

STREAM INVENTORY REPORT

GROUSE CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Grouse Creek. The survey began at the confluence with the East Fork Scott River and extended upstream 2.41 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 the East Fork Scott River, located in Siskiyou County, California (Map 1). Grouse Creek's legal description at the confluence with the East Fork Scott River is T40N R7W S19. Its location is 41° 19' 04" North latitude and 122° 43' 28" West longitude. Grouse Creek is a second order stream and has approximately 5 miles of blue line stream according to the USGS Scott Mountain 7.5 minute quadrangle. Grouse Creek drains a watershed of approximately 12 square miles. Elevations range from about 3,600 feet at the mouth of the creek to about 6,300 feet in the headwater areas. Douglas fir/grass/oak/mixed hardwood/mixed conifer forest dominates the watershed. The watershed is primarily privately owned and national forest land and is managed for timber production/rangeland/recreation. Vehicle access exists via Highway 3 or the Gazelle - Callahan 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 (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". 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 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 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 densimeters 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'.

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, eighteen sites were snorkel dived. 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 8.4, 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 ten 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
- Mean Percent Vegetative Cover
- Fish Habitat Elements by Stream Reach
- Dominant Vegetation Type for Entire Stream
- Mean Percent Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Grouse 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
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Bank Composition by Composition Type
- Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of July 12 to August 13, 2002, was conducted by T. Behm and S. Maurer (DFG). The total length of stream surveyed was 12,532 feet.

A stream flow measurement of Grouse Creek on August 14, 2002 showed a stream flow of 0.77 cubic feet per second (cfs).

Grouse Creek is a B3 channel type with an average bankfull width of 27.25 feet for the first 8,895 feet, an A1 channel type with an average bankfull width of 24 feet for the next 406 feet, an A3 channel type with an average bankfull width of 25 feet for the next 680 feet, an A1 channel type with an average bankfull width of 25 feet for the next 1,979 feet, and an A2 channel type with an average bankfull width of 32 feet for the final 572 feet.

B3 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and cobble dominant substrates. A1 channels are steep, narrow, cascading step-pool streams with high energy/debris transport associated with depositional soils but very stable bedrock channels. A3 channels are steep, narrow, cascading step-pool streams with high energy/debris transport associated with depositional soils and cobble channels. A2 channels are steep, narrow, cascading step-pool streams with high energy/debris transport associated with depositional soils and boulder channels.

Water temperatures taken during the survey period ranged from 57 to 74 degrees Fahrenheit. Air temperatures ranged from 61 to 97 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% riffle units, 34% flatwater units, and 21% pool units (Graph 1). Based on total length of Level II habitat types there were 49% riffle units, 37% flatwater units, and 14% pool units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 23%; step run, and high gradient riffle, both at 22%; and run, 15% (Graph 3). Based on percent total length, low gradient riffles made up 28%, step runs 24%, and high gradient riffles 17%.

A total of 40 pools were identified (Table 3). Scour pools were the most frequently encountered, at 60%, (Graph 4) and comprised 52% of the total length of all pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty-eight of the 40 pools (70%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 40 pool tail-outs measured, 9 had a value of 1 (23%); 26 had a value of 2 (65%); 2 had a value of 3 (5%); 0 had a value of 4 (0%); and 3 had a value of 5 (7%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

Grouse

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 22, flatwater habitat types had a mean shelter rating of 19, and pool habitats had a mean shelter rating of 16 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 17. Main channel pools had a mean shelter rating of 15 (Table 3).

Grouse Creek contained a total of 42 pieces of large woody debris. This is an average of 0.31 pieces of LWD per 100'. Reach one had a total of 14 pieces of LWD for an average of 0.16 pieces of LWD per 100'. In reach two, Grouse Creek had a total of 2 pieces of LWD. This is an average of 0.15 pieces of LWD per 100'. Reach three had a total of 2 pieces of LWD for an average of 0.29 pieces of LWD per 100'. In reach four, Grouse Creek had a total of 11 pieces of LWD. This is an average of 0.56 pieces of LWD per 100'. Reach five had a total of 13 pieces of LWD for an average of 2.27 pieces of LWD per 100'.

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

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 35 % of pool tail-outs while large cobble was the next most frequently observed substrate type, at 23%.

The mean percent canopy density for the surveyed length of Grouse Creek was 57%. The mean percentages of deciduous and coniferous trees were 51% and 49%, respectively. Forty-three percent of the canopy was open. Graph 9 describes the mean percent canopy in Grouse Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 33%. The mean percent left bank vegetated was 31%. The dominant elements composing the structure of the stream banks consisted of 31% bedrock, 51% boulder, 13% cobble/gravel, and 4% sand/silt/clay (Graph 10). Deciduous was the dominant vegetation type observed in 49% of the units surveyed. Additionally, 20% had coniferous trees as the dominant vegetation, and 20% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twenty-five sites were snorkel-dived for species composition and distribution in Grouse Creek between August 6, and 19, 2002. Water temperatures taken during the dive period ranged from 66 to 68 degrees Fahrenheit. Air temperatures ranged from 66 to 92 degrees Fahrenheit. The sites were sampled by S. Maurer (DFG). Note: Initially, too many dives units were laid out, so the following dives were eliminated: 13 – 18, and 22 – 24.

The first site sampled was habitat unit #2, a lateral scour pool - root wad enhanced, located approximately 97 feet from the survey start.

The second site sampled was habitat unit #3, a run, located approximately 157 feet from the survey start.

The third site sampled was habitat unit #11, a high gradient riffle, located approximately 814 feet from the survey start.

The fourth site sampled was habitat unit #25, a plunge pool, located approximately 2,227 feet from the survey start.

