CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Frasier Creek

Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2000

INTRODUCTION

A stream inventory was conducted during the summer of 2000 on Frasier Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish and other aquatic species with an emphasis on anadromous salmonids in Frasier Creek. The objective of the biological inventory was to document the presence and distribution of salmonids and other aquatic 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

Frasier Creek flows into Big Sulphur Creek, a tributary of the Russian River, and is located primarily in Sonoma County with headwaters in Mendocino County (see Frasier Creek map, Appendix A). The legal description at the confluence with Big Sulphur Creek is T11N, R9W, S6. Its location is 38.828126102708 N latitude and 122.910516542223 W longitude, LLID: 1229105388281. Year round vehicle access exists from Highway 101 near Cloverdale, via Geysers Road.

Frasier Creek and its tributaries drain a basin of approximately 3.81 square miles. Frasier Creek is a fourth order stream and has approximately 2.9 miles of blue line stream, according to the Asti USGS 7.5 minute quadrangle. There are two major unnamed tributaries which were also habitat typed and are described in this report in italics. Minor tributaries include Cascade and Boggs Creeks, which were not surveyed because their confluence was above a barrier to fish migration. Summer flow was measured as approximately 1.49 cfs in habitat unit #003 under the Geysers Road Bridge. Elevations range from about 715 feet at the mouth of the creek to 2966 feet in the headwaters. Oak woodland dominates the watershed. The watershed is owned exclusively by private landowners and Wilderness Unlimited and primary land uses include grazing and hunting. There are no sensitive plants listed within the Frasier Creek drainage in the CNPS Inventory or DFG's Natural Diversity Database**.**

METHODS

The habitat inventory conducted in Frasier Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers 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 and was supervised by Bob Coey, Russian River Basin Planner (DFG).

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 (1998). This form was used in Frasier Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows are also measured or estimated at major tributary confluences.

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 (1998). Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) Water Slope Gradient, 2) Entrenchment, 3) Width/Depth Ratio, 4) Substrate Composition, and 5) Sinuosity.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand-held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures are also recorded using remote temperature recorders which log temperatures at set intervals, 24 hours/day.

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. De-watered units are labeled "DRY". Frasier 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 unit lengths were measured. The first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (Length, Mean Width, Mean Depth, Maximum Depth and Pool Tail Crest Depth). All measurements are in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Frasier Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). "Not suitable" (value 5) is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, absence of particulate substrate (e.g. 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Frasier Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

In all fully measured habitat units, dominant and sub-dominant substrate elements are visually estimated using a list of seven size classes: Silt/Clay, Sand, Gravel, Small Cobble, Large Cobble, Boulder, and Bedrock.

8. Canopy:

Stream canopy density is estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual (1998). Canopy density relates to the amount of stream shaded from the sun. In Frasier 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. Finally, the total canopy over each habitat unit is visually divided into evergreen and deciduous, and the estimated percentages are recorded.

9. Bank Composition and Vegetation:

Banks may be composed primarily of (1) Bedrock, (2) Boulders, (3) Cobble/Gravel, or (4) Silt/Clay/Sand, and may be covered predominantly with (5) Grass, (6) Brush, (7) Deciduous Trees, (8) Coniferous Trees, or (9) No Vegetation at all. These factors influence the ability of stream banks to withstand winter flows. For each fully measured habitat unit in Frasier Creek, the dominant Bank Composition Type and Vegetation Type of both the right and left banks were chosen from the options above. Additionally, the percentage of vegetal coverage was estimated and recorded for each bank.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species present and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, and 3) electro-fishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual (1998).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed by CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual 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 Frasier 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 Residual 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

HISTORICAL STREAM SURVEYS

There are no historical records of surveys conducted on Frasier Creek or its tributaries by the Department of Fish and Game.

HABITAT INVENTORY RESULTS FOR FRASIER CREEK

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

The habitat inventory was conducted from June 20, 2000 – July 5, 2000 by Jacob Newell and Teresa Wildfong (AmeriCorps), Michael Shugars (Intern), and Sarah Nossaman (CDFG), with supervision and analysis by CDFG. The survey began at the confluence with Big Sulphur and extended up Frasier to the end of anadromous fish passage at a rock falls. The total length of the stream surveyed was 9302 feet, with an additional 13 feet of side channel.

In the summer of 2000, a flow of 1.49 cfs was measured at habitat unit # 003, under the Geysers Road Bridge with a Marsh-McBirney Model 2000 flowmeter.

This section of Frasier has four channel types: from the mouth to 3741 feet a B2; next 1370 feet an A2; next 1617 feet an F3 and the upper 2574 feet an A2.

B2 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and a predominantly boulder substrate.

A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate.

F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

Water temperatures on the survey dates ranged from 60°F to 72°F. Air temperatures ranged from 70°F to 88°F. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs, Appendix E). A recorder in Reach 1 of Frasier Creek logged temperatures every two hours from June 2 to September 19, 2000. The highest temperature recorded was 80°F in August and the lowest was 56°F in September. The mean of the daily highs was 71°F for the month of June, 75°F for July, and 76°F for August.

Another recorder placed in Cascade Creek logged temperatures every two hours from June 20 to October 26, 2000. The highest temperature recorded was 66°F in August and the lowest was 55°F in September. The mean of the daily highs was 60°F for the months of July, August, and September.

Another recorder placed in Boggs Creek logged temperatures every two hours from June 20 to October 26, 2000. The highest temperature recorded was 73°F in July and the lowest was 51°F in September. The mean of the daily highs was 66°F for the month of July, 68°F for August, and 66°F for September.

A recorder was also placed in Frasier Creek during the summer of 1999, where it logged temperatures every two hours from June 30 to September 26. The highest temperature recorded was 78°F in July and the lowest was 57°F in September. The mean of the daily highs was 73°F for the months of July and August, and 71°F for September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% flatwater units, 31% pool units, and 24% riffle units. Based on total length there were 77% flatwater units, 12% riffle units, and 11% pool units.

Of the 173 habitat units measured, 31% were completely sampled. Fifteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent occurrence were step runs at 29.5%, mid-channel pools at 14%, low gradient riffles at 10% and glides at 10%. By percent total length, step runs made up 68%, low gradient riffles 8%, glides 5.5%, and mid-channel pools 4.5%.

Fifty-four pools were identified (Table 3). Scour pools were most often encountered at 48%, and comprised 47% of the total length of pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Of the 54 pools measured, 21 (38%) had a depth of two feet or greater. These deeper pools comprised 6% of the total length of stream habitat.

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. Pool types had the highest shelter rating at 26. Riffles and flatwater rated 26 and 14 respectively (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 33, backwater pools rated 20, and scour pools rated 20 (Table 3).
Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 67%, bedrock ledges at 13.8%, small woody debris at 6.1%, and white water at 4.3%. (Graph 7)

Table 6 summarizes the dominant substrate by habitat type. Gravel was not the dominant substrate observed in any of the five low gradient riffles measured. Small cobble was dominant in one of the low gradient riffles.

No mechanical gravel sampling was conducted in 2000 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 53 pool tail-outs measured, eight had a value of 1 (15%), 14 had a value of 2 (26%), nine had a value of 3 (17%), and three had a value of 4 (6%), (Graph 6). Nineteen riffles (36%) rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Boulder and small cobble were the dominant substrates observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 76%. The mean percentages of deciduous and evergreen trees were 44% and 56%, respectively.

For the entire stream reach surveyed, the mean percent right bank vegetated was 40% and the mean percent left bank vegetated was 31%. For the habitat units measured, the dominant vegetation types for the stream banks were: 36% deciduous trees, 31% evergreen trees, 23% grass, 8% brush and 1% bare soil. The dominant substrate for the stream banks were: 38% boulder, 34% cobble/gravel, 17% bedrock and 11% silt/clay/sand.

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY #1

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

The habitat inventory of July 6, 2000 was conducted by Teresa Wildfong and Jacob Newell (AmeriCorps), and Michael Shugars (Intern) with supervision and analysis by CDFG. The survey began at the confluence with Frasier Creek and extended up Unnamed Tributary #1 to a rock falls. The total length of the stream surveyed was 618 feet, with an additional 30 feet of side channel.

Flow was estimated to be 0.24 cfs during the survey period.

This section of Unnamed Tributary #1 has one channel type: from the mouth to 618 feet an A2.

A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high

energy/debris transport associated with depositional soils and a predominantly boulder substrate.

Water temperatures on the survey date ranged from 58°F to 60°F. Air temperatures ranged from 62°F to 70°F.

Table 1a summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** *there were 41% pool units, 30% riffle units and 30% flatwater units. Based on total* ***length*** *there were 61% flatwater units, 22% pool units and 17% riffle units.*

Of the 27 habitat units measured, 44% were completely sampled. Nine Level IV habitat types were identified. The data is summarized in Table 2a. The most frequent habitat types by percent ***occurrence*** *were step runs at 26%, boulder scour pools at 19%, cascades at 15% and mid-channel pools at 11%. By percent total* ***length****, step runs made up 59%, boulder scour pools 10%, cascades 9%, and mid-channel pools 6%.*

Eleven pools were identified (Table 3a). Scour pools were most often encountered at 55%, and comprised 56% of the total length of pools.

Table 4a is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. One of the 11 pools (9%) had a depth of two feet or greater. These deeper pools comprised 5% of the total length of stream habitat.

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. Pool types had the highest shelter rating at 20. Riffles had the lowest rating with 5 and flatwater rated 8 (Table 1a). Of the pool types, the main channel pools had the highest mean shelter rating at 32, and scour pools rated 10 (Table 3a).

Table 5a summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 79%, undercut banks at 15%, aquatic vegetation at 4%, and small woody debris at 2%.

Table 6a summarizes the dominant substrate by habitat type. Boulder was the dominant substrate type in the only riffle measured.

No mechanical gravel sampling was conducted in 2000 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 11 pool tail-outs measured, three had a value of 1 (27%), one had a value of 2 (9%), and two had a value of 3 (18%). Five riffles (45%) rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel and boulder was the dominant substrate observed at pool tail-outs (Graph 8a).

The mean percent canopy density for the stream reach surveyed was 85%. The mean percentages of deciduous and evergreen trees were 24% and 76%, respectively (Graph9a) .

For the entire stream reach surveyed, the mean percent right bank vegetated was 15% and the mean percent left bank vegetated was 24%. For the habitat units measured, the dominant vegetation types for the stream banks were: 54% evergreen trees, 21% brush, 13% grass and 13% deciduous trees (Graph 11a). The dominant substrate types for the stream banks were: 33% boulder, 29% cobble/gravel, 21% silt/clay/sand and 17% bedrock (Graph 10a).

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY #2

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

The habitat inventory of July 7, 2000, was conducted by Jacob Newell and Teresa Wildfong (AmeriCorps) with supervision and analysis by CDFG. The survey began at the confluence with Frasier Creek and extended 1399 feet up Unnamed Tributary #2 to a rock falls.

Flow was estimated to be 0.50 cfs during the survey period.

This section of Unnamed Tributary #2 has one channel type: from the mouth to 1399 feet an A2. A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate.

