STREAM INVENTORY REPORT

Wheatfield Fork Gualala River

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Wheatfield Fork Gualala River. The survey began at the confluence with the South Fork Gualala River and extended upstream 20.2 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Wheatfield Fork Gualala River Gualala River.

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

Wheatfield Fork Gualala River is a tributary to the South Fork Gualala River, a tributary to the Gualala River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Wheatfield Fork Gualala River's legal description at the confluence with the South Fork Gualala River is T10N R14W S21. Its location is 38.7016 degrees north latitude and 123.4153 degrees west longitude. Wheatfield Fork Gualala River is a fourth order stream and has approximately 28.8 miles of blue line stream according to the USGS Stewarts Point 7.5 minute quadrangle. Wheatfield Fork Gualala River drains a watershed of approximately 111.6 square miles. Elevations range from about 200 feet at the mouth of the creek to 1,500 feet in the headwater areas. Mixed hardwood, mixed conifer forest and grassland dominates the watershed. The watershed is entirely privately owned and is managed for timber production, rangeland and agriculture. Vehicle access exists via Highway 1, south to Annapolis Road, to the mouth of Wheatfield Fork Gualala River.

METHODS

The habitat inventory conducted in Wheatfield Fork Gualala River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) personnel 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 Wheatfield Fork Gualala River 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". Wheatfield Fork Gualala River 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 Wheatfield Fork Gualala River, 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 Wheatfield Fork Gualala River, 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 Wheatfield Fork Gualala River, 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 Wheatfield Fork Gualala River, 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.

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 Wheatfield Fork Gualala River 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 September 27 through November 1, 2001, was conducted by J. Richardson and A. Pothast (PSMFC). The total length of the stream surveyed was 106,877 feet with an additional 10,026 feet of side channel.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.9 cfs on November 2, 2001.

Wheatfield Fork Gualala River is an F4 channel type for the entire 106,877 feet of the stream surveyed. 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 50 degrees Fahrenheit to 67 degrees Fahrenheit. Air temperatures ranged from 41 degrees Fahrenheit to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35% pool units, 28% riffle units, and 28% flatwater units (Graph 1). Based on total length of Level II habitat types there were 62% pool units, 21% flatwater units, and 10% riffle units, and (Graph 2).

Sixteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 27%; mid-channel pool units, 25%; and run units, 23% (Graph 3). Based on percent total length, mid-channel pool units made up 47%, run units 15%, and low gradient riffle units 9%.

A total of 441 pools were identified (Table 3). Main channel pools were the most frequently encountered at 72%, and comprised 83% 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. One hundred seventy-five of the 441 pools (40%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 441 pool tail-outs measured, 58 had a value of 1 (13%); 133 had a value of 2 (30%); 115 had a value of 3 (26%); 69 had a value of 4 (16%); and 66 had a value of 5 (15%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 66 pool tail-outs that had an embeddedness value of 5 were as follows: 35% bedrock, 33% gravel, 30% sand and 1.5% silt/clay.

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 7, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 17(Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 19. Scour pools had a mean shelter rating of 14 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Wheatfield Fork Gualala River. Graph 7 describes the pool cover in Wheatfield Fork Gualala River. Small woody debris is the dominant pool cover type followed by terrestrial vegetation.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 79% of pool tail-outs. Small cobble was the next most frequently observed substrate type, at 9%.

The mean percent canopy density for the surveyed length of Wheatfield Fork Gualala River was 44%. The mean percentages of deciduous and coniferous trees were 48% and 52%, respectively. Graph 9 describes the mean percent canopy in Wheatfield Fork Gualala River.

For the stream reach surveyed, the mean percent right bank vegetated was 65.5%. The mean percent left bank vegetated was 66.4%. The dominant elements composing the structure of the stream banks consisted of 51% sand/silt/clay, 34% bedrock, 13% cobble/gravel, and 2% boulders (Graph 10). 62% of the units surveyed had deciduous trees as the dominant vegetation type, and 38% had coniferous trees as the dominant vegetation (Graph 11).

DISCUSSION

Wheatfield Fork Gualala River is an F4 channel type for the entire 106,877 feet of stream surveyed. 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; poor for boulder clusters.

The water temperatures recorded on the survey days September 27 to November 1, 2001 ranged from 50 degrees Fahrenheit to 67 degrees Fahrenheit. Air temperatures ranged from 41 degrees Fahrenheit to 83 degrees Fahrenheit. This is a moderate water temperature range for salmonids. 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 10% of the total length of this survey, riffles 21%, and pools 62%. The pools are relatively deep, with 175 of the 442 (40%) 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 and fourth 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.