The fifth site sampled was habitat unit #27, a run, located approximately 2,302 feet from the survey start.

The sixth site sampled was habitat unit #31, a low gradient riffle, located approximately 2,548 feet from the survey start.

The seventh site sampled was habitat unit #49, a run, located approximately 4,315 feet from the survey start.

The eighth site sampled was habitat unit #53, a lateral scour pool - bedrock formed, located approximately 4,784 feet from the survey start.

The ninth site sampled was habitat unit #60, a low-gradient riffle, located approximately 5,135 feet from the survey start.

The tenth site sampled was habitat unit #68, a low-gradient riffle, located approximately 5,970 feet from the survey start.

The eleventh site sampled was habitat unit #90, a run, located approximately 7,444 feet from the survey start.

The twelfth site sampled was habitat unit #95, a lateral scour pool - bedrock formed, located approximately 7,782 feet from the survey start.

The nineteenth site sampled was habitat unit #111, a low gradient riffle, located approximately 8,802 feet from the survey start.

The twentieth site sampled was habitat unit #112, a step pool, located approximately 8,895 feet from the survey start.

The twenty-first site sampled was habitat unit #117, a pocket water, located approximately 9,150 feet from the survey start.

The twenty-fifth site sampled was habitat unit #126, a backwater pool – boulder formed, located approximately 9,443 feet from the survey start.

The twenty-sixth site sampled was habitat unit #130, a low gradient riffle, located approximately 9,672 feet from the survey start.

The twenty-seventh site sampled was habitat unit #131, a lateral scour pool – bedrock formed, located approximately 9,714 feet from the survey start.

The twenty-eighth site sampled was habitat unit #133, a run, located approximately 9,779 feet from the survey start.

The twenty-ninth site sampled was habitat unit #135, a run, located approximately 9,918 feet from the survey start.

The thirtieth site sampled was habitat unit #139, a trench pool, located approximately 10,096 feet from the survey start.

The thirty-first site sampled was habitat unit #146, a mid-channel pool, located approximately 10,467 feet from the survey start.

The thirty-second site sampled was habitat unit #151, a low gradient riffle, located approximately 10,577 feet from the survey start.

The thirty-third site sampled was habitat unit #159, a step run, located approximately 10,922 feet from the survey start.

The thirty-fourth site sampled was habitat unit #168, a run, located approximately 11,366 feet from the survey start.

The thirty-fifth site sampled was habitat unit #181, a low gradient riffle, located approximately 12,235 feet from the survey start.

The thirty-sixth site sampled was habitat unit #182, a run, located approximately 12,281 feet from the survey start.

The thirty-seventh site sampled was habitat unit #186, a plunge pool, located approximately 12,504 feet from the survey start.

The following chart displays the information yielded from these sites:

| Date | Site # | Approx. Dist. from start (ft.) | Hab. Unit # | Hab. Type | Reach # | Channel type | Steelhead | | | Coho | | |
|---------|--------|--------------------------------|-------------|-----------|---------|--------------|-----------|----|----|------|----|----|
| | | | | | | | YOY | 1+ | 2+ | YOY | 1+ | 2+ |
| 8/6/02 | 1 | 97 | 2 | 5.3 | 1 | B3 | 23 | 1 | 0 | 69 | 0 | 0 |
| 8/6/02 | 2 | 157 | 3 | 3.3 | 1 | B3 | 30 | 1 | 0 | 19 | 0 | 0 |
| 8/6/02 | 3 | 814 | 11 | 1.2 | 1 | B3 | 24 | 1 | 0 | 4 | 0 | 0 |
| 8/6/02 | 4 | 2,227 | 25 | 5.6 | 1 | B3 | 23 | 4 | 3 | 47 | 0 | 0 |
| 8/6/02 | 5 | 2,302 | 27 | 3.3 | 1 | B3 | 85 | 0 | 0 | 73 | 0 | 0 |
| 8/6/02 | 6 | 2,548 | 31 | 1.1 | 1 | B3 | 26 | 1 | 1 | 2 | 0 | 0 |
| 8/12/02 | 7 | 4,315 | 49 | 3.3 | 1 | B3 | 37 | 3 | 0 | 11 | 0 | 0 |
| 8/12/02 | 8 | 4,784 | 53 | 5.4 | 1 | B3 | 56 | 6 | 3 | 54 | 0 | 0 |
| 8/12/02 | 9 | 5,135 | 60 | 1.1 | 1 | B3 | 39 | 0 | 0 | 11 | 0 | 0 |
| 8/12/02 | 10 | 5,970 | 68 | 1.1 | 1 | B3 | 25 | 3 | 4 | 3 | 0 | 0 |
| 8/12/02 | 11 | 7,444 | 90 | 3.3 | 1 | B3 | 51 | 4 | 3 | 48 | 0 | 0 |
| 8/12/02 | 12 | 7,782 | 95 | 5.4 | 1 | B3 | 58 | 5 | 7 | 49 | 0 | 0 |
| 8/19/02 | 19 | 8,802 | 111 | 1.1 | 1 | B3 | 14 | 1 | 2 | 16 | 0 | 0 |

