STREAM INVENTORY REPORT

GROUSE CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2003 on Grouse Creek. The survey began at the confluence with North Fork Yager Creek and extended upstream 0.87 miles. The Grouse 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 Grouse 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

Grouse Creek is a tributary to North Fork Yager Creek, a tributary to Yager Creek, a tributary to the Van Duzen River, a tributary to the Eel River, located in Humboldt County, California (Map 1). Grouse Creek's legal description at the confluence with North Fork Yager Creek is Township 03 N, Range 02 E, Section 24. Its location is 40°37′17.0″ north latitude and 123°53′49.0″ west longitude. Grouse Creek is a second order stream and has approximately 1.7 miles of blue line stream according to the Iaqua Buttes and Owl Creek 7.5 minute USGS Quadrangles. Grouse Creek drains a watershed of approximately 5.6 square miles. Elevations range from about 1,000 feet at the mouth of the creek to 2,600 feet in the headwater areas. Grass and mixed hardwood dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Kneeland Road.

METHODS

The habitat inventory conducted in Grouse Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors, and 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. All pools except step-pools are fully sampled.

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 Grouse Creek to record measurements and observations. There are eleven 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 (1990). 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". Grouse 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 Grouse 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 such as bedrock, log sills, boulders 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 Grouse 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 Grouse 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 Grouse 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.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

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 Grouse Creek. In addition, sixteen 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 Stream Habitat 1.30, a Visual Basic data entry program developed by Karen Wilson, Coastal Watershed Assessment Program, California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type

- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Grouse Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant 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 15 and 16, 2003, was conducted by Janelle Breton (CCC) and Shaunna Bradshaw (WSP). The total length of the stream surveyed was 4,634 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.7 cfs on July 16, 2003.

Grouse Creek is a B2 channel type for the first 1,623 feet of the stream and an A2 channel type for the remaining 3,011 feet surveyed. B2 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools; very stable plan and profile; stable banks; boulder-dominated substrates. A2 channel types are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils and a boulder dominated channel.

Water temperatures taken during the survey period ranged from 62 to 64 degrees Fahrenheit. Air temperatures ranged from 62 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35.3% riffle units, 33.6% flatwater units, and 31% pool units (Graph 1).

Based on total length of Level II habitat types there were 31% riffle units, 47.5% flatwater units, and 21.5% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 26%; step runs, 17%; and high grade riffles, 17% (Graph 3). Based on percent total length, step runs made up 32%; mid-channel pools, 16%; and runs, 15%.

A total of 36 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 92%, and comprised 95% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twelve of the 34 measured pools (35.3%) had a residual depth of two feet or greater.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 34 pool tail-outs measured, one had a value of 1 (2.94%); six had a value of 2 (17.65%); thirteen had a value of 3 (38.24%); ten had a value of 4 (29.4%); and four had a value of 5 (11.76%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 24, flatwater habitat types had a mean shelter rating of 27, and pool habitats had a mean shelter rating of 53 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 70. Main channel pools had a mean shelter rating of 52 (Table 3).

Table 5 summarizes mean percent escape cover by habitat type. Boulders and white water are the dominant cover types in Grouse Creek. Graph 7 describes the pool cover in Grouse Creek. Boulders are the dominant pool cover type followed by whitewater.

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 63% of pool tail-outs while large cobble was the next most frequently observed substrate type, at 17%.

The mean percent canopy density for the surveyed length of Grouse Creek was 90%. The mean percentages of deciduous and coniferous trees were 2% and 98%, respectively. Graph 9 describes the mean percent canopy in Grouse Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 69.8%. The mean percent left bank vegetated was 71.1%. The dominant elements composing the structure of the stream banks consisted of 11% bedrock, 69% boulder, 18% cobble/gravel, and 2% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 92% of the units surveyed. Additionally, 4% of the units surveyed had coniferous trees as the dominant vegetation type. (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Sixteen sites were electrofished for species composition and distribution in Grouse Creek on September 23, 2003. Water temperatures taken during the electrofishing period 09:30 to 16:10 ranged from 56 to 58 degrees Fahrenheit. Air temperature was 58 degrees Fahrenheit. The sites were sampled by Trevor Tollefson (DFG) and Sarah Ganas (WSP).

In the first reach, seven sites were sampled starting at habitat unit 004 and ending in habitat unit 021. The seven sites yielded, 24 steelhead young-of-the-year (YOY) steelhead, four 1+ steelhead, and one 2+ steelhead.