Water temperatures on the survey date ranged from 60 ℉ to 62 ℉. Air temperatures ranged from 60 ℉ to 70 ℉.

Table 1b summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** *there were 39% flatwater units, 39% pool units, and 23% riffle units. Based on total* ***length*** *there were 76% flatwater units, 13% riffle units, and 11% pool units.*

Of the 44 habitat units measured, 27% were completely sampled. Ten Level IV habitat types were identified. The data is summarized in Table 2b. The most frequent habitat types by percent ***occurrence*** *were step runs at 39%, plunge pools at 16%, mid-channel pools at 9% and low gradient riffles at 7%. By percent total* ***length****, step runs made up 76%, low gradient riffles 8%, plunge pools 4%, and mid-channel pools 3%.*

Seventeen pools were identified (Table 3b). Scour pools were most often encountered at 65%, and comprised 60% of the total length of pools.

Table 4b is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. None of the 17 pools (0%) had a depth of two feet or greater.

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. Pool types had the highest shelter rating at 17. Riffle had the lowest rating with 5 and flatwater rated 5 (Table 1b). Of the pool types, the scour pools had the highest mean shelter rating at 17 and main channel pools rated 15 (Table 3b).

Table 5b summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 63%, white water at 14%, bedrock ledges at 13%, and undercut banks at 8%.

Table 6b summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in the one low gradient riffle measured.

No mechanical gravel sampling was conducted in 2000 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 16 pool tail-outs measured, seven had a value of 1 (44%), three had a value of 2 (19%), and four had a value of 3 (25%). Two (13%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs (Graph 8b).

The mean percent canopy density for the stream reach surveyed was 61%. The mean percentages of deciduous and evergreen trees were 17% and 83%, respectively (Graph 9b).

For the entire stream reach surveyed, the mean percent right bank vegetated was 19% and the mean percent left bank vegetated was 25%. For the habitat units measured, the dominant vegetation types for the stream banks were: 88% grass and 13% deciduous trees (Graph 11b). The dominant substrate types for the stream banks were: 46% cobble/gravel, 21% bedrock, 21% silt/clay/sand and 13% boulder (Graph 10b).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

No biological sampling was conducted on Frasier Creek or its tributaries by CDFG in 2000 due to inadequate staffing levels. All age classes of steelhead were observed on Frasier Creek in Reaches 1 through 4.

During the habitat inventory, no salmonids were observed upstream of unit # 174, 9,282 feet above the confluence with Big Sulphur Creek, where a rock falls (8' high) appears to impede further passage.

Historical records reflect that advanced fingerling steelhead were transferred from Dry Creek to Frasier Creek in 1959.

Table 1. Summary of fish transfers into Frasier Creek

YEAR	SOURCE	SPECIES	#	SIZE
1959	Dry Creek	SH	2,337	ADFNG

SH = steelhead
ADFNG = advanced fingerling

ADULT SURVEYS:

There are no historical records of spawning/carcass surveys conducted by the Department of Fish and Game on Frasier Creek or its tributaries.

No spawning /carcass surveys were conducted on Frasier Creek or its tributaries in 2000 due to inadequate staffing levels.

DISCUSSION FOR FRASIER CREEK

Frasier Creek has four channel types: B2 (3741 ft.), A2 (1370 ft.), F3 (1617 ft.) and A2 (2574 ft.).

According to the CDFG's Salmonid Stream Habitat Restoration Manual, B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover. B channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter.

The high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered in F channel types will require careful design, placement, and construction that must include protection for any unstable banks.

Many site-specific projects can be designed within both B and F channel types, especially to increase pool frequency, volume and shelter.

The water temperatures recorded on the survey days ranged from 60°F to 72°F. Air temperatures ranged from 70°F to 88°F. The warmer water temperatures were recorded in Reach 1.

The warmest temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

Summer temperatures measured using remote temperature recorders placed in pools ranged from 55° to 80°F for Reach 1 of Frasier Creek, 55° to 60° F in Cascade Creek, and 51° to 73°F in Boggs Creek. The Temperature Summary graphs show that for much of the summer (July through

August) Frasier Creek exhibited temperatures above the optimal for salmonids.

Pools comprised 11% of the total length of this survey. 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. In Frasier Creek, the pools are relatively deep with 61% having a maximum depth of at least two feet. These pools comprised 6% of the total length of stream habitat. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 25. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (62%), small woody debris (17%), white water (6%), and bedrock ledges (5%).Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

One of the five low gradient riffles measured (20%) had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

Twenty-three of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 15% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel and because of fine sediment capping the redd and preventing fry emergence. In Frasier Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 76%. This is acceptable, since 80 percent is generally considered desirable

DISCUSSION FOR UNNAMED TRIBUTARY #1

Unnamed Tributary #1 to Frasier Creek has one channel type: A2 (618 ft.).

There are 618 feet of A2 channel type in Reach 1. According to the CDFG's Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Water temperatures on the survey date ranged from 58°F to 60°F. Air temperatures ranged from 62°F to 70°F. These temperatures, if sustained, are favorable for salmonids.

Pools comprised 22% of the total length of this survey. 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. In Unnamed Tributary #1, the pools are relatively shallow with only 9% having a maximum depth of at least two feet. These pools comprised 5% of the total length of stream habitat. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 20. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (79%), undercut banks (15%), aquatic vegetation (4%), and small woody debris (2%).Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Eighteen of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 27% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The mean percent canopy for the survey was 85%. This is very good, since 80 percent is generally considered desirable.

DISCUSSION FOR UNNAMED TRIBUTARY #2

The Unnamed Tributary #2 to Frasier Creek has one channel type: A2 (1399 ft.).

According to the CDFG's Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

The water temperatures recorded on the survey day ranged from 60°F to 62°F. Air temperatures ranged from 60°F to 70°F. The warmer water temperatures were recorded in Reach 1. These temperatures, if sustained, are favorable for salmonids.

Pools comprised 11% of the total length of this survey. 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. In Unnamed Tributary #2, the pools are very shallow with none having a maximum depth of at least two feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools of at least two feet in depth comprising approximately 50% of total habitat length.

The mean shelter rating for pools was 17. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily

by boulders (63%), white water (14%), and bedrock ledges (13%), and undercut banks (8%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The one low gradient riffle measured had grave as the dominant substrate. This is generally considered good for spawning salmonids.

Twenty-five of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 44% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The mean percent canopy for the survey was 61%. This is a low percentage of canopy, since 80 percent is generally considered desirable. The large trees required for adequate stream canopy would eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

GENERAL MANAGEMENT RECOMMENDATIONS

Frasier Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Access for migrating salmonids is an ongoing potential problem in Frasier Creek, therefore, fish passage should be monitored, and improved where possible.

2) Increase the canopy on Frasier Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (particularly in Reach 2). The non-anadromous reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

3) Map sources of upslope and in-channel 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. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against

agricultural, grazing and urban runoff.

4) In Frasier Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

5) Where feasible, design and engineer pool enhancement structures to increase the number of pools in Reaches 1 and 3 of Frasier Creek. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

6) Where feasible, increase woody cover in the pool and flatwater habitat units in Reaches 1 and 3 of Frasier Creek. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.

FRASIER CREEK SURVEY COMMENTS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT #	DISTANCE UPSTREAM	COMMENTS
1.00	143	36 0+ Salmonids
2.00	166	Fence LB
3.00	229	Fence on Left Bank
4.00	266	12 0+ Salmonids; Old Barbed Wire Fence on LB
5.00	284	Hobo Temp Flag
7.00	362	Shale Erosion 80'h X 20'w on Right Bank.
9.00	411	6 Inch Steelhead
10.00	427	GPS F1 810 Elevation N33 49'44.3", W122 54"43.9"; Waypoint #011
13.00	622	2 4" Salmonids; Small Dry Trib LB
14.00	722	7" Salmonids: 12 Bank Erosion-see Form
17.00	859	Old Water Pipes and Cement Sill LB
19.00	1143	Small Dry Trib LB/ Erosive
20.00	1167	Gps F1 Elevation 890 N38 49'48.5" W 122 54' 50.7", Waypoint #012
22.00	1376	Dry Trib LB
26.00	1701	Dry Trib RB, 10 1+ Salmonids
30.00	2064	Dry Trib LB N38 49'52.4" W122 54'59.5" Waypoint #015 (F1)

34.00	2162	All Age Classes of Salmonids Present in Pool
		Dry Side Channel LB/small Dry Trib LB
37.00	2235	All Age Classes of Salmonids in Pool
41.00	2599	GPS F1 N38 49'56.4" W122 55'1.5" Waypoint #016
42.00	2820	Dry Trib LB; 1+ Fish
43.00	2833	All Age Classes of Salmonids; Fence RB
44.00	2982	Dry Trib LB; Wet Trib LB; 65 Deg.
		Possibly Habitat Type; Steelhead Present; 5 1+
		Max Depth of Trib; 2 Feet , 6-8 Feet Wide
		Water 70 Deg. at Confluence
47.10	3066	Substrate Change to Cobble
50.00	3262	Fence LB GPS F1 N38 49'59.5" W122 55'6"waypoint #017
54.00	3430	GPS F1 N38 49'59.6" W122 55'8.2" Waypoint #018
55.00	3662	2 Dry Tribs on Left Bank
		Barbed Wire Fence Upper LB; Good Habitat
58.00	3741	Channel Type Change
60.00	3895	Small Dry Trib RB
62.00	4025	Dry Trib LB
64.00	4570	GPS F1 Waypoint #019 Bank Erosion -See Form #2
		Dry Trib LB; 9.9% Gradient
65.00	4596	All Age Classes of Salmonids Present
66.00	4659	Slide LB 90w X 50l X 10d / Source of Swd
69.00	4861	4' Jump, Passable at High Flow
72.00	4966	Small Dry Trib LB
73.00	4975	Fencing Left Bank
74.00	5111	GPS F1 N3850'4.9" W122 55'25.8" Waypoint #020
		Salmonids Present
78.00	5251	Large Wet Trib LB 68 Deg.
		At Confluence "East Fork Frasier"
82.00	5490	Many Salmonid Fry Present
83.00	5576	Road Crossing Inbetween Units 082 and 083
84.00	5593	3 Dozen Salmonid Fry; 4 1+ Salmonids
		Waypoint #021 on GPS F1
86.00	5826	Pool Temp 68 Degrees
100.00	6610	Dry Trib LB
101.00	6623	9 Inch Salmonid
102.00	6728	Channel Type Change, Dry Trib RB
104.00	6781	N38 50'4.7" W122 55'43.6' Waypoint #023 (F1)
109.00	6833	10" Salmonid
110.00	6844	1' Salmonid
114.00	6995	Gully Left Bank down to Bedrock
		GPS F1 N38 50'4.3" W122 55' 46.3" Waypoint #024
116.00	7033	Spring LB, Dry Trib LB
120.00	7392	Cascade with Series of Jumps; Max Being 5'
122.00	7449	1 0+ Salmonid Spotted
124.00	7469	GPS F1 N38 50'2" W122 55' 51.4" Waypoint #025
126.00	7497	Heavy Sedimentation Throughout Reach
128.00	7583	Seven 1+ Salmonids