| Date | Site # | Approx. Dist. from start (ft.) | Hab. Unit # | Hab. Type | Reach # | Channel type | Steelhead | | | Coho | | |
|---------|--------|--------------------------------|-------------|-----------|---------|--------------|-----------|----|----|------|----|----|
| | | | | | | | YOY | 1+ | 2+ | YOY | 1+ | 2+ |
| 8/19/02 | 20 | 8,895 | 112 | 4.4 | 2 | A1 | 35 | 1 | 1 | 46 | 0 | 0 |
| 8/19/02 | 21 | 9,150 | 117 | 3.1 | 2 | A1 | 6 | 2 | 0 | 1 | 0 | 0 |
| 8/19/02 | 25 | 9,443 | 126 | 6.2 | 3 | A3 | 14 | 3 | 1 | 19 | 0 | 0 |
| 8/19/02 | 26 | 9,672 | 130 | 1.1 | 3 | A3 | 5 | 1 | 0 | 0 | 0 | 0 |
| 8/19/02 | 27 | 9,714 | 131 | 5.4 | 3 | A3 | 15 | 2 | 2 | 8 | 0 | 0 |
| 8/19/02 | 28 | 9,779 | 133 | 3.3 | 3 | A3 | 23 | 1 | 0 | 2 | 0 | 0 |
| 8/19/02 | 29 | 9,918 | 135 | 3.3 | 3 | A3 | 17 | 0 | 0 | 0 | 0 | 0 |
| 8/19/02 | 30 | 10,096 | 139 | 4.1 | 4 | A1 | 19 | 8 | 5 | 0 | 0 | 0 |
| 8/19/02 | 31 | 10,467 | 146 | 4.2 | 4 | A1 | 11 | 2 | 0 | 0 | 0 | 0 |
| 8/19/02 | 32 | 10,577 | 151 | 1.1 | 4 | A1 | 12 | 3 | 0 | 0 | 0 | 0 |
| 8/19/02 | 33 | 10,922 | 159 | 3.4 | 4 | A1 | 5 | 1 | 0 | 0 | 0 | 0 |
| 8/19/02 | 34 | 11,366 | 168 | 3.3 | 4 | A1 | 16 | 0 | 0 | 0 | 0 | 0 |
| 8/19/02 | 35 | 12,235 | 181 | 1.1 | 5 | A2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/19/02 | 36 | 12,281 | 182 | 3.3 | 5 | A2 | 10 | 0 | 0 | 0 | 0 | 0 |
| 8/19/02 | 37 | 12,504 | 186 | 5.6 | 5 | A2 | 7 | 1 | 1 | 0 | 0 | 0 |

Six sites were snorkel-dived again on October 10, 2002. Water temperatures taken during the re-dive period ranged from 49 to 51 degrees Fahrenheit. Air temperatures ranged from 64 to 72 degrees Fahrenheit. The sites were sampled by S. Maurer

The first site re-sampled was habitat unit #2, a lateral scour pool - root wad enhanced, located approximately 97 feet from the survey start.

The second site re-sampled was habitat unit #3, a run, located approximately 157 feet from the survey start.

The third site re-sampled was habitat unit #11, a high gradient riffle, located approximately 814 feet from the survey start.

The fourth site re-sampled was habitat unit #111, a low gradient riffle, located approximately 8,802 feet from the survey start.

The fifth site re-sampled was habitat unit #112, a step pool, located approximately 8,895 feet from the survey start.

The sixth site re-sampled was habitat unit #117, a pocket water, located approximately 9,150 feet from the survey start.

| Date | Site # | Approx. Dist. from start (ft.) | Hab. Unit # | Hab. Type | Reach # | Channel type | Steelhead | | | Coho | | |
|----------|--------|--------------------------------|-------------|-----------|---------|--------------|-----------|----|----|------|----|----|
| | | | | | | | YOY | 1+ | 2+ | YOY | 1+ | 2+ |
| 10/10/02 | 1 | 97 | 2 | 5.3 | 1 | B3 | 40 | 2 | 0 | 85 | 0 | 0 |
| 10/10/02 | 2 | 157 | 3 | 3.3 | 1 | B3 | 9 | 1 | 0 | 5 | 0 | 0 |
| 10/10/02 | 3 | 814 | 11 | 1.2 | 1 | B3 | 6 | 0 | 0 | 0 | 0 | 0 |
| 10/10/02 | 4 | 8,802 | 111 | 1.1 | 1 | B3 | 12 | 1 | 0 | 7 | 0 | 0 |
| 10/10/02 | 5 | 8,895 | 112 | 4.4 | 2 | A1 | 14 | 1 | 0 | 24 | 0 | 0 |
| 10/10/02 | 6 | 9,150 | 117 | 3.1 | 2 | A1 | 1 | 0 | 0 | 0 | 0 | 0 |

DISCUSSION

Grouse Creek is a B3 channel type for the first 8,895 feet, an A1 channel type for the next 406 feet, an A3 channel type for the next 680 feet, an A1 channel type for the next 1,979 feet, and an A2 channel type for the final 572 feet. The suitability of B3 channel types for fish habitat improvement structures is as follows: Excellent for plunge weirs, boulder clusters and bank-placed boulders, single and opposing wing-deflectors, and log cover. A1 channel types are generally not suitable for fish habitat improvement structures because of poor gravel retention capabilities due to the high energy of the stream. A3 channel types are good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors, and log cover; and poor for boulder clusters and single-wing deflectors. A2 channel types are generally not suitable for fish habitat improvement structures because of poor gravel retention capabilities due to the high energy of the stream.

The water temperatures recorded during the survey period of July 12 to August 13, 2002, ranged from 57 to 74 degrees Fahrenheit. Air temperatures ranged from 61 to 97 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 34% of the total length of this survey, riffles 45%, and pools 21%. The pools are relatively deep, with 28 of the 40 (70%) 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Thirty-five of the 40 pool tail-outs measured had embeddedness ratings of 1 or 2. 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.

