STREAM INVENTORY REPORT

Wiregrass Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Wiregrass Creek. The survey began at the confluence with Redwood Creek and extended upstream 2,000 feet.

The Wiregrass 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 Wiregrass 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 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

Wiregrass Creek is a tributary to Redwood Creek, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Wiregrass Creek's legal description at the confluence with Redwood Creek is T07N R3E S28. Its location is 40.9678 degrees north latitude and 123.8418 degrees west longitude. Wiregrass Creek is a first order stream and has approximately 0.7 miles of blue line stream according to the USGS Lord-Ellis Summit 7.5 minute quadrangle. Wiregrass Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 700 feet at the mouth of the creek to 1,020 feet in the headwater areas. Redwood forest, Douglas fir forest and mixed hardwood forest dominate the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via highway 299 to Redwood Valley Road.

METHODS

The habitat inventory conducted in Wiregrass Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) 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 (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are 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 Wiregrass 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 a Marsh-McBirney Model 2000 flow meter.

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. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

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". Wiregrass 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. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Wiregrass 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 not suitable for spawning due to inappropriate substrate particle size, bedrock, 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 Wiregrass 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 Wiregrass 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 Wiregrass 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 (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Wiregrass Creek. In addition, twelve 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 Wiregrass 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 low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of June 20, 2001 was conducted by E. Gill, M. Wallar (WSP/AmeriCorps), K. Bromley and S. Ferson (DFG). The total length of the stream surveyed was 2,000 feet with an additional 186 feet of side channel.

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Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flow meter at 0.23 cfs on June 28, 2001.

Wiregrass Creek is a B4 channel type for the entire 2,000 feet of the stream surveyed. B4 channels are moderately entrenched, riffle dominated gravel channels with infrequently spaced pools, stable banks, and a moderate gradient.

Water temperatures taken during the survey period ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 62 to 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% pool units, 40% flatwater units, and 17% riffle units (Graph 1). Based on total length of Level II habitat types there were 71% flatwater units, 15% riffle units, and 13% pool units (Graph 2).

Six Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step runs, 36%; mid-channel pools, 32%; low gradient riffles, 11%, and plunge pools, 11% (Graph 3). Based on percent total length, step runs made up 67%, mid-channel pools 10%, low gradient riffles 11%, and plunge pools 4%.

A total of twenty pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 75%, and comprised 73% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Seven of the twenty pools (33%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 19 pool tail-outs measured, five had a value of 1 (26%); six had a value of 2 (32%); and eight had a value of 5 (42%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the eight pool tail-outs that had an embeddedness value of 5 were as follows: 75% boulders and 25% silt/clay/sand or small gravel.

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 35, flatwater habitat types had a mean shelter rating of 43, and pool habitats had a mean shelter rating of 40 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 40 and scour pools had a mean shelter rating of 40 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Wiregrass Creek. Graph 7 describes the pool cover in Wiregrass Creek. Boulders are the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Boulders were the dominant substrate observed in 37% of pool tail-outs while gravel and small cobble were the next most frequently observed substrate

types, both at 26%.

The mean percent canopy density for the surveyed length of Wiregrass Creek was 98%. The mean percentages of deciduous and coniferous trees were 100% and 0%, respectively. Graph 9 describes the mean percent canopy in Wiregrass Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 92%. The mean percent left bank vegetated was 90%. The dominant elements composing the structure of the stream banks consisted of 69% boulder and 31% cobble/gravel (Graph 10). Of the units surveyed, 96% had deciduous trees as the dominant vegetation type, and 4% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twelve sites were electrofished for species composition and distribution in Wiregrass Creek on August 8, 2001. The water temperature during the electrofishing period was 61 degrees Fahrenheit. The air temperature was 64 degrees Fahrenheit. The sites were sampled by A. Renger (DFG), M. Wallar and E. Gill (WSP/AmeriCorps).

The first site sampled was Habitat Unit #003, a mid-channel pool located approximately 61 feet from the confluence with Redwood Creek. The site yielded three young-of-the-year (YOY) steelhead and two age 1+ steelhead.

The second site sampled was Habitat Unit #004, a step run located approximately 96 feet from the creek mouth. The site yielded three YOY steelhead.