134.00	7724	0+ Salmonid GPS F1 N38 50'3.8" W122 55' 53.1" Waypoint #026
136.00	7782	Several 0+ and 1+ Salmonids
137.00	7839	Channel Narrows, Entrenchment Increases
143.00	7940	O+ and 1+ Salmonids
144.00	7986	GPS F1 N38 50'4.6" W122 55' 56.8" Waypoint #027
149.00	8091	1 Dozen 0+ and 1+ Salmonids
150.00	8114	Trib on LB-almost Dried up
151.00	8123	6' Vertical Jump, No Pool below
154.00	8163	GPS F1 N38 50'5" W122 55'57.3" Waypoint #028 Salmonids of All Age Classes Including 2 at 0.7 Ft in Length
155.00	8170	6' Single Vertical Jump
156.00	8357	0+ and 1+ Salmonids Present
159.00	8392	3' Vertical with 2' Jump
160.00	8521	1+ Salmonids
161.00	8526	5' Vertical Jump Through Rocks
162.00	8565	Several 2-3 Ft Jumps
164.00	8616	GPS F1 N38 50'9" W122 55'57.3" Waypoint #029
166.00	8663	Fencing Upslope RB
167.00	8677	Salamander
169.00	8730	Small Dry Trib RB
171.00	8755	Six Foot Vert. Step
172.00	9276	Road Crossing, Possible Ctc. Fence Crosses Creek. 0+ Salmonids, 1+ Rana boylii. Small Dry Trib LB.
173.00	9291	Several .8' Dark Fish
174.00	9302	Eight Foot Vert. Jump; End of Survey Waypoint# 030 (F1)

<u>UNNAMED TRIBUTARY #1 SURVEY COMMENTS</u>

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT #	*DISTANCE UPSTREAM*	*COMMENTS*
1.00	*12*	*Small dry trib LB*
3.00	*40*	*HUs 001 - 004 are within main Big Sulphur channel*
4.00	*63*	*Eroding LB. 1+ SH HUs 002 - 004*
5.00	*162*	*Trib channel starts 13' from base of HU.*
7.00	*216*	*Flow Reading*
8.00	*226*	*Salamander*
9.00	*234*	*Eroding RB. Possible CT site.*
10.00	*247*	*WAYPOINT 032 (F1) Lat 38 50' 1.4" N Lon 122 55' 3.6" W*

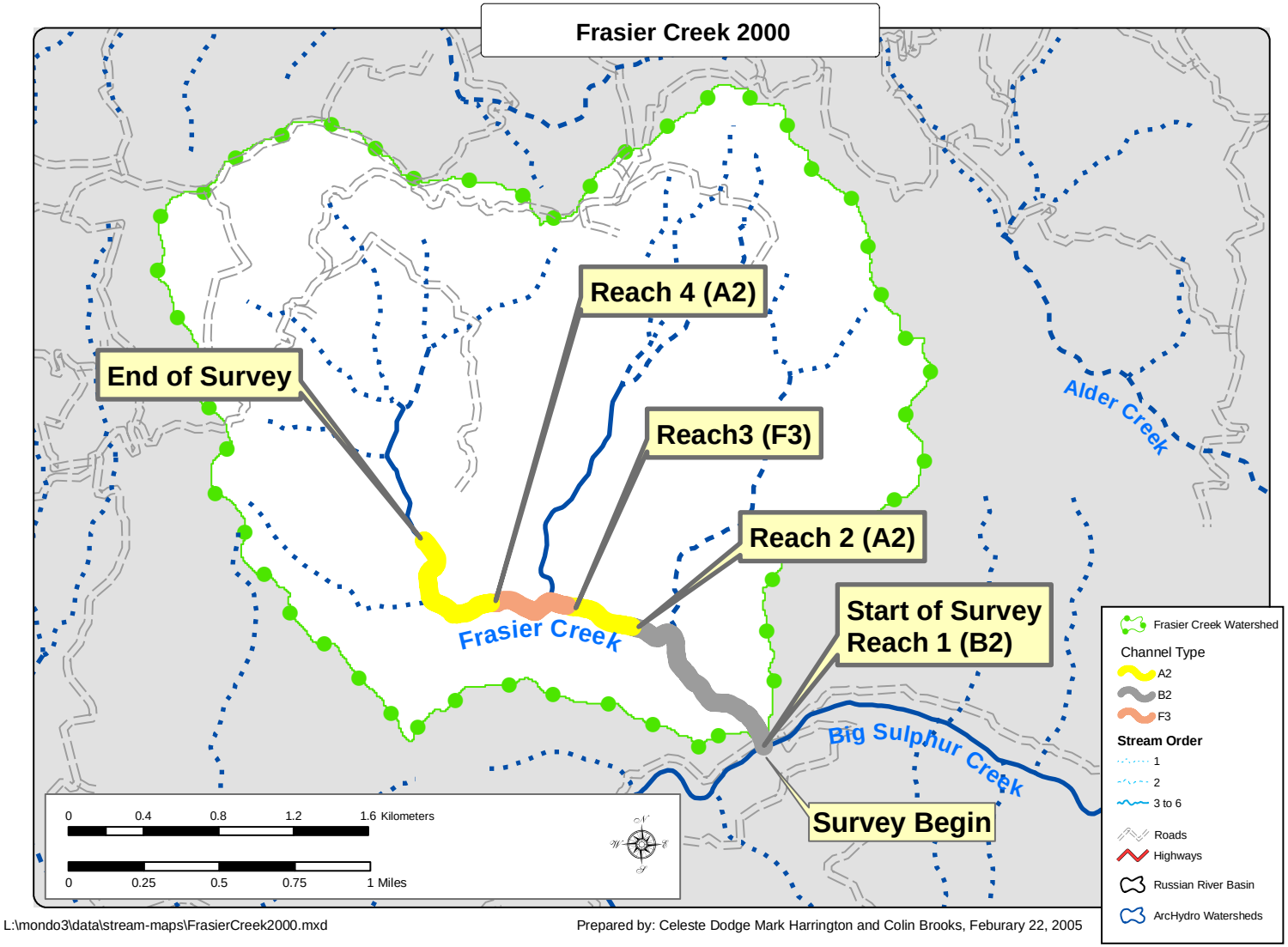
11.00	*264*	*Channel grade increases*
12.00	*275*	*Dead fallen U. californica along RB*
13.00	*290*	*Three foot jump*
16.00	*433*	*LWD perched on boulders. RB small gully. 2+ salmonid, 8 inches. Last fish seen.*
17.00	*438*	*Three foot vert. jump. Instream evergreen growth, LWD perched*
18.00	*463*	*RB small gully & perched LWD*
20.00	*495*	*WAYPOINT 033 (F1) LB erosion 50' x 40', depth 10'. .*
21.00	*502*	*Six ft. vert. jump.*
22.00	*566*	*LWD perched on boulders.*
23.00	*577*	*Moderately good for high flow spawning.*
25.00	*601*	*LWD perched along RB.*
26.00	*618*	*Several 2'-3' jumps with no pools.*
26.10	*648*	*WAYPOINT 034 (F1). Series of 2'-4' drops w/ shallow pools.*

<u>UNNAMED TRIBUTARY #2 SURVEY COMMENTS</u>

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT #	*DISTANCE UPSTREAM*	*COMMENTS*
1	*173*	*Top third divided by 12' gravel bar.*
2	*178*	*Fence LB.*
5	*309*	*Road crossing.*
7	*364*	*Two 0+ salmonids. Heavy sediment deposition.*
9	*385*	*Fence LB. Fence RB.*
15	*478*	*One 1+ salmonid. Heavy sediment deposition.*
17	*585*	*Wet trib LB*
18	*590*	*One 0+ SH. Spring LB. Heavy sediment deposition.*
23	*661*	*Two 0+ SH, 1 2+ SH.*
28	*711*	*Several small pools w/ 0+ SH. Potential channel change.*
30	*972*	*Two 1+ SH. Heavy sediment deposition.*
37	*1135*	*One 2+, 1 1+, 1 0+ SH.*
39	*1223*	*Dry trib RB. 5 1+ SH*
40	*1228*	*Two 1+ SH*
41	*1329*	*Heavy sediment load in pool.*

APPENDIX A: MAP



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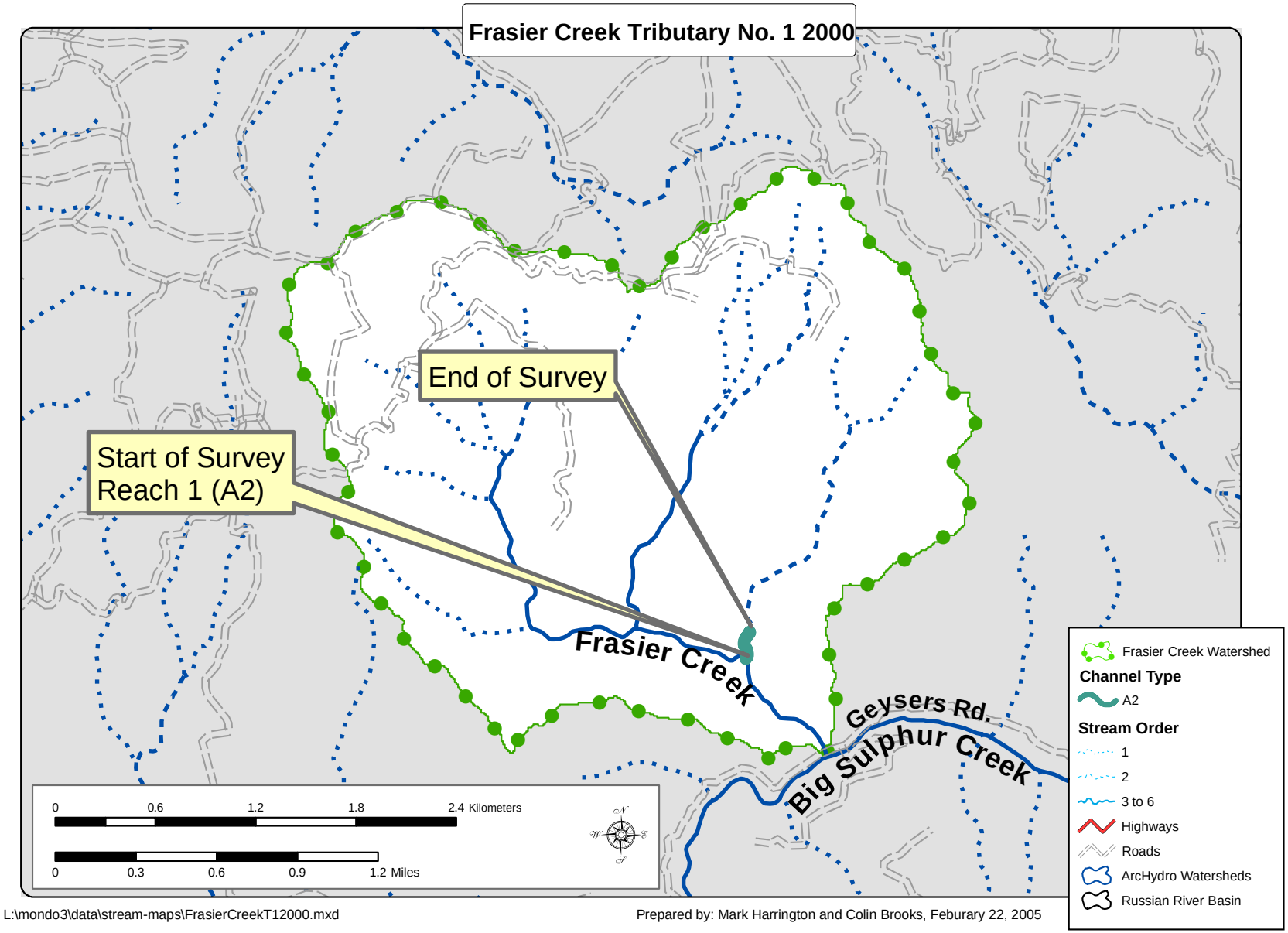
Prepared by: Celeste Dodge Mark Harrington and Colin Brooks, Feburary 22, 2005