Thirteen of the 40 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean shelter rating for pools was 16. The shelter rating in the flatwater habitats was 19. 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, bedrock ledges and whitewater contribute 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 57%. Reach 1 had a canopy density of 54%, Reach 2 had a canopy density of 43%, Reach 3 had a canopy density of 59%, Reach 4 had a canopy density of 64% and Reach 5 had a canopy density of 76%. 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 33% and 31%, 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) 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 Grouse Creek by planting willow, alder, 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 affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

- 8) Suitable size spawning substrate on Grouse Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 9) There are several log debris accumulations present on Grouse Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.
- 10) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazer and developed if possible.
- 11) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

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 East Fork Scott River. Channel type is A2.
- 97' Dive 1.
- 157' Dive 2.
- 814' Dive 3.
- 1,065' Road crossing.
- 2,227' Dive 4. Confluence with Hayes Gulch.
- 2,302' Dive 5.
- 2,548' Dive 6.
- 2,790' 20 x 10 chunk of concrete in stream.
- 3,403' Low water crossing.
- 4,148' Tributary, left bank. Tributary, right bank.
- 4,315' Dive 7.

4,784' Dive 8.

5,135' Dive 9.

5,813' Low water crossing.

8,389' Debris jam creates five-foot jump. Possible juvenile barrier.

5,970' Dive 10.

6,151' Road crossing.

6,200' Road crossing.

6,398' Tributary, left bank; Carmen Creek. Very little water.

6,736' Crayfish observed.

6,951' One 24" dia. Tree down across creek. Three large trees down.

7,444' Dive 11.

7,782' Dive 12.

7,976' Log jam blocks stream at low flow. Possible juvenile barrier.

8,148' Landslide from Forest Road 40N03, caused by approximately 400 feet of collection from inboard ditch to an 18" CMP with a plugged pipe which has overtopped. This is a chronic problem and needs immediate attention.

8,758' Low water crossing. Possible fish barrier.

8,802' Dive 19.

8,895' Dive 20. Foothill yellow-legged frog observed.

9,150' Dive 21.

9,943' Dive 25. Crayfish.

9,672' Dive 26.

9,714' Dive 27.

9,779' Dive 28. Foothill yellow-legged frog and monarch butterfly observed.

9,918' Dive 29. Seep, approx. 0.5 gpm.

10,096' Dive 30.

10,467' Dive 31. Large boulders partially damming pool.

10,552' Tributary, right bank.

10,577' Dive 32.

10,869' Old concrete on right bank acts like bedrock.

10,905' Old concrete on right bank.

10,922' Dive 33.

11,019' Large chunk of old concrete in middle of pool.

11,366' Dive 34.

11,704' Possible barrier. Deep jump pool with 5' jump to lower end of 25' long bedrock sheet.

11,794' Diversion ditch, right bank. Currently not in use but not disconnected from stream.

11,824' Tributary, right bank.

12,235' Dive 35.

12,281' Dive 36.

12,504' Dive 37. End of Survey at end of USFS property line. No further landowner permission

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} |

FLAT WATER

| | | | |
|--------------|-------|-------|------|
| 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] | |

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE: 41°19'4" LONGITUDE: 122°43'28"

| HABITAT UNITS FULLY MEASURED | HABITAT TYPE | HABITAT PERCENT OCCURRENCE | MEAN LENGTH (ft.) | TOTAL LENGTH (ft.) | MEAN WIDTH (ft.) | TOTAL WIDTH (ft.) | MEAN DEPTH (ft.) | TOTAL DEPTH (ft.) | MEAN AREA (sq.ft.) | TOTAL AREA (sq.ft.) | MEAN ESTIMATED VOLUME (cu.ft.) | TOTAL ESTIMATED VOLUME (cu.ft.) | MEAN RESIDUAL SHELTER RATING |
|------------------------------|--------------|----------------------------|-------------------|--------------------|------------------|-------------------|------------------|-------------------|--------------------|---------------------|--------------------------------|---------------------------------|------------------------------|
| 86 | 20 RIFFLE | 45 | 72 | 6214 | 49 | 12.9 | 0.6 | 738 | 63433 | 470 | 40421 | 0 | 22 |
| 64 | 22 FLATWATER | 34 | 73 | 4670 | 37 | 11.6 | 0.8 | 711 | 45532 | 607 | 38867 | 0 | 19 |
| 40 | 40 POOL | 21 | 46 | 1828 | 14 | 11.9 | 1.4 | 486 | 19458 | 693 | 27715 | 484 | 16 |

TOTAL UNITS 190
 TOTAL LENGTH (ft.) 12712

TOTAL AREA (sq. ft.) 128423
 TOTAL VOL. (cu. ft.) 107003

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE:41°19'4" LONGITUDE:122°43'28"

