all pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Forty-four of the 134 pools (32.8%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 134 pool tail-outs measured, none had a value of 1; 66 had a value of 2 (49.3%); 44 had a value of 3 (32.8%); 5 had a value of 4 (3.7%) and 19 had a value of 5 (14.2%) (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.

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 40, flatwater habitat types had a mean shelter rating of 23, and pool habitats had a mean shelter rating of 5 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 17. Backwater pools had a mean shelter rating of 5 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders, white water and aquatic vegetation are the dominant cover types in Woodman Creek. Graph 7 describes the pool cover in Woodman Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 67 of the 134 (50%) pool tail-outs measured. Small cobble was the next most frequently observed dominant substrate type and occurred in 17% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 70%. The mean percentages of deciduous and coniferous trees were 90% and 9%, respectively. Graph 9 describes the canopy in Woodman Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 36.9%. The mean percent left bank vegetated was 36.7%. The dominant elements composing the structure of the stream banks consisted of 31.9% bedrock, 0.6% boulder, 20% cobble/gravel, and 47.5% sand/silt/clay (Graph 10). Deciduous trees was the dominant vegetation type observed in 56.3% of the units surveyed. Additionally, 3.8% of the units surveyed had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Woodman Creek

One site was electrofished on July 17,1998, in Woodman Creek. The site was sampled by Gary Flosi and Scott Downie (DFG).

The site sampled was approximately 18,400 ft. from the confluence with the mainstem Eel River and has run and low-gradient riffle habitat types. Water temperature was 60° F. The site yielded ten young-of-the-year (YOY) steelhead rainbow trout and six age 1+ steelhead rainbow trout.

DISCUSSION

Woodman Creek is an A2 channel type for the first 2,295 feet of stream surveyed, a C4 for the next 3,772 feet, a B1 channel type for the next 1,931 feet, a F1 for the next 4,795, a F4 channel type for the next 9,318 feet, and an A1 for the last 543 feet. The suitability of A2, C4, B1, F1, F4 and A1 channel types for fish habitat improvement structures is as follows: A2 channels are generally not suitable because they are high energy streams with stable stream banks but poor gravel retention capabilities. C4 channel types are good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. B1 channels are excellent for bank-placed boulders; good for log cover; poor for plunge weirs, single and opposing wing-deflectors, and boulder clusters. F1 channel types are good for bank-placed boulders; fair for single wing-deflectors and log cover; poor for plunge weirs, boulder clusters and opposing wing deflectors. F4 channels are good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; poor for boulder clusters. A1 channel types are generally not suitable for fish habitat improvement structures because they are high energy streams with stable stream banks and poor gravel retention capabilities.

The water temperatures recorded on the survey days July 7-14, 1998, ranged from 60° to 70° F. Air temperatures ranged from 69° to 90° F. This is a fair water temperature range for steelhead. Tto 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 45% of the total length of this survey, riffles 29%, and pools 26%. The pools are relatively shallow, with 44 of the 134 (32.8%) pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third order streams, a primary pool is defined to have a maximum depth of at least three 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.

Sixty-six of the 134 (49%) pool tail-outs measured had an embeddedness rating of 2, 33% had a rating of 3, 4% had a rating of 4, and 14% had a rating of 5 and were considered unsuitable for spawning. Nineteen of the 134 (14%) were unsuitable for spawning due to the dominant substrate being boulderbedrock. 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 Woodman 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 5. The shelter rating in the flatwater habitats was 23. 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, aquatic vegetation contribute 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.

Eighty-nine of the 134 (66%) 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 70%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 37% each. 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.

RECOMMENDATIONS

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

2) The limited water temperature data available suggest that maximum temperatures are nearing threshold stress range for juvenile salmonids. 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) Increase the canopy and bank vegetation on Woodman Creek by planting willow, alder, or other native riparian tree species 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 the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

5) In the “C” and “F” channel types design and engineer pool enhancement structures to increase the number of pools or deepen existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

6) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from white water and boulders. 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 mainstem Eel River. Channel type is A2.

75' Out of the hydraulic influence of Eel River.

444' Right bank failure, 10' long x 7' wide x 15' high.

817' Tributary enters left bank.

989' Young-of-the-year salmonids observed.

2,295' Channel type changes to C4.

3,112' Tributary enters left bank with a flow of approximately 0.5 cfs.

3,860' Road cuts through the stream, 28' wide x 26' long. Fish observed.

3,975' Road cuts through channel for 28'.

4,228' Road leaves streambed after 250' in the stream.

5,302' Left bank slide.

5,315' Road crossing.

5,357' An old stone and cement weir forms a pool.

6,041' Tributary enters right bank.

6,067' Channel type changes to B1.

7,201' Tributary enters right bank.

7,757' Tributary enters left bank.

Woodman Creek

7,987' Channel type change to F1.

8,480' Log debris accumulation (LDA), 25' long x 30' wide x 6' high.

8,967' Tributary enters left bank.

9,755' Tributary enters right bank.

9,897' Spring on left bank.

12,086' LDA, 12' long x 32' wide x 7' high.

12,630' Tributary enters right bank via a culvert with a 4-5' drop.

12,943' Road through creek.

12,984' Flatcar bridge.

13,861' Tributary enters left bank.

14,900' Tributary enters left bank.

16,412' Left bank failure.

16,652' Railroad trestle bridge.

17,034' YOY observed.

14,780' Road crosses creek.

14,792' Stream forks with the survey crew following the left fork. See the sub-section report for the unnamed tributary. Water temperature ranged from 64°-66° degrees, while air temperature ranged from 74°-76° F. Channel type was either a A1 or A2. One YOY was observed on this fork. The survey for this fork ended at a cascade area of 25% gradient followed by a 18' waterfall, whose top is blocked by boulders. Flow was measured as 0.23 cfs for this fork.

17,771' Foot bridge crosses stream.

18,400' Electrofishing site.
18,445' Road crossing.

20,293' Tributary enters right bank, with a water temperature of 73° F.

20,635' Road crossing.

20,665' Log weir, that is not a fish barrier.

20,762' The stream forks. The survey crew followed the left fork. See sub-section report for unnamed tributary. Water temperature ranged from 64°-69° F, while air temperature ranged from 79°-82° F. Juvenile steelhead were seen in 6 different sites. The survey ended at an impassable culvert at a road crossing. The culvert had a 8 1/2' plunge into 0.7' of water.

21,282' LDA.

21,842' Log weir.

22,111' Channel type changes to A1.

22,309' Log weir.

22,597' Tributary enters right bank.

22,654' End of habitat survey due to lack of flow.

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