Fraiser Creek Tables Graphs Map
Assessment Completed 2000



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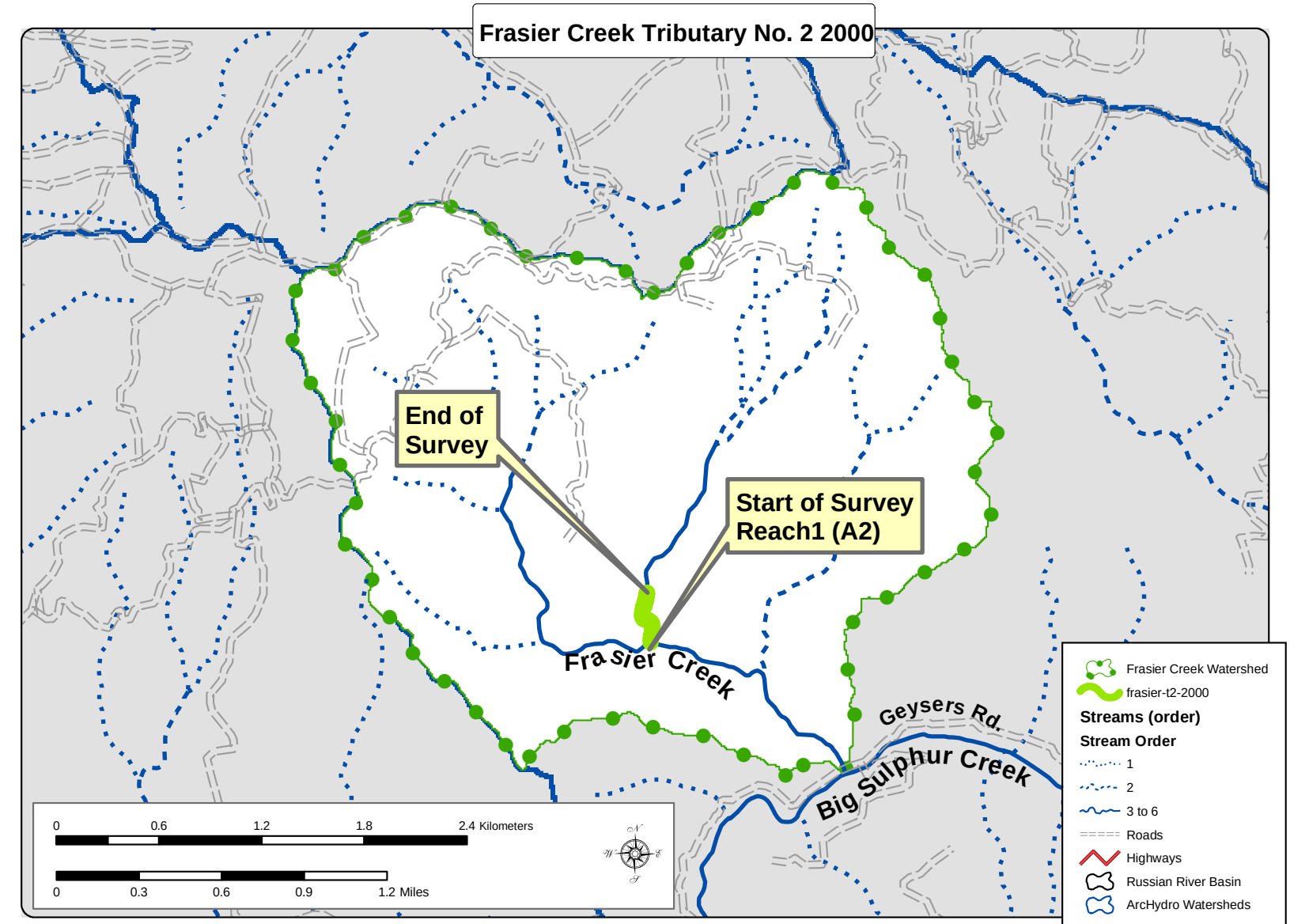
Prepared by: Mark Harrington and Colin Brooks, Feburary 22, 2005



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Prepared by: Celeste Dodge and Colin Brooks, Feburary 22, 2005

APPENDIX B
FRASIER CREEK MAINSTEM TABLES

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Frasier Creek

LLID: 1229105388281

Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
78	20	FLATWATER	45.1	92	7161.5	76.9	9.5	0.6	1.3	527	41121	354	27590		14
54	52	POOL	31.2	19	1036	11.1	10.0	1.1	1.9	179	9683	247	13091	190	26
41	18	RIFFLE	23.7	27	1117	12.0	6.8	0.4	0.8	186	7613	79	2869		26

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
173	90	9314.5	58417	43551

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Frasier Creek LLID: 1229105388281 Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
17	5	LGR	9.8	44	754	8.1	9	0.3	1	446	7587	135	2302		8	60
5	4	HGR	2.9	37	185	2.0	10	0.6	1.3	211	1055	136	679		20	76
11	7	CAS	6.4	7	76	0.8	5	0.3	1	35	384	7	58		100	80
8	2	BRS	4.6	13	102	1.1	1	0.3	3	11	89	1	12			89
17	6	GLD	9.8	30	509	5.5	9	0.7	1.5	324	5514	180	3063		7	79
10	3	RUN	5.8	31	315	3.4	11	0.6	1.6	203	2030	127	1272		13	71
51	11	SRN	29.5	124	6338	68.0	9	0.6	8	726	37038	510	26019		18	73
24	24	MCP	13.9	18	423	4.5	11	1.1	2.8	190	4551	283	6788	214	33	75
2	1	STP	1.2	48	95	1.0	7	1.6	2	353	706	635	1270	564	40	75
2	2	LSR	1.2	19	38	0.4	8	1.0	1.8	145	290	160	320	121	45	88
6	5	LSBk	3.5	24	143	1.5	8	0.8	4.3	207	1240	223	1339	156	16	86
10	10	LSBo	5.8	20	202	2.2	10	1.1	2.4	190	1903	236	2364	193	15	78
8	8	PLP	4.6	14	109	1.2	10	1.0	2.8	123	986	158	1103	117	23	78
1	1	BPL	0.6	13	13	0.1	8	0.9	2.1	104	104	146	146	94	20	65
1	1	DPL	0.6	13	13	0.1	8	1.3	2.4	104	104	135	135	135	20	100

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
173	90	9314.5	63581	46868

Table 3 - Summary of Pool Types

Stream Name: Frasier Creek

LLID: 1229105388281

Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI

Legal Description: T11NR09WS06

Latitude: 38:49:41.0N

Longitude: 122:54:38.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
26	25	MAIN	48	20	518	50	10.7	1.1	196	5100	228	5925	33
26	25	SCOUR	48	19	492	47	9.6	1.0	168	4381	157	3924	20
2	2	BACKWATER	4	13	26	3	8.0	1.1	104	208	114	229	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
54	52	1036	9689	10078

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Frasier Creek

LLID: 1229105388281

Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
24	MCP	46	1	4	12	50	11	46	0	0	0	0
1	STP	2	0	0	0	0	1	100	0	0	0	0
2	LSR	4	0	0	2	100	0	0	0	0	0	0
6	LSBk	12	0	0	5	83	0	0	0	0	1	17
10	LSBo	19	0	0	7	70	3	30	0	0	0	0
7	PLP	13	0	0	4	57	3	43	0	0	0	0
1	BPL	2	0	0	0	0	1	100	0	0	0	0
1	DPL	2	0	0	0	0	1	100	0	0	0	0

Total Units

	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
52	1	2	30	58	20	38	0	0	1	2

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Frasier Creek LLID: 1229105388281 Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000 Dry Units: 0

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
17	3	LGR	0	30	0	0	0	33	0	37	0
5	3	HGR	0	0	0	0	0	3	8	88	0
11	1	CAS	0	10	0	0	0	0	40	60	0
8	0	BRS									
41	7	TOTAL RIFFLE	0	14	0	0	0	16	9	62	0
17	5	GLD	18	0	8	0	0	0	18	54	2
10	3	RUN	3	2	0	0	0	0	0	95	0
51	8	SRN	0	8	1	0	0	31	9	52	0
78	16	TOTAL FLAT	6	4	3	0	0	15	10	61	1
24	21	MCP	4	11	2	2	0	0	4	68	9
2	1	STP	0	0	10	0	0	0	15	75	0
2	2	LSR	20	0	0	55	0	0	0	25	0
6	6	LSBk	0	10	0	0	0	0	1	28	62
10	10	LSBo	0	0	0	0	0	0	0	90	10
8	8	PLP	0	1	0	0	0	0	14	74	0
1	1	BPL	0	0	0	0	0	0	0	100	0
1	1	DPL	10	0	0	0	0	0	0	60	30
54	50	TOTAL POOL	3	6	1	3	0	0	4	67	14
173	73	TOTAL	3	7	1	2	0	5	6	65	10

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Frasier Creek

LLID: 1229105388281

Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Dry Units: 0

Confluence Location: Quad: ASTI

Legal Description: T11NR09WS06

Latitude: 38:49:41.0N

Longitude: 122:54:38.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
17	5	LGR	0	0	0	20	80	0	0
5	4	HGR	0	0	0	0	50	25	25
11	5	CAS	0	0	0	0	0	60	40
8	2	BRS	0	0	0	0	0	0	100
17	7	GLD	0	71	14	0	14	0	0
10	3	RUN	0	0	0	0	67	33	0
51	11	SRN	0	9	0	0	36	36	18
24	7	MCP	0	57	0	0	0	29	14
2	1	STP	0	100	0	0	0	0	0
2	2	LSR	50	50	0	0	0	0	0
6	3	LSBk	0	67	0	33	0	0	0
10	3	LSBo	0	33	0	0	0	67	0
8	4	PLP	0	25	0	0	25	50	0
1	1	BPL	0	100	0	0	0	0	0
1	1	DPL	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Frasier Creek

LLID: 1229105388281

Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
76	56	44	0	40	31

Note: Mean percent conifer and hardwood 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.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Frasier Creek LLID: 1229105388281 Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	7	12	16.7
Boulder	29	14	37.7
Cobble / Gravel	18	21	34.2
Sand / Silt / Clay	3	10	11.4