| HABITAT UNITS | UNITS FULLY MEASURED | HABITAT TYPE | HABITAT OCCURRENCE | MEAN LENGTH | TOTAL LENGTH | MEAN WIDTH | TOTAL WIDTH | MEAN DEPTH | MAXIMUM DEPTH | MEAN AREA | TOTAL AREA | MEAN VOLUME | TOTAL VOLUME | MEAN RESIDUAL SHELTER | TOTAL SHELTER | MEAN CANOPY | TOTAL CANOPY | EST. POOL VOL RATING | |
|---------------|----------------------|--------------|--------------------|-------------|--------------|------------|-------------|------------|---------------|-----------|------------|-------------|--------------------|-----------------------|---------------|-------------|--------------|----------------------|---|
| | | | | | | | | | | | | | | | | | | ft. | % |
| 44 | 12 | LGR | 23 | 82 | 3608 | 28 | 13 | 0.5 | 1.5 | 780 | 34335 | 448 | 19712 | 0 | 22 | 52 | | | |
| 33 | 6 | HGR | 17 | 67 | 2218 | 17 | 14 | 0.7 | 2.4 | 838 | 27666 | 641 | 21150 | 0 | 23 | 58 | | | |
| 9 | 2 | BRS | 5 | 43 | 388 | 3 | 9 | 0.5 | 1.1 | 179 | 1609 | 89 | 805 | 0 | 18 | 65 | | | |
| 1 | 1 | POW | 1 | 26 | 26 | 0 | 11 | 0.8 | 1.6 | 200 | 200 | 160 | 160 | 0 | 40 | 45 | | | |
| 1 | 1 | GID | 1 | 41 | 41 | 0 | 10 | 1.3 | 2.0 | 369 | 369 | 480 | 480 | 0 | 15 | 63 | | | |
| 29 | 13 | RUN | 15 | 55 | 1598 | 13 | 12 | 0.8 | 2.1 | 730 | 21169 | 610 | 17694 | 0 | 18 | 59 | | | |
| 33 | 7 | SRN | 17 | 91 | 3005 | 24 | 11 | 0.8 | 2.2 | 799 | 26367 | 684 | 22577 | 0 | 19 | 57 | | | |
| 2 | 2 | TRP | 1 | 40 | 79 | 1 | 8 | 1.2 | 3.4 | 294 | 588 | 358 | 716 | 229 | 10 | 39 | | | |
| 6 | 6 | MCP | 3 | 35 | 207 | 2 | 12 | 1.2 | 2.9 | 374 | 2244 | 442 | 2654 | 253 | 15 | 77 | | | |
| 5 | 5 | STP | 3 | 104 | 519 | 4 | 12 | 1.6 | 4.5 | 1057 | 5285 | 1540 | 7701 | 1127 | 18 | 58 | | | |
| 2 | 2 | LSR | 1 | 70 | 140 | 1 | 17 | 1.2 | 2.4 | 1029 | 2058 | 1178 | 2356 | 663 | 23 | 48 | | | |
| 13 | 13 | LSBK | 7 | 39 | 509 | 4 | 11 | 1.4 | 4.5 | 391 | 5077 | 603 | 7833 | 446 | 12 | 59 | | | |
| 4 | 4 | LSBO | 2 | 46 | 183 | 1 | 12 | 1.0 | 2.9 | 446 | 1783 | 425 | 1702 | 221 | 13 | 31 | | | |
| 5 | 5 | FLP | 3 | 25 | 125 | 1 | 14 | 2.2 | 8.3 | 311 | 1555 | 748 | 3740 | 609 | 31 | 77 | | | |
| 3 | 3 | BPB | 2 | 22 | 66 | 1 | 12 | 1.1 | 2.8 | 289 | 868 | 338 | 1014 | 227 | 5 | 47 | | | |
| TOTAL UNITS | 190 | | | | 12712 | | | | | | 131173 | | TOTAL VOL. (cu.ft) | | 110292 | | | | |

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE:41°19'4" LONGITUDE:122°43'28"

| HABITAT UNITS | HABITAT FULLY MEASURED | HABITAT TYPE | HABITAT PERCENT OCCURRENCE | MEAN LENGTH (ft.) | TOTAL LENGTH (ft.) | MEAN WIDTH (ft.) | MEAN DEPTH (ft.) | MEAN AREA (sq.ft.) | TOTAL AREA (sq.ft.) | MEAN VOLUME (cu.ft.) | TOTAL VOLUME (cu.ft.) | EST. POOL VOL. (cu.ft.) | MEAN RESIDUAL SHELTER RATING |
|------------------|------------------------------|-----------------|----------------------------------|-------------------------|--------------------------|------------------------|------------------------|--------------------------|---------------------------|----------------------------|-----------------------------|-------------------------------|---------------------------------------|
| 13 | 13 | MAIN | 33 | 62 | 805 | 11.2 | 1.3 | 624 | 8116 | 852 | 11071 | 585 | 15 |
| 24 | 24 | SCOUR | 60 | 40 | 957 | 12.2 | 1.5 | 436 | 10473 | 651 | 15630 | 460 | 17 |
| 3 | 3 | BACKWATER | 8 | 22 | 66 | 12.3 | 1.1 | 289 | 868 | 338 | 1014 | 227 | 5 |
| TOTAL UNITS | 40 | | | | TOTAL LENGTH (ft.) | | | TOTAL AREA (sq.ft.) | | TOTAL VOLUME (cu.ft.) | | | |
| | | | | | 1828 | | | 19458 | | 27715 | | | |

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE:41°19'4" LONGITUDE:122°43'28"

| UNITS MEASURED | HABITAT TYPE | HABITAT PERCENT OCCURRENCE | <1 FOOT | | 1-<2 FT. | | 2-<3 FT. | | 3-<4 FT. | | >=4 FEET | |
|----------------|--------------|----------------------------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | | | MAXIMUM DEPTH OCCURRENCE | PERCENT | MAXIMUM DEPTH OCCURRENCE | PERCENT | MAXIMUM DEPTH OCCURRENCE | PERCENT | MAXIMUM DEPTH OCCURRENCE | PERCENT | MAXIMUM DEPTH OCCURRENCE | PERCENT |
| 2 | TRP | 5 | 0 | 0 | 1 | 50 | 0 | 0 | 1 | 50 | 0 | 0 |
| 6 | MCP | 15 | 0 | 0 | 2 | 33 | 4 | 67 | 0 | 0 | 0 | 0 |
| 5 | STP | 13 | 0 | 0 | 0 | 0 | 3 | 60 | 1 | 20 | 1 | 20 |
| 2 | LSR | 5 | 0 | 0 | 1 | 50 | 1 | 50 | 0 | 0 | 0 | 0 |
| 13 | LSBK | 33 | 0 | 0 | 3 | 23 | 7 | 54 | 2 | 15 | 1 | 8 |
| 4 | LSBC | 10 | 0 | 0 | 3 | 75 | 1 | 25 | 0 | 0 | 0 | 0 |
| 5 | PLP | 13 | 0 | 0 | 1 | 20 | 1 | 20 | 2 | 40 | 1 | 20 |
| 3 | BPB | 8 | 0 | 0 | 1 | 33 | 2 | 67 | 0 | 0 | 0 | 0 |