In the second reach, eight sites were sampled starting at habitat unit 042 and ending at habitat unit 109. The eight sites yielded, 28 young-of-the-year steelhead, six 1+ steelhead, and two 2+ steelhead.

One additional site was sampled above the end of the habitat survey. No fish were sampled.

The following chart describes the information collected at these sites.

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Steelhead		
					YOY	1+	2+
Reach 1 B2 Channel Type							
09/23/03	1	004	4.3	200	7	0	0
09/23/03	2	008	4.2	450	0	0	0
09/23/03	3	012	4.2	535	0	0	0
09/23/03	4	014	4.2	600	0	0	0
09/23/03	5	016	4.2	640	1	1	0
09/23/03	6	020	3.4	800	14	0	0
09/23/03	7	021	4.2	879	2	3	1
Reach 2 A2 Channel Type							
09/23/03	8	042	4.2	1830	4	1	0
09/23/03	9	046	4.2	1990	9	0	0

Grouse Creek

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Steelhead		
					YOY	1+	2+
09/23/03	10	050	4.2	2080	2	3	1
09/23/03	11	055	3.3	2294	6	0	0
09/23/03	12	060	4.2	2480	7	0	0
09/23/03	13	095	5.4	3880	0	2	1
09/23/03	14	099	3.4	3980	0	0	0
09/23/03	15	109	4.2	4340	0	0	0
Reach 3 Above end of habitat survey reach.							
09/23/03	16	N/A	N/A	4780	0	0	0

DISCUSSION

Grouse Creek is a B2 channel type for the first 1,623 feet of stream surveyed and an A2 channel type for the remaining 3,011 feet. B2 channel type suitability for fish habitat improvement structures are excellent for plunge weirs, single and opposing wing-deflectors and log cover. A2 channel types are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days July 15, 2003, ranged from 62 to 64 degrees Fahrenheit. Air temperatures ranged from 62 to 74 degrees Fahrenheit. 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 47.5% of the total length of this survey, riffles 31%, and pools 21.5%. The pools are relatively shallow, with only 12 of the 34 measured (35%) pools having a maximum residual 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 residual 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Seven of the 34 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-three of the pool tail-outs had embeddedness ratings of 3 or 4. Four of the pool tail-outs had a rating of 5, which is 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.

Sediment sources in Grouse Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twenty-one of the 34 measured 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 53. The shelter rating in the flatwater habitats was 27. 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, white water 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 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 90%. Reach 1 had a canopy density of 94% while Reach 2 had a canopy density of 89%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was at 69.8% and 71.1%, 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) Grouse 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) 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.

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) 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.

6) In the B2 channel reach, 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.

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 North Fork Yager Creek.

200’ First electrofishing site.

246’ Channel is out of the influence of North Fork Yager Creek.

450’ Second electrofishing site.

535’ Third electrofishing site.

600’ Fourth electrofishing site.

640’ Fifth electrofishing site.

751’ Right bank erosion 10’ high (H) x 10’ wide (W) x 2’ deep (D).

791’ Left bank erosion contributing boulders and cobble 100’ H x 100’ W x 75’ D.

800’ Sixth electrofishing site.

879’ Seventh electrofishing site.

1,398’ Channel type changes from B2 to A2.

1,623’ Left bank erosion 40’ H x 20’ W x 20’ D.

1,712’ Tributary enters from left bank, dry at time of survey.

1,745’ Left bank erosion 11’ H x 30’ W x 4’ D.

1,830’ Eighth electrofishing site.

1,990’ Ninth electrofishing site.

2,080’ Tenth electrofishing site.

2,294’ Eleventh electrofishing site.

2,480’ Twelfth electrofishing site.

2,811’ Right bank erosion 20’ H x 20’ W x 10’ D.

2,914’ Spring enters from left bank.
Stream slope 70% within habitat unit.

3,087’ Tributary enters from right bank, dry at time of survey.

3,165’ Tributary enters from left bank, dry at time of survey.

3,880’ Thirteenth electrofishing site.

3,883’ Five foot plunge.

3,980’ Fourteenth electrofishing site.

4,096’ Cascade with 10’ plunge and no plunge pool.
60% slope.

4,265’ Tributary enters from right bank tributary contributing 10% of Grouse Creek’s flow. Not accessible to fish due to high slope and entrenchment.

4,340’ Fifteenth electrofishing site.

4,532’ Right bank erosion contributing sediment 75’L x 30’H x25’D.

4,634’ End of survey. Channel had been over 20% slope for 3,011 feet with many cascades. No fish observed for 700 feet. Survey ends at a small cascade 700’ below bridge.

4,700’ Sixteenth electrofishing site.

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]	