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	13	13	22.8
Brush	4	5	7.9
Hardwood Trees	22	19	36.0
Coniferous Trees	17	18	30.7
No Vegetation	0	1	0.9

Total Stream Cobble Embeddedness Values: 3

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: Frasier Creek LLID: 1229105388281 Drainage: Russian River - Middle

Survey Dates: 6/20/2000 to 7/5/2000

Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	6	3
SMALL WOODY DEBRIS (%)	14	4	6
LARGE WOODY DEBRIS (%)	0	3	1
ROOT MASS (%)	0	0	3
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	16	15	0
WHITEWATER (%)	9	10	4
BOULDERS (%)	62	61	67
BEDROCK LEDGES (%)	0	1	14

Table 1a - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000*

Confluence Location: *Quad: ASTI* *Legal Description: T11NR10WS01* *Latitude: 38:49:60.0N* *Longitude: 122:54:58.0W*

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
8	2	FLATWATER	29.6	49	393	60.7	5.5	0.5	0.8	259	2068	128	1021		8
11	11	POOL	40.7	13	144.3	22.3	10.0	0.8	1.3	116	1281	122	1346	99	20
8	5	RIFFLE	29.6	14	110.6	17.1	7.2	0.2	0.4	31	246	7	59		5

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
27	18	647.9	3596	2426

Table 2a - Summary of Habitat Types and Measured Parameters

Stream Name: Frasier Creek, Trib 1 *LLID:* 1229162388332 *Drainage:* Russian River - Middle

Survey Dates: 7/6/2000 to 7/6/2000

Confluence Location: *Quad:* ASTI *Legal Description:* T11NR10WS01 *Latitude:* 38:49:60.0N *Longitude:* 122:54:58.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
2	1	LGR	7.4	12	25	3.8	10	0.1	0.3	40	80	4	8		5	88
2	2	HGR	7.4	14	27	4.2	9	0.3	0.9	52	104	16	32		5	80
4	2	CAS	14.8	15	59	9.1	4	0.1	0.1	5	19	0	2			93
1	1	RUN	3.7	10	10	1.5	4	0.4	0.6	32	32	13	13		5	60
7	1	SRN	25.9	55	383	59.1	7	0.5	0.9	485	3396	243	1698		10	91
3	3	MCP	11.1	12	36	5.6	14	1.1	1.9	145	435	198	593	174	42	95
2	2	STP	7.4	14	28	4.3	14	0.7	2	163	326	156	311	114	18	70
1	1	LSBk	3.7	13	13	2.1	8	0.8	1.7	101	101	101	101	81	25	90
5	5	LSBo	18.5	13	67	10.3	7	0.6	1.3	84	420	68	340	51	7	83

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
27	18	647.9	4912	3098

Table 3a - Summary of Pool Types

Stream Name: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:49:60.0N* *Longitude:* *122:54:58.0W*

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
5	5	MAIN	45	13	64	44	13.8	1.0	152	761	150	750	32
6	6	SCOUR	55	13	80	56	6.8	0.7	87	521	56	337	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
11	11	144.3	1281	1087

Table 4a - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Frasier Creek, Trib 1 *LLID: 1229162388332* *Drainage: Russian River - Middle*

Survey Dates: 7/6/2000 to 7/6/2000

Confluence Location: *Quad: ASTI* *Legal Description: T11NR10WS01* *Latitude: 38:49:60.0N* *Longitude: 122:54:58.0W*

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
3	MCP	27	1	33	2	67	0	0	0	0	0	0
2	STP	18	0	0	1	50	1	50	0	0	0	0
1	LSBk	9	0	0	1	100	0	0	0	0	0	0
5	LSBo	45	2	40	3	60	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
11	3	27	7	64	1	9	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

Table 5a - Summary of Mean Percent Cover By Habitat Type

Stream Name: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000* *Dry Units:* *0*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:49:60.0N* *Longitude:* *122:54:58.0W*

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
2	1	LGR	0	20	0	0	0	0	0	80	0
2	1	HGR	0	0	0	0	0	0	0	100	0
4	0	CAS									
8	2	TOTAL RIFFLE	0	10	0	0	0	0	0	90	0
1	1	RUN	0	0	0	0	0	0	0	100	0
7	1	SRN	0	10	0	0	0	0	0	90	0
8	2	TOTAL FLAT	0	5	0	0	0	0	0	95	0
3	3	MCP	23	0	0	0	0	13	0	63	0
2	2	STP	0	13	0	0	0	0	0	88	0
1	1	LSBk	0	0	0	0	0	0	0	100	0
5	5	LSBo	19	0	0	0	0	0	0	81	0
11	11	TOTAL POOL	15	2	0	0	0	4	0	79	0
27	15	TOTAL	11	4	0	0	0	3	0	83	0

Table 6a - Summary of Dominant Substrates By Habitat Type

Stream Name: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000* *Dry Units:* *0*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:49:60.0N* *Longitude:* *122:54:58.0W*

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
2	1	LGR	0	0	0	0	0	100	0
2	2	HGR	0	0	0	0	50	50	0
4	2	CAS	0	0	0	0	0	50	50
1	1	RUN	0	0	0	0	0	100	0
7	1	SRN	0	0	0	0	0	100	0
3	1	MCP	0	0	100	0	0	0	0
2	1	STP	0	0	0	0	0	100	0
1	1	LSBk	0	0	100	0	0	0	0
5	2	LSBo	0	100	0	0	0	0	0

Table 7a - Summary of Mean Percent Canopy for Entire Stream

Stream Name: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:49:60.0N* *Longitude:* *122:54:58.0W*

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
85	76	24	0	15	24

Note: Mean percent conifer and hardwood 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.

Table 9a - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:49:60.0N* *Longitude:* *122:54:58.0W*

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	*Number of Units Right Bank*	*Number of Units Left Bank*	*Total Mean Percent (%)*
Bedrock	*3*	*1*	*16.7*
Boulder	*3*	*5*	*33.3*
Cobble / Gravel	*3*	*4*	*29.2*
Sand / Silt / Clay	*3*	*2*	*20.8*

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	*Number of Units Right Bank*	*Number of Units Left Bank*	*Total Mean Percent (%)*
Grass	*0*	*3*	*12.5*
Brush	*5*	*0*	*20.8*
Hardwood Trees	*1*	*2*	*12.5*
Coniferous Trees	*6*	*7*	*54.2*
No Vegetation	*0*	*0*	*0.0*

Total Stream Cobble Embeddedness Values: *3*

Table 10a - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: *Frasier Creek, Trib 1* *LLID:* *1229162388332* *Drainage:* *Russian River - Middle*

Survey Dates: *7/6/2000 to 7/6/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:49:60.0N* *Longitude:* *122:54:58.0W*

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	15
SMALL WOODY DEBRIS (%)	10	5	2
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	4
WHITEWATER (%)	0	0	0
BOULDERS (%)	90	95	79
BEDROCK LEDGES (%)	0	0	0

Table 1b - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000*

Confluence Location: *Quad: ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
17	3	FLATWATER	38.6	63	1066	76.2	10.3	0.4	0.5	571	9715	203	3450		5
17	17	POOL	38.6	9	156	11.2	5.1	0.4	0.8	42	706	29	470	21	17
10	5	RIFFLE	22.7	18	177	12.7	5.8	0.2	0.6	129	1292	22	178		5

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
44	25	1399	11713	4097

Table 2b - Summary of Habitat Types and Measured Parameters

Stream Name: Frasier Creek, Trib 2 *LLID:* 1229238388347 *Drainage:* Russian River - Middle

Survey Dates: 7/7/2000 to 7/7/2000

Confluence Location: *Quad:* ASTI *Legal Description:* T11NR10WS01 *Latitude:* 38:50:05.0N *Longitude:* 122:55:26.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
3	1	LGR	6.8	37	111	7.9	6	0.2	0.3	388	1163	78	233			30
1	1	HGR	2.3	20	20	1.4	3	0.3	0.5	27	27	8	8		5	30
3	2	CAS	6.8	11	32	2.3	10	0.1	0.9	113	340	2	3			73
3	1	BRS	6.8	5	14	1.0	1	0.2	0.5	5	15	1	3			50
17	3	SRN	38.6	63	1066	76.2	10	0.4	0.7	571	9715	203	3450		5	71
4	4	MCP	9.1	9	35	2.5	6	0.4	1.1	40	159	25	100	15	9	38
2	2	STP	4.5	14	27	1.9	4	0.6	1	42	84	48	48	36	40	70
3	3	LSBk	6.8	9	28	2.0	4	0.4	0.9	37	110	22	66	15	22	75
1	1	LSBo	2.3	10	10	0.7	5	0.4	1	50	50	30	30	20	35	
7	7	PLP	15.9	8	56	4.0	6	0.5	1.3	43	303	32	226	24	13	58

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
44	25	1399	11965	4167

Table 3b - Summary of Pool Types

Stream Name: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
6	6	MAIN	35	10	62	40	5.2	0.4	41	243	19	97	15
11	11	SCOUR	65	9	94	60	5.1	0.4	42	463	21	232	17

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
17	17	156	706	330

Table 4b - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Frasier Creek, Trib 2 *LLID: 1229238388347* *Drainage: Russian River - Middle*

Survey Dates: 7/7/2000 to 7/7/2000

Confluence Location: *Quad: ASTI* *Legal Description: T11NR10WS01* *Latitude: 38:50:05.0N* *Longitude: 122:55:26.0W*

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
4	MCP	25	3	75	1	25	0	0	0	0	0	0
1	STP	6	0	0	1	100	0	0	0	0	0	0
3	LSBk	19	3	100	0	0	0	0	0	0	0	0
1	LSBo	6	0	0	1	100	0	0	0	0	0	0
7	PLP	44	6	86	1	14	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
16	12	75	4	25	0	0	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 0.8

Table 5b - Summary of Mean Percent Cover By Habitat Type

Stream Name: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000* *Dry Units:* *0*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
3	0	LGR									
1	1	HGR	0	0	0	0	0	0	0	100	0
3	0	CAS									
3	0	BRS									
10	1	TOTAL RIFFLE	0	0	0	0	0	0	0	100	0
17	1	SRN	0	0	0	0	0	0	0	100	0
17	1	TOTAL FLAT	0	0	0	0	0	0	0	100	0
4	4	MCP	0	0	0	0	0	0	23	78	0
2	1	STP	0	0	0	0	0	0	70	30	0
3	3	LSBk	33	0	0	0	0	0	0	33	33
1	1	LSBo	0	0	0	0	0	0	0	95	5
7	7	PLP	4	4	0	0	0	0	9	67	14
17	16	TOTAL POOL	8	2	0	0	0	0	14	63	13
44	18	TOTAL	7	2	0	0	0	0	12	67	11

Table 6b - Summary of Dominant Substrates By Habitat Type

Stream Name: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000* *Dry Units:* *0*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
3	1	LGR	0	0	100	0	0	0	0
1	1	HGR	0	0	0	0	0	0	100
3	1	CAS	0	0	0	0	0	100	0
3	1	BRS	0	0	0	0	0	0	100
17	3	SRN	0	0	33	0	33	33	0
4	1	MCP	0	100	0	0	0	0	0
2	1	STP	0	0	100	0	0	0	0
3	1	LSBk	0	100	0	0	0	0	0
1	0	LSBo	0	0	0	0	0	0	0
7	2	PLP	0	100	0	0	0	0	0

Table 7b - Summary of Mean Percent Canopy for Entire Stream

Stream Name: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
61	83	17	0	19	25

Note: Mean percent conifer and hardwood 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.