TOTAL UNITS
40

Handwritten notes: 13, 4, 6, 3

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE:41°19'4" LONGITUDE:122°43'28"

| UNITS MEASURED | UNITS FULLY MEASURED | HABITAT TYPE | BANKS | | UNDERCUT | SWD | LWD | MASS VEGETATION | ROOT TERR. | AQUATIC VEGETATION | WHITE WATER | BOULDERS | BEDROCK LEDGES |
|----------------|----------------------|--------------|--------|--------|----------|-----|-----|-----------------|------------|--------------------|-------------|----------|----------------|
| | | | MEAN % | MEAN % | | | | | | | | | |
| 44 | 1.2 | LGR | 1 | 3 | 4 | 4 | 1 | 8 | 0 | 0 | 25 | 58 | 0 |
| 33 | 6 | HGR | 0 | 3 | 4 | 4 | 2 | 0 | 0 | 0 | 31 | 61 | 0 |
| 9 | 2 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 30 | 8 |
| 1 | 1 | POW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 60 | 10 |
| 1 | 1 | GLD | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 40 | 25 |
| 29 | 1.3 | RUN | 7 | 1 | 2 | 3 | 3 | 3 | 0 | 0 | 9 | 70 | 5 |
| 33 | 7 | SRN | 2 | 3 | 1 | 2 | 2 | 2 | 0 | 0 | 26 | 61 | 2 |
| 2 | 2 | TRP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 53 | 30 |
| 6 | 6 | MCP | 0 | 0 | 0 | 0 | 3 | 5 | 0 | 0 | 10 | 75 | 7 |
| 5 | 5 | STP | 2 | 5 | 4 | 4 | 0 | 0 | 0 | 0 | 27 | 28 | 34 |
| 2 | 2 | LSR | 20 | 0 | 0 | 0 | 60 | 10 | 0 | 0 | 0 | 10 | 0 |
| 13 | 1.3 | LSBK | 4 | 3 | 0 | 3 | 3 | 2 | 0 | 0 | 15 | 51 | 22 |
| 4 | 4 | LSBO | 0 | 1 | 0 | 9 | 9 | 1 | 0 | 0 | 19 | 65 | 5 |
| 5 | 5 | PLP | 6 | 6 | 3 | 2 | 2 | 5 | 0 | 0 | 27 | 33 | 18 |
| 3 | 3 | BFB | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 23 | 63 | 10 |

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07MS19 LATITUDE:41°19'4" LONGITUDE:122°43'28"

| TOTAL HABITAT UNITS MEASURED | UNITS FULLY | HABITAT TYPE | SILT/CLAY | | SAND | | GRAVEL | | SM COBBLE | | LG COBBLE | | BOULDER | | % TOTAL BEDROCK DOMINANT | |
|------------------------------|-------------|--------------|------------------|---------|------------------|---------|------------------|---------|------------------|---------|------------------|------------------|---------|------------------|--------------------------|--|
| | | | % TOTAL DOMINANT | % TOTAL | % TOTAL DOMINANT | % TOTAL | % TOTAL DOMINANT | % TOTAL | % TOTAL DOMINANT | % TOTAL | % TOTAL DOMINANT | % TOTAL DOMINANT | % TOTAL | % TOTAL DOMINANT | | |
| 44 | 12 | LGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 8 | |
| 33 | 6 | HGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | |
| 9 | 2 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | |
| 1 | 1 | POW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | |
| 1 | 1 | GLD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | |
| 29 | 13 | RUN | 0 | 0 | 0 | 15 | 15 | 23 | 23 | 31 | 15 | 15 | 31 | 15 | 15 | |
| 33 | 7 | SEN | 0 | 0 | 0 | 0 | 0 | 29 | 29 | 57 | 14 | 14 | 57 | 14 | 14 | |
| 2 | 2 | TRP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 50 | |
| 6 | 6 | MCP | 0 | 0 | 0 | 17 | 17 | 33 | 33 | 50 | 0 | 0 | 50 | 0 | 0 | |
| 5 | 5 | STP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 60 | 60 | |
| 2 | 2 | LSR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | |
| 13 | 13 | LSBK | 0 | 0 | 0 | 38 | 38 | 8 | 8 | 15 | 23 | 23 | 15 | 23 | 23 | |
| 4 | 4 | LSEB | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 0 | 0 | 0 | 75 | 0 | 0 | |
| 5 | 5 | PLP | 0 | 0 | 0 | 0 | 0 | 60 | 60 | 20 | 20 | 20 | 0 | 20 | 20 | |
| 3 | 3 | BFB | 0 | 0 | 0 | 33 | 33 | 0 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | |

Summary of Mean Percent Vegetative Cover for Entire Stream

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Deciduous | Mean Percent Open units | Mean Right bank % Cover | Mean Left Bank % Cover |
|---------------------------|----------------------------|------------------------------|-------------------------------|-------------------------------|------------------------------|
| 57 | 49 | 51 | 0 | 33.4 | 31.2 |

Note: Mean percent conifer and deciduous for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

