STREAM INVENTORY REPORT

Woods Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Woods 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 Woods 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

Woods Creek is tributary to the Mattole River, tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Woods Creek's legal description at the confluence with Mattole River is T 3S R 1W S 2. Its location is 40°13′52″ north latitude and 124°08′54″ west longitude. Woods Creek is a first order stream and has approximately 1.2 miles of blue line stream according to the USGS Shubrick Peak 7.5 minute quadrangle. Woods Creek drains a watershed of approximately 1.9 square miles. Elevations range from about 70 feet at the mouth of the creek to 1,700 feet in the headwater areas. Douglas fir forest and oak grassland dominate the watershed. The watershed is entirely privately owned and is managed for rangeland and homesteads.

Vehicle access exists from U.S. Highway 101 South at the South Fork/ Honeydew exit. Follow the Mattole Road to Honeydew. At Honeydew the road forks, continue on the Mattole Road (right fork). About 1.8 miles after Honeydew, Woods Creek will pass under the Mattole Road.

METHODS

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

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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 Woods 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:

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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". Woods 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 Woods 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 Woods 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 Woods 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 Woods 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 Woods 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

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- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Woods 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 June 15,16, and 17, 1999, was conducted by D. Rehberg and G. Larson (AmeriCorps/WSP). The total length of the stream surveyed was 9,893 feet with an additional 393 feet of side channel.

Woods Creek is a F4 channel type for the first 6,415 feet and a B4 channel type for the next 3,478 feet of the stream reach surveyed. F4 channels are entrenched meandering

riffle/pool gravel channels on low gradients with high width/depth ratio. B4 channels are moderately entrenched, moderate gradient, riffle dominated gravel channels with infrequently spaced pools, very stable plan and profile, and stable banks.

Water temperatures taken during the survey period ranged from 53° to 62° F. Air temperatures ranged from 55° to 73° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 51% riffle units, 29% flatwater units, and 21% pool units (Graph 1). Based on total length of Level II habitat types there were 77% riffle units, 18% flatwater units, and 5% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 30%; runs, 21%; and mid-channel pools, 16% (Graph 3). Based on percent total length, low gradient riffles made up 49%, high gradient riffle, 21%, and runs, 11% (Table 2).

A total of 26 pools were identified (Table 3). Main channel pools were most frequently encountered at 81% (Graph 4) and comprised 84% of the total length of all pools (Table 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Sixteen of the 26 pools (62%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 23 pool tail-outs measured, 0 had a value of 1; 12 had a value of 2 (52.2%); 6 had a value of 3 (26.1%); 0 had a value of 4; and 5 had a value of 5 (21.7%) (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 37, and pool habitats had a mean shelter rating of 75 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 93. Main channel pools had a mean shelter rating of 80 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Woods Creek and are extensive. Large and small woody debris are lacking in most habitat types. Graph 7 describes the pool cover in Woods Creek.

Table 6 summarizes the dominant substrate by habitat types. Gravel was the dominant substrate observed in 8 of the 23 pool tail-outs measured (39%). Large cobble was the next most frequently observed dominant substrate type and occurred in 26% 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 17% and 83%, respectively. Graph 9 describes the canopy in Woods Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 69.8%. The mean percent left bank vegetated was 70.9%. The dominant elements composing the structure of the stream banks consisted of 15% bedrock, 74% cobble/gravel, and 11% sand/silt/clay (Graph 10). Deciduous trees was the dominant bank vegetation type observed in 80% of the units surveyed. Additionally, 80% of the units surveyed had deciduous trees as the dominant bank vegetation, and 2% had coniferous trees as the

dominant bank vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on September 28 and 30, 1999 in Woods Creek. The sites were sampled by Glenn Yoshioka (DFG), and Paul Ferns and Donn Rehberg (WSP/AmeriCorps).

The first site was sampled was a run, a plunge pool, and 10 mid-channel pools in the F4 channel. The site yielded yielded 194 juvenile steelhead rainbow trout. The probable breakdown of steelhead age classes is: 158 age 0+, 27 age 1+, 7 age 2+, 2 age 3+ juveniles.

The second site was sampled was a riffle, a run, a lateral scour pool-rootwad enhanced, and 9 mid-channel pools in the B4 channel. The site yielded 144 juvenile steelhead rainbow trout. The probable breakdown of steelhead age classes is: 109 age 0+, 27 age 1+, 7 age 2+, 1 age 3+ juveniles.

These data can be summarized as follows:

	SHRT Age 0+	SHRT Age 1+	SHRT Age 2+	SHRT Age 3+
Site 1	158	27	7	2
Site 2	109	27	7	1

DISCUSSION

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Woods Creek is a F4 channel type for the first 6,415 feet of stream surveyed and a B4 channel type for the remaining 3,478 feet surveyed. The suitability of F4 and B4 channel types for fish habitat improvement structures is: 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. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 15-17, 1999, ranged from 53° to 62° F. Air temperatures ranged from 55° to 73° F. This is a good 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 18% of the total length of this survey, riffles 77%, and pools 5%. The pools are relatively deep, with 16 of the 26 (62%) 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 only 3% of the total stream length surveyed. Installing structures that will increase or deepen pool habitat is recommended.

None of the 23 pool tail-outs measured had an embeddedness rating of 1, 52% had a rating of 2, 26% had ratings of 3 or 4, and 22% had a rating of 5 and were considered unsuitable for spawning. 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

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Woods 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 75. The shelter rating in the flatwater habitats was 37. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in most habitat types. Additionally, whitewater 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.

Thirteen of the 23 (57%) 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%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 69% and 70%, 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) Woods 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) Primary pools comprise only 3% of the total stream length. 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.

4) 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.

5) 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.

6) 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.

7) Increase the canopy on Woods 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.

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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 the Mattole River. Channel type is a F4.

719' Mattole Road Bridge crosses the creek.

974' Out of the hydrologic influence of the receiving stream and its flood prone zone. Begin 100% occurrence.

2,170' Right bank failure, 40' long, 25' high.

2,962' YOY fish observed.

3,410' Left bank slide, 20' long x 40' high.

3,827' Right bank failure, 50' long x 12' high.

4,000' Intermittent tributary enters from the left bank. Subsurface first 35' before Woods Creek.

4,381' Left bank erosion.

4,414' Four foot falls at top of the unit.

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4,461' Left bank erosion.

4,760' Left bank tributary enters, 65° F.

5,003' Begin massive slope failure along right bank, at least 200' tall, riffle cuts through deposited sediment.

5,109' Slope failure continues along right bank.

6,415' Channel type changes from a F4 to a B4.

6,987' Tributary enters from the right bank.

8,958' Right bank tributary enters creek; possibly contributing 25% of stream flow. Water temperature of tributary is 54° F.

9,198' Numerous side channels exist. Many juvenile salmonids seen in small pools in side channels. Channel is in small pools in side channels. Channel is essentially braided, and very high gradient, 4-8%.

9,383' Eroded slope above left bank, 80' in height, extending upstream 225'.

9,626' Back to single thread channel.

9,644' Tributary enters from the left bank.

9,659' End of survey. Stream is very high gradient and dominated by large boulder.

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Stream is intermittent, with severely diminished flow above. No juvenile salmonids seen above.

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