Table 9b - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	*Number of Units Right Bank*	*Number of Units Left Bank*	*Total Mean Percent (%)*
Bedrock	*4*	*1*	*20.8*
Boulder	*0*	*3*	*12.5*
Cobble / Gravel	*7*	*4*	*45.8*
Sand / Silt / Clay	*1*	*4*	*20.8*

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	*Number of Units Right Bank*	*Number of Units Left Bank*	*Total Mean Percent (%)*
Grass	*10*	*11*	*87.5*
Brush	*0*	*0*	*0.0*
Hardwood Trees	*2*	*1*	*12.5*
Coniferous Trees	*0*	*0*	*0.0*
No Vegetation	*0*	*0*	*0.0*

Total Stream Cobble Embeddedness Values: *2*

Table 10b - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: *Frasier Creek, Trib 2* *LLID:* *1229238388347* *Drainage:* *Russian River - Middle*

Survey Dates: *7/7/2000 to 7/7/2000*

Confluence Location: *Quad:* *ASTI* *Legal Description:* *T11NR10WS01* *Latitude:* *38:50:05.0N* *Longitude:* *122:55:26.0W*

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	8
SMALL WOODY DEBRIS (%)	0	0	2
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	14
BOULDERS (%)	100	100	63
BEDROCK LEDGES (%)	0	0	13

APPENDIX C
FRASIER CREEK MAINSTEM

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Frasier Creek LLID: 1229105388281 Drainage: Russian River -
Survey Dates: 6/20/2000 to 7/5/2000 Survey Length (ft.): 9314.5 Main Channel (ft.): 9301.5 Side Channel (ft.): 13
Confluence Location: Quad: ASTI Legal Description: T11NR09WS06 Latitude: 38:49:41.0N Longitude: 122:54:38.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B2
Reach Length (ft.): 3741
Riffle/Flatwater Mean Width (ft.): 12.4
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 63 - 72 Air (F): 70 - 88
Dry Channel (ft.): 0

Canopy Density (%): 71.9
Coniferous Component (%): 43.8
Hardwood Component (%): 56.2
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 44.6
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0.7
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 9.2
Pool Frequency (%): 32.1
Residual Pool Depth (%):
< 2 Feet Deep: 55.6
2 to 2.9 Feet Deep: 44.4
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.87
Mean Pool Shelter Rating: 32

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 5.6 Gravel: 5.6 Sm Cobble: 50.0 Lg Cobble: 5.6 Boulder: 22.2 Bedrock: 11.1
Embeddedness Values (%): 1. 27.8 2. 22.2 3. 27.8 4. 0.0 5. 22.2

STREAM REACH: 2

Channel Type: A2
Reach Length (ft.): 1370
Riffle/Flatwater Mean Width (ft.): 5.0
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 63 - 68 Air (F): 70 - 82
Dry Channel (ft.): 0

Canopy Density (%): 63.8
Coniferous Component (%): 57.5
Hardwood Component (%): 42.5
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 36.3
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 4.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 10.1
Pool Frequency (%): 31.3
Residual Pool Depth (%):
< 2 Feet Deep: 60.0
2 to 2.9 Feet Deep: 40.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 69

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 60.0 Sm Cobble: 20.0 Lg Cobble: 0.0 Boulder: 20.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 80.0 3. 0.0 4. 0.0 5. 20.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: F3
Reach Length (ft.): 1617
Riffle/Flatwater Mean Width (ft.): 8.5
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 68 - 72 Air (F): 80 - 88
Dry Channel (ft.): 0

Canopy Density (%): 81.2
Coniferous Component (%): 62.1
Hardwood Component (%): 37.9
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 36.0
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 2.2
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 9.6
Pool Frequency (%): 28.6
Residual Pool Depth (%):
< 2 Feet Deep: 75.0
2 to 2.9 Feet Deep: 25.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.65
Mean Pool Shelter Rating: 15

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 37.5 Sm Cobble: 12.5 Lg Cobble: 12.5 Boulder: 37.5 Bedrock: 0.0
Embeddedness Values (%): 1. 12.5 2. 37.5 3. 12.5 4. 0.0 5. 37.5

STREAM REACH: 4

Channel Type: A2
Reach Length (ft.): 2573.5
Riffle/Flatwater Mean Width (ft.): 5.9
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 60 - 68 Air (F): 70 - 80
Dry Channel (ft.): 0

Canopy Density (%): 79.4
Coniferous Component (%): 62.9
Hardwood Component (%): 37.1
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 24.8
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 15.0
Pool Frequency (%): 30.6
Residual Pool Depth (%):
< 2 Feet Deep: 60.0
2 to 2.9 Feet Deep: 35.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 5.0
Mean Max Residual Pool Depth (ft.): 2.025
Mean Pool Shelter Rating: 15

Pool Tail Substrate (%): Silt/Clay: 4.8 Sand: 4.8 Gravel: 14.3 Sm Cobble: 14.3 Lg Cobble: 14.3 Boulder: 33.3 Bedrock: 14.3
Embeddedness Values (%): 1. 9.5 2. 14.3 3. 9.5 4. 14.3 5. 52.4

Appendix 2C - Fish Habitat Inventory Data Summary

Stream Name: Frasier Creek, Trib 1 *LLID: 1229162388332* *Drainage: Russian River -*
Survey Dates: 7/6/2000 to 7/6/2000 *Survey Length (ft.): 647.9* *Main Channel (ft.): 617.9* *Side Channel (ft.): 30*
Confluence Location: Quad: ASTI *Legal Description: T11NR10WS01* *Latitude: 38:49:60.0N* *Longitude: 122:54:58.0W*

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: A2
Reach Length (ft.): 617.9
Riffle/Flatwater Mean Width (ft.): 6.7
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.24
Water (F): 58 - 60 Air (F): 62 - 70
Dry Channel (ft.): 0

Canopy Density (%): 85.3
Coniferous Component (%): 76.3
Hardwood Component (%): 23.8
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 19.2
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 23.4
Pool Frequency (%): 42.3
Residual Pool Depth (%):
< 2 Feet Deep: 90.9
2 to 2.9 Feet Deep: 9.1
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.30
Mean Pool Shelter Rating: 20

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 9.1 Gravel: 36.4 Sm Cobble: 9.1 Lg Cobble: 9.1 Boulder: 36.4 Bedrock: 0.0
Embeddedness Values (%): 1. 27.3 2. 9.1 3. 18.2 4. 0.0 5. 45.5

Appendix 3C - Fish Habitat Inventory Data Summary

Stream Name: Frasier Creek, Trib 2 *LLID: 1229238388347* *Drainage: Russian River -*
Survey Dates: 7/7/2000 to 7/7/2000 *Survey Length (ft.): 1399* *Main Channel (ft.): 1399* *Side Channel (ft.): 0*
Confluence Location: Quad: ASTI *Legal Description: T11NR10WS01* *Latitude: 38:50:05.0N* *Longitude: 122:55:26.0W*

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: A2
Reach Length (ft.): 1399
Riffle/Flatwater Mean Width (ft.): 7.5
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0.5
Water (F): 60 - 62 Air (F): 60 - 70
Dry Channel (ft.): 0

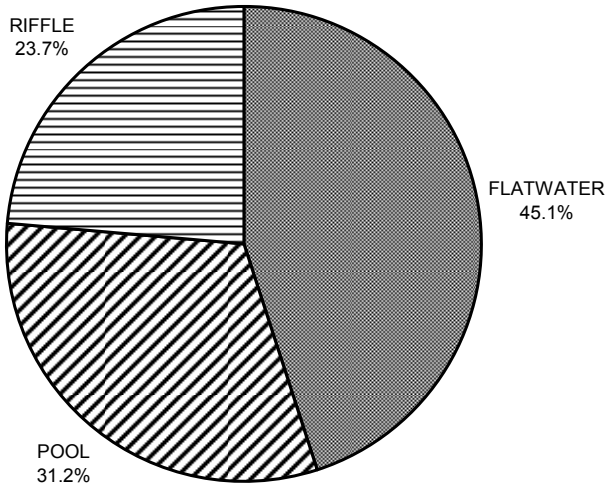
Canopy Density (%): 61.1
Coniferous Component (%): 83.3
Hardwood Component (%): 16.7
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 22.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 11.2
Pool Frequency (%): 38.6
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 0.775
Mean Pool Shelter Rating: 17

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 62.5 Sm Cobble: 25.0 Lg Cobble: 6.3 Boulder: 6.3 Bedrock: 0.0
Embeddedness Values (%): 1. 43.8 2. 18.8 3. 25.0 4. 0.0 5. 12.5

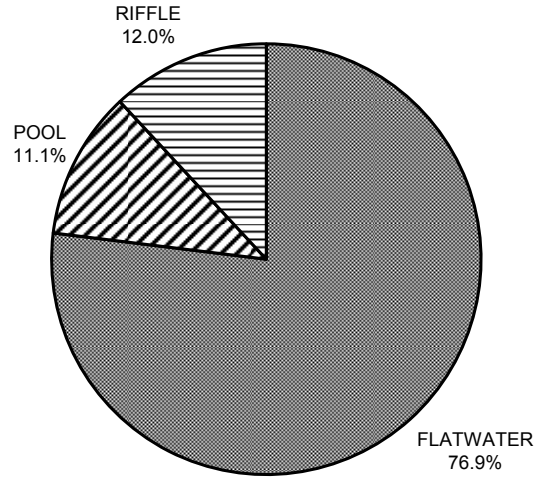
Appendix D
Frasier Creek Mainstem Graphs

FRASIER CREEK 2000
HABITAT TYPES BY PERCENT OCCURRENCE



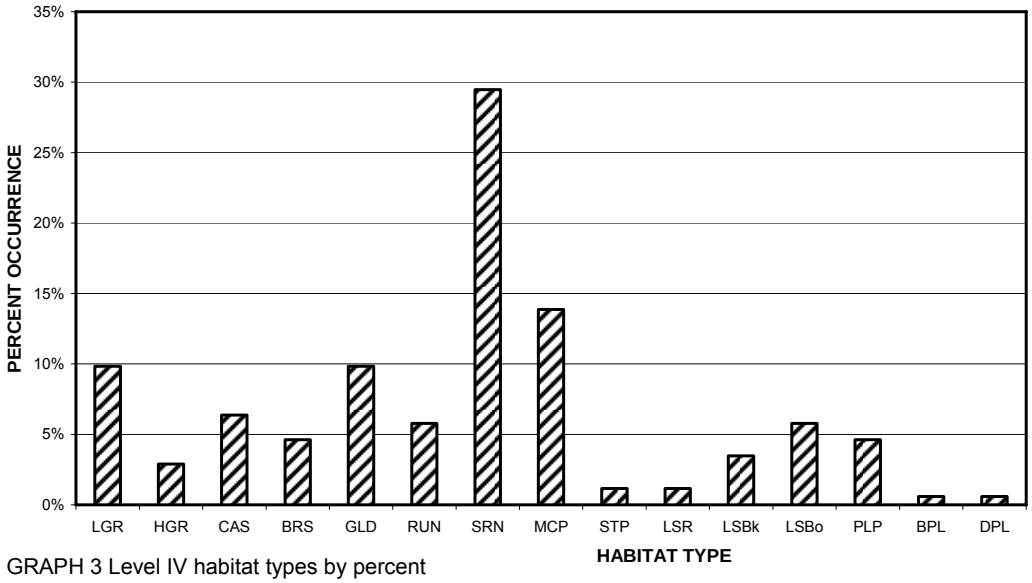
GRAPH 1 Level II habitat types by percent occurence