The third site was Habitat Unit #011, a mid-channel pool located approximately 327 feet above the creek mouth. The site yielded two YOY steelhead.

The fourth site sampled was Habitat Unit #014, a mid-channel pool located approximately 490 feet above the creek mouth. The site yielded one YOY steelhead.

The fifth site sampled was Habitat Unit #016, a mid-channel pool located approximately 574 feet above the creek mouth. The site yielded no fish.

The sixth site sampled included Habitat Unit #019, a mid-channel pool located approximately 716 feet above the creek mouth. The site yielded two YOY steelhead and one age 1+ steelhead.

The seventh site sampled was Habitat Unit #022, a mid-channel pool located approximately 797 feet above the creek mouth. The site yielded no fish.

The eighth site sampled was Habitat Unit #023, a mid-channel pool located approximately 809 feet above the creek mouth. The site yielded one age 1+ steelhead.

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The ninth site sampled was at Habitat Unit #025, a mid-channel pool located approximately 1,204 feet above the creek mouth. The site yielded no fish.

The tenth site sampled was at Habitat Unit #029, and was located approximately 1,312 feet above the creek mouth. The site yielded no fish.

The eleventh site sampled was at Habitat Unit #030, and was located approximately 1,325 feet above the creek mouth. The site yielded one age 1+ steelhead.

The twelfth site sampled was at Habitat Unit #044, and was located approximately 1,979 feet above the creek mouth. The site yielded one age 2+ steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
08/08/01	1	61	003	4.2	1	B4	3	2	0
08/08/01	2	96	004	3.4	1	B4	3	0	0
08/08/01	3	327	011	4.2	1	B4	2	0	0
08/08/01	4	490	014	4.2	1	B4	1	0	0
08/08/01	5	574	016	4.2	1	B4	0	0	0
08/08/01	6	716	019	4.2	1	B4	2	1	0
08/08/01	7	797	022	4.2	1	B4	0	0	0
08/0/01	8	809	023	4.2	1	B4	0	1	0
08/08/01	9	1,204	025	4.2	1	B4	0	0	0
08/08/01	10	1,312	029	4.2	1	B4	0	0	0
08/08/01	11	1,325	030	5.6	1	B4	0	1	0
08/08/01	12	1,979	044	5.6	1	B4	0	0	1

DISCUSSION

Wiregrass Creek is a B4 channel type for the entire 2,000 feet of stream surveyed. The suitability of B4 a channel type for fish habitat improvement structures is as follows: 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 day, June 20, 2001, ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 62 to 65 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 71% of the total length of this survey, riffles 15%, and pools 13%. The pools are relatively shallow, with seven of the 21 (33%) pools having a maximum depth greater than two 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.

Eleven of the 19 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. Eight of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Six of the eight tail-outs were not suitable for spawning due to the dominant substrate being boulders. The remaining two were dominated by gravel too small 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.

Ten of the 19 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 40. The shelter rating in the flatwater habitats was 43. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, whitewater contributed a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance 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.

The mean percent canopy density for the stream was 98%. In general, revegetation projects are considered when canopy density is less than 80% or the canopy composition is dominated by deciduous trees. The percentage of right and left bank covered with vegetation was high at 92% and 90%, respectively.

RECOMMENDATIONS

1) Wiregrass 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 woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.

4) Increase the canopy on Wiregrass Creek by planting redwood, Douglas fir or other native conifers within the riparian zones. The tributaries to Wiregrass Creek and the reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream.

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.

Position (ft):	Comments:
0'	Start of survey at the confluence with Redwood Creek. The channel type is B4.
61'	Electrofishing site #1.
327'	Electrofishing site #2.
490'	Electrofishing site #3.
574'	Electrofishing site #4.
673'	Plunge of 3 feet.
716'	Electrofishing site #5.
797'	Electrofishing site #6.
1,204'	Electrofishing site #7.
1,312'	Electrofishing site #8.
1,402'	Plunge of 2 feet.
1,484'	Plunge of 2.5 feet.
1,979'	Electrofishing site #9.

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2,000' End of survey due to small waterfall that has a 10 foot jump from pool to top of waterfall. Waterfall is created by a knickpoint in bedrock and is possibly end of anadromy.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	