$49 \times .57 = 28\% \text{ coniferous}$

$51 \times .57 = 29\% \text{ deciduous}$

$100 - 57 = 43\% \text{ open}$

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Grouse Creek
 SAMPLE DATES: 07/12/02 to 08/13/02
 STREAM LENGTH: 12532 ft.
 LOCATION OF STREAM MOUTH:
 USGS Quad Map: Scott Mtn Latitude: 41°19'4"
 Legal Description: T40NR07WS19 Longitude: 122°43'28"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

| | |
|-------------------------------------|----------------------------|
| Channel Type: B3 | Canopy Density: 54% |
| Channel Length: 8895 ft. | Coniferous Component: 47% |
| Riffle/flatwater Mean Width: 13 ft. | Deciduous Component: 53% |
| Total Pool Mean Depth: 1.2 ft. | Pools by Stream Length: 9% |
| Base Flow: 1.1 cfs | Pools >=3 ft.deep: 5% |
| Water: 57 - 74 °F Air: 61 -97 °F | Mean Pool Shelter Rtn: 14 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Boulders |
| Vegetative Cover: 33% | Occurrence of LOD: 3% |
| Dom. Bank Substrate: Boulder | Dry Channel: 0 ft. |

Embeddness Value: 1. 5% 2.84% 3. 11% 4. 0% 5. 0%

STREAM REACH 2

| | |
|-------------------------------------|-----------------------------|
| Channel Type: A1 | Canopy Density: 43% |
| Channel Length: 406 ft. | Coniferous Component: 64% |
| Riffle/flatwater Mean Width: 12 ft. | Deciduous Component: 36% |
| Total Pool Mean Depth: 1.1 ft. | Pools by Stream Length: 37% |
| Base Flow: 1.1 cfs | Pools >=3 ft.deep: 25% |
| Water: 64 - 64 °F Air: 77 -84 °F | Mean Pool Shelter Rtn: 16 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Boulders |
| Vegetative Cover: 17% | Occurrence of LOD: 3% |
| Dom. Bank Substrate: Boulder | Dry Channel: 0 ft. |

Embeddness Value: 1. 25% 2.75% 3. 0% 4. 0% 5. 0%

STREAM REACH 3

| | |
|-------------------------------------|-----------------------------|
| Channel Type: A3 | Canopy Density: 59% |
| Channel Length: 680 ft. | Coniferous Component: 48% |
| Riffle/flatwater Mean Width: 12 ft. | Deciduous Component: 52% |
| Total Pool Mean Depth: 1.0 ft. | Pools by Stream Length: 14% |
| Base Flow: 1.1 cfs | Pools >=3 ft.deep: 0% |
| Water: 64 - 68 °F Air: 86 -89 °F | Mean Pool Shelter Rtn: 13 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Boulders |
| Vegetative Cover: 32% | Occurrence of LOD: 0% |
| Dom. Bank Substrate: Boulder | Dry Channel: 0 ft. |

Embeddness Value: 1. 67% 2.33% 3. 0% 4. 0% 5. 0%

STREAM REACH 4

| | |
|-------------------------------------|-----------------------------|
| Channel Type: A1 | Canopy Density: 64% |
| Channel Length: 1979 ft. | Coniferous Component: 54% |
| Riffle/flatwater Mean Width: 12 ft. | Deciduous Component: 46% |
| Total Pool Mean Depth: 1.9 ft. | Pools by Stream Length: 36% |
| Base Flow: 1.1 cfs | Pools >=3 ft.deep: 46% |
| Water: 60 - 67 °F Air: 72 -93 °F | Mean Pool Shelter Rtn: 16 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Boulders |

Vegetative Cover: 36%
Dom. Bank Substrate: Boulder

Occurrence of LOD: 0%
Dry Channel: 0 ft.

Embeddness Value: 1. 38% 2. 38% 3. 0% 4. 0% 5. 23%

STREAM REACH 5

Channel Type: A2
Channel Length: 572 ft.
Riffle/flatwater Mean Width: 13 ft.
Total Pool Mean Depth: 1.8 ft.
Base Flow: 1.1 cfs
Water: 62 - 64 °F Air: 85 -86 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 41%
Dom. Bank Substrate: Boulder

Canopy Density: 76%
Coniferous Component: 38%
Deciduous Component: 62%
Pools by Stream Length: 5%
Pools >=3 ft.deep: 100%
Mean Pool Shelter Rtn: 40
Dom. Shelter: Boulders
Occurrence of LOD: 4%
Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 100% 3. 0% 4. 0% 5. 0%

Mean Percentage of Dominant Substrate

| Dominant Class of Substrate | Number Units Right Bank | Number Units Left Bank | Total Mean Percent |
|-----------------------------------|-------------------------------|------------------------------|--------------------------|
| Bedrock | 22 | 29 | 31.1 |
| Boulder | 45 | 39 | 51.2 |
| Cobble/Gravel | 10 | 12 | 13.4 |
| Silt/clay | 5 | 2 | 4.3 |

Mean Percentage of Dominant Vegetation

| Dominant Class of Vegetation | Number Units Right Bank | Number Units Left Bank | Total Mean Percent |
|------------------------------------|-------------------------------|------------------------------|--------------------------|
| Grass | 13 | 14 | 16.5 |
| Brush | 13 | 12 | 15.2 |
| Decid. Trees | 43 | 37 | 48.8 |
| Conif. Trees | 13 | 19 | 19.5 |
| No Vegetation | 0 | 0 | 0 |

Total stream average embeddedness value for pool 2.1

TABLE 10. MEAN PERCENT OF SHELTER COVER TYPES FOR ENTIRE STREAM

Stream: Grouse Creek Drainage: EAST FORK SCOTT RIVER

Survey Date: 07/12/02 to 08/13/02

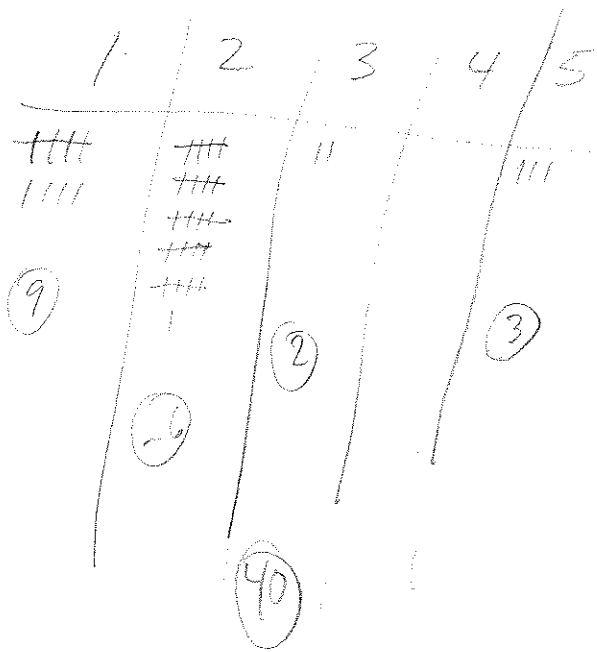
| | RIFFLES | FLATWATER | POOLS |
|--------------------|---------|-----------|-------|
| UNDERCUT BANKS | 3.1 | 7.2 | 3.4 |
| SMALL WOODY DEBRIS | 2.9 | 2.6 | 2.5 |
| LARGE WOODY DEBRIS | 1.7 | 1.5 | 0.9 |
| ROOTS | 3.6 | 2.2 | 5.6 |
| TERRESTRIAL VEG | 3.7 | 3.0 | 2.9 |
| AQUATIC VEG | 0 | 0 | 0 |
| WHITewater | 20.1 | 15 | 17.8 |
| BOULDERS | 54.9 | 63.3 | 49.8 |
| BEDROCK LEDGES | 9.9 | 5.2 | 17.3 |

Grouse Creek - 2002

9: Limited address

| | |
|-----------|----------|
| # of 1's: | 9 = 23% |
| # of 2's: | 26 = 65% |
| # of 3's: | 2 = 5% |
| # of 4's: | 0 = 0% |
| # of 5's: | 3 = 7% |
| <hr/> | |
| T = | 40 |

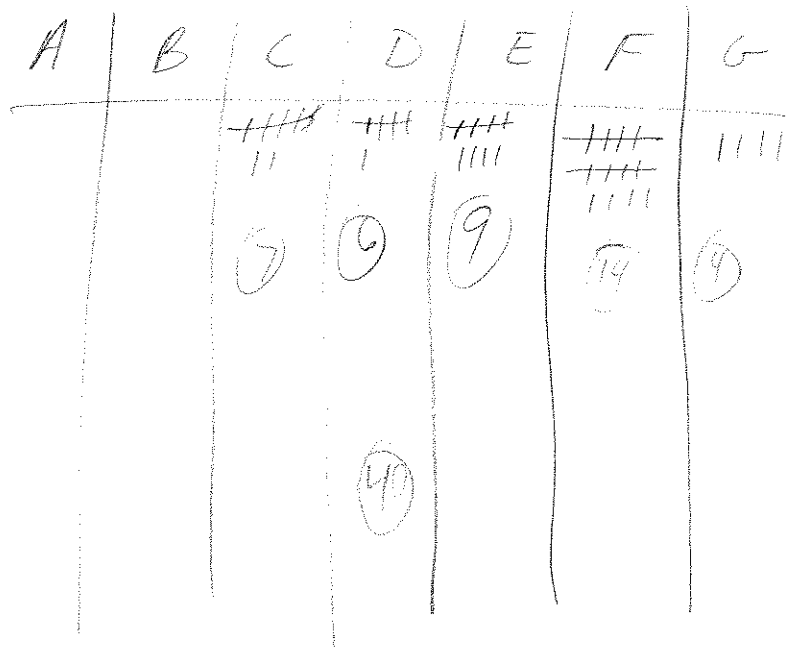
Graph 1



bol Tail Substrate

| | |
|--------------------|----|
| A = 0 = 0% | |
| B = 0 = 0% | |
| C = 7 = 17.5 ≈ 18% | |
| D = 6 = 15% | |
| E = 9 = 22.5 ≈ 23% | |
| F = 14 = 35% | |
| G = 4 = 10% | |
| <hr/> | |
| T = | 40 |

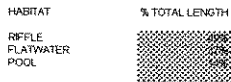
Graph 8



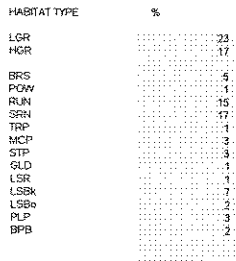
GRAPH 1 - HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 2 - HABITAT TYPES BY PERCENT TOTAL LENGTH



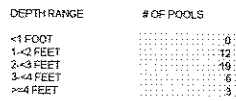
GRAPH 3 - HABITAT TYPES BY PERCENT OCCURRENCE



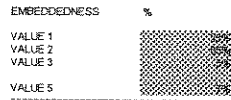
GRAPH 4 - POOL HABITAT TYPES BY PERCENT OCCURRENCE



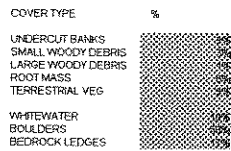
GRAPH 5 - MAXIMUM DEPTH IN POOLS



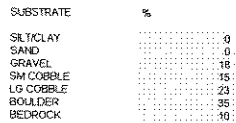
GRAPH 6 - PERCENT EMBEDDEDNESS



GRAPH 7 - MEAN PERCENT COVER TYPES IN POOLS



GRAPH 8 - DOMINANT SUBSTRATE IN POOL TAIL OUTS



GRAPH 9 - PERCENT CANOPY



GRAPH 10 - DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 11 - DOMINANT BANK VEGETATION IN SURVEY REACH