FRASIER CREEK 2000
HABITAT TYPES BY PERCENT TOTAL LENGTH



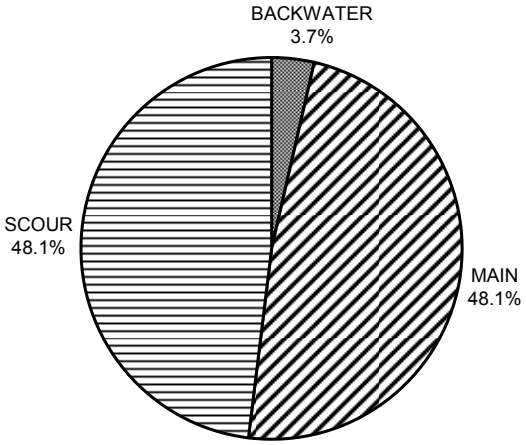
GRAPH 2 Level II habitat types by percent total length

FRASIER CREEK 2000
HABITAT TYPES BY PERCENT OCCURRENCE



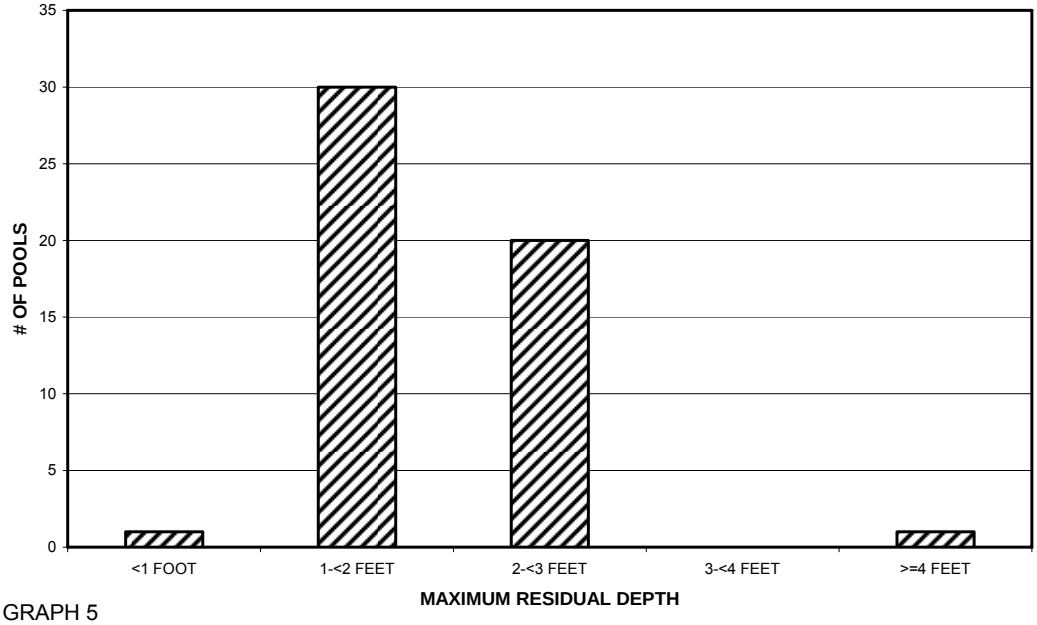
GRAPH 3 Level IV habitat types by percent

FRASIER CREEK 2000
POOL TYPES BY PERCENT OCCURRENCE



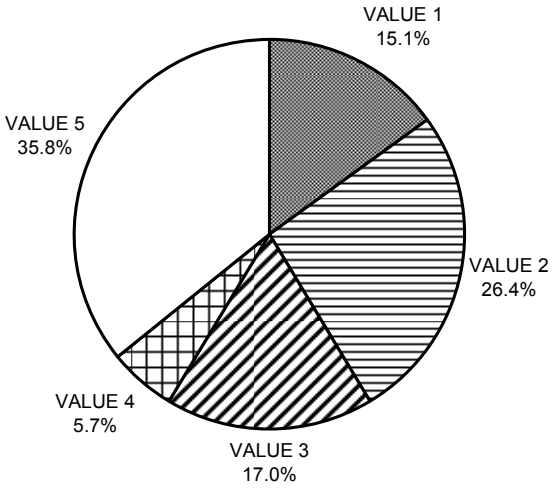
GRAPH 4 Level I pool types by percent occurence

FRASIER CREEK 2000
MAXIMUM DEPTH IN POOLS



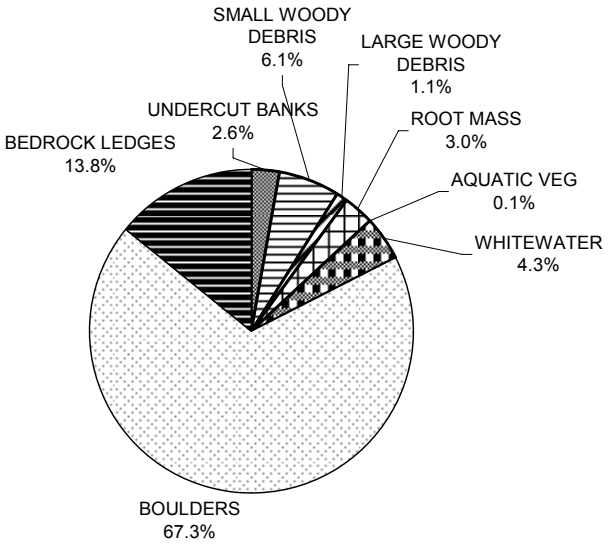
GRAPH 5

FRASIER CREEK 2000
PERCENT EMBEDDEDNESS



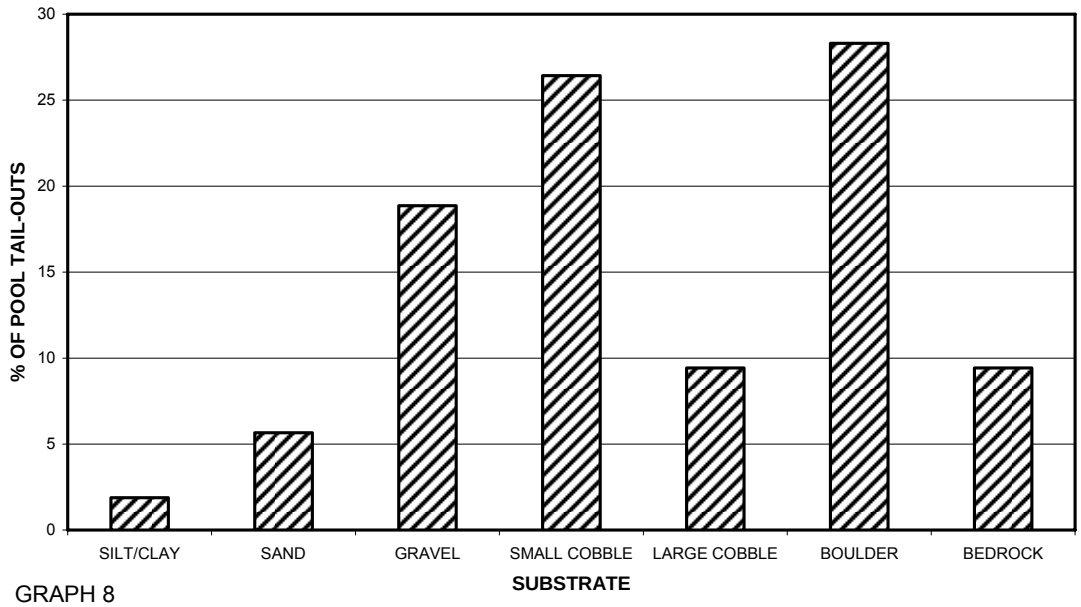
GRAPH 6

FRASIER CREEK 2000
MEAN PERCENT COVER TYPES IN POOLS



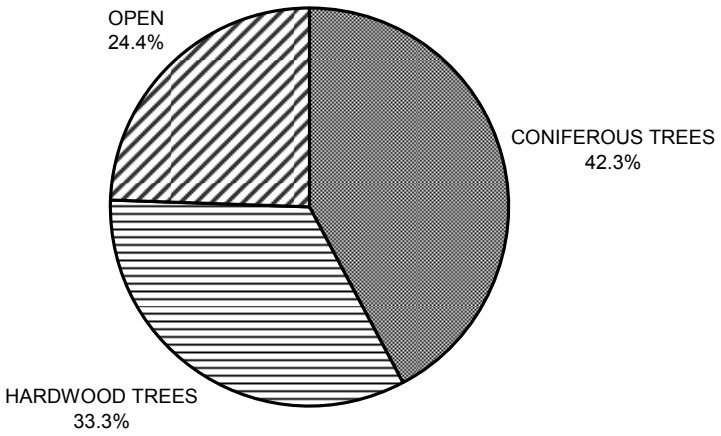
GRAPH 7

FRASIER CREEK 2000
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



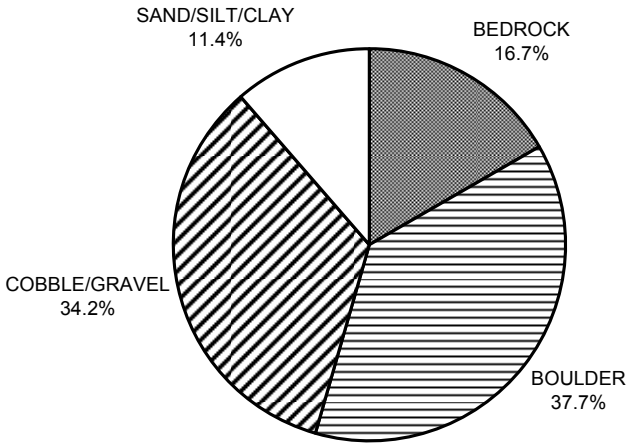
GRAPH 8

FRASIER CREEK 2000
MEAN PERCENT CANOPY



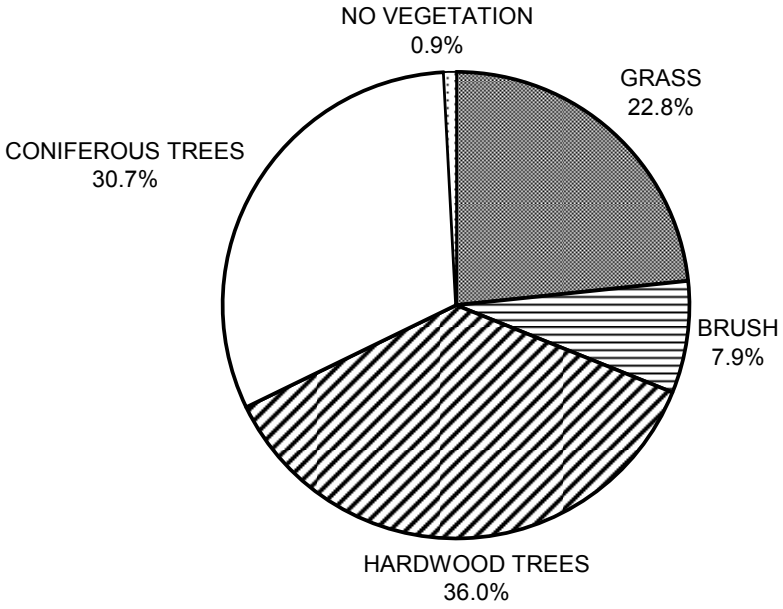
GRAPH 9

FRASIER CREEK 2000
DOMINANT BANK COMPOSITION



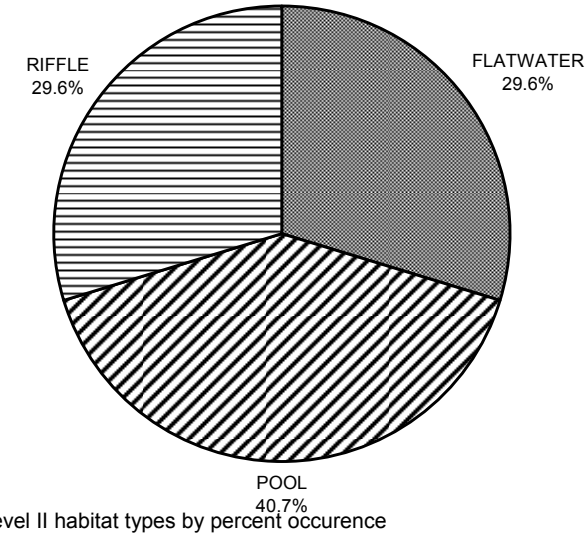
GRAPH 10

FRASIER CREEK 2000
DOMINANT BANK VEGETATION



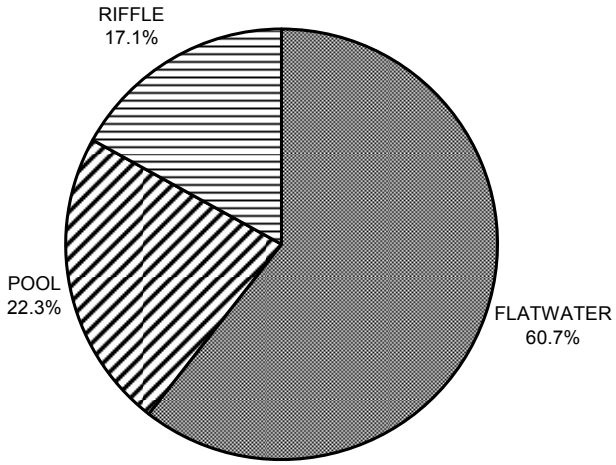
GRAPH 11

FRASIER CREEK, TRIB 1 2000
HABITAT TYPES BY PERCENT OCCURRENCE



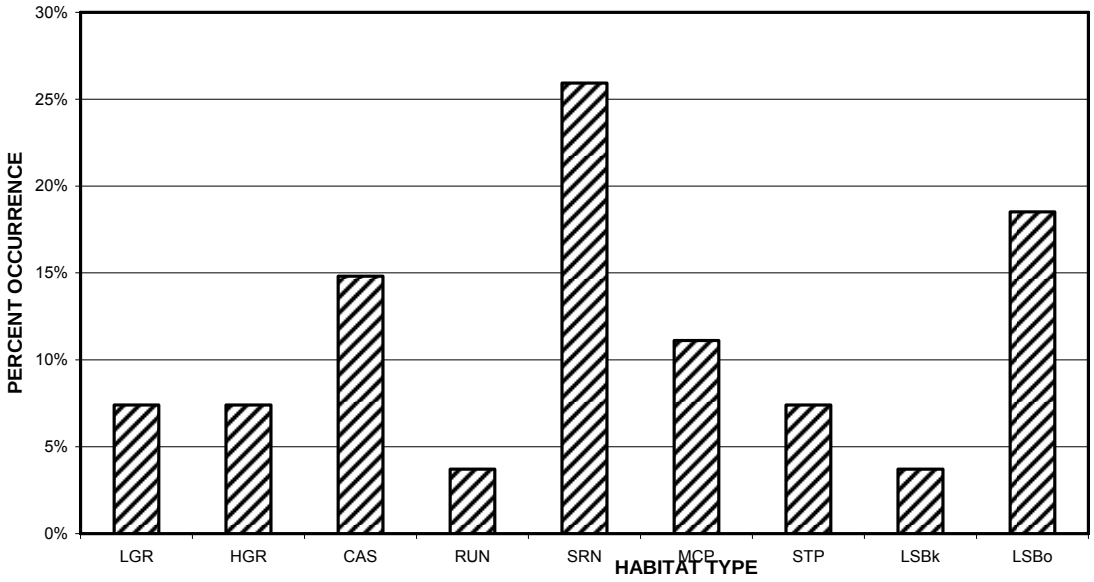
GRAPH 1a: Level II habitat types by percent occurence

FRASIER CREEK, TRIB 1 2000
HABITAT TYPES BY PERCENT TOTAL LENGTH



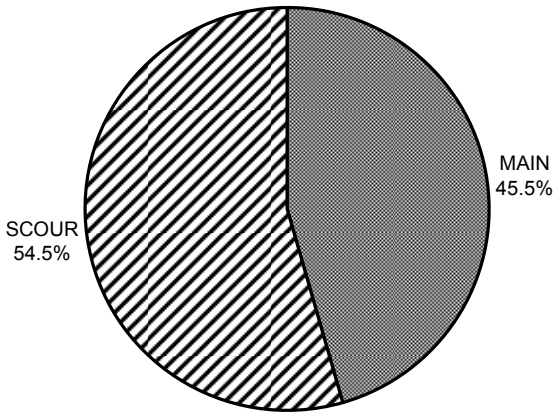
GRAPH 2a: Level II habitat types by percent total length

FRASIER CREEK, TRIB 1 2000
HABITAT TYPES BY PERCENT OCCURRENCE



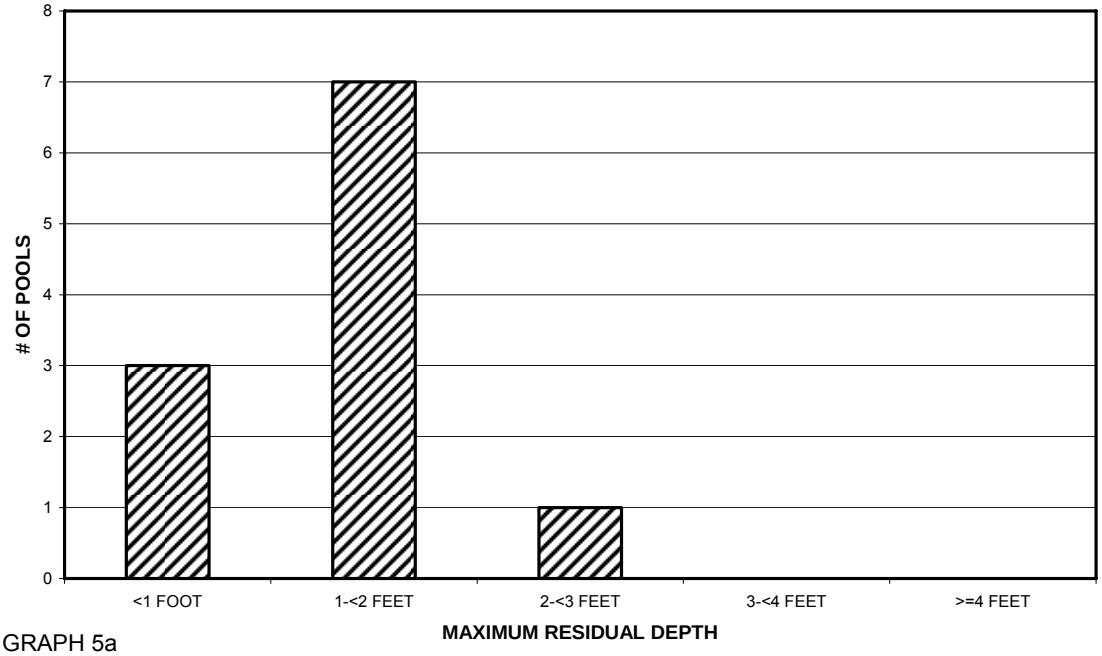
GRAPH 3a: Level IV habitat types by percent occurence

FRASIER CREEK, TRIB 1 2000
POOL TYPES BY PERCENT OCCURRENCE



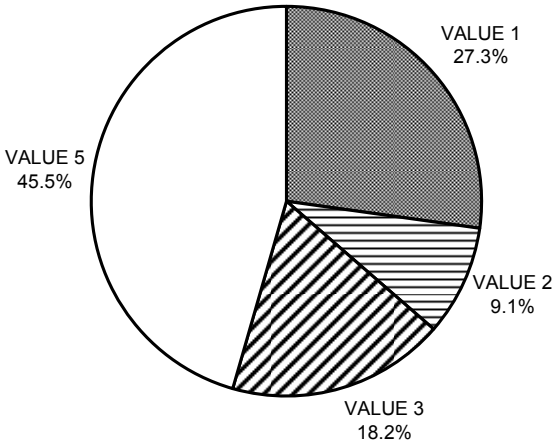
GRAPH 4a: Level I pool types by percent occurence

FRASIER CREEK, TRIB 1 2000
MAXIMUM DEPTH IN POOLS



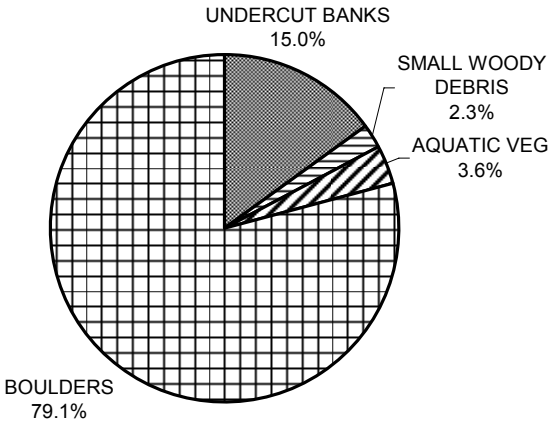
GRAPH 5a

FRASIER CREEK, TRIB 1 2000
PERCENT EMBEDDEDNESS