One hundred ninety-one of the 441 pool tail-outs measured had embeddedness ratings of 1 or 2. One hundred eighty-four of the pool tail-outs had embeddedness ratings of 3 or 4. Sixty-six of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Twenty-three of the 66 were unsuitable for spawning due to the dominant substrate being bedrock. The remainder of pool tail-outs with embeddedness ratings of 5 were dominated by gravel, sand and silt/clay. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Wheatfield Fork Gualala River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Three hundred eighty-eight of the 441 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 17. The shelter rating in the flatwater habitats was 7. 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, terrestrial vegetation contributes 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 structures provides rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 44%. 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 65.5% and 66.4%, respectively. 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) Wheatfield Fork Gualala River 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) 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) Increase the canopy on Wheatfield Fork Gualala River 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.

Wheatfield Fork Gualala River

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 South Fork Gualala River. The channel is an F4 for the entire length of the survey.
1,074'	Annapolis Road bridge crosses over Wheatfield Fork Gualala River. Bridge is 40' above the channel and measures 36' wide x 318' long.
5,071'	Tributary enters on the left bank.
10,001'	An erosion site on the left bank measures approximately 80' long x 20' high.
11,242'	An erosion site on the right bank measures approximately 30' long x 80' high.
14,690'	High gradient tributary enters on the left bank.
19,570'	An erosion site on the right bank measures approximately 30' long x 70' high.
22,753'	Tributary enters on the left bank.
26,424'	Annapolis Falls Creek enters on the left bank.
31,387'	An erosion site on the right bank measures approximately 170' long x 340' high.
33,174'	An erosion site on the left bank measures approximately 20' long x 60' high.
33,274'	Tributary enters on the left bank.
35,797'	An erosion site on the right bank measures approximately 60' long x 60' high.
40,433'	An erosion site on the right bank measures approximately 60' long by 25' high.
42,501'	Fuller Creek enters on the right bank.
43,212'	An erosion site on the left bank measures approximately 120' long x 40' high.
43,599'	Tributary enters on the left bank.
44,220'	An erosion site on the left bank measures approximately 75' long x 50' high.

Wheatfield Fork Gualala River

45,485' High-gradient tributary enters on the right bank.

46,469' High-gradient tributary enters on the left bank.

48,667' Dry left bank tributary.

52,619' Rip-rap on left bank for stabilization of Skagg Springs Road. Skagg Springs Road bridge crosses over Wheatfield Fork Gualala River. The bridge is 20’ above channel and measures 20’ wide x 180’ long.

53,498' Tributary enters on the right bank.

58,058' High-gradient tributary enters on left bank.

61,452' An erosion site on the right bank measures approximately 105’ long x 40’ high.

66,842' Tributary enters on the right bank.

67,776' An erosion site on the left bank measures approximately 140’ long x 180’ high.

68,069' An erosion site on the left bank measures approximately 140’ long x 75’ high.

68,562' An erosion site on the left bank measures approximately 160’ long x 125’ high.

70,078' Recently decommissioned road crossing.

71,686' High gradient tributary enters on the right bank. There is a 6’ high plunge from a concrete culvert at the mouth of the tributary.

73,028' An erosion site on the right bank measures approximately 20’ long x 70’ high.

76,245' High-gradient tributary enters on the right bank. An erosion site on the right bank measures approximately 270’ long x 50’ high.

76,271' An erosion site on the right bank measures approximately 40’ long x 100’ high.

76,590' An erosion site on the right bank measures approximately 300’ long x 65’ high.

79,070' Tributary enters on the left bank.

79,473' An erosion site on the left bank measures approximately 150’ long x 25’ high.

82,157' Tributary enters on the right bank. Start of 7,656’ long unsurveyed section.

89,909' End of unsurveyed section. Tributary enters on the right bank.

Wheatfield Fork Gualala River

98,886' High-gradient tributary enters on the left bank.

106,607' Wolf Creek enters on the left bank.

108,675' An erosion site on the right bank measures approximately 150’ long x 60’ high.

109,141' High-gradient tributary enters on the right bank.

114,270' Tributary enters on the left bank.

116, 878' End of survey.

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.

Wheatfield Fork Gualala River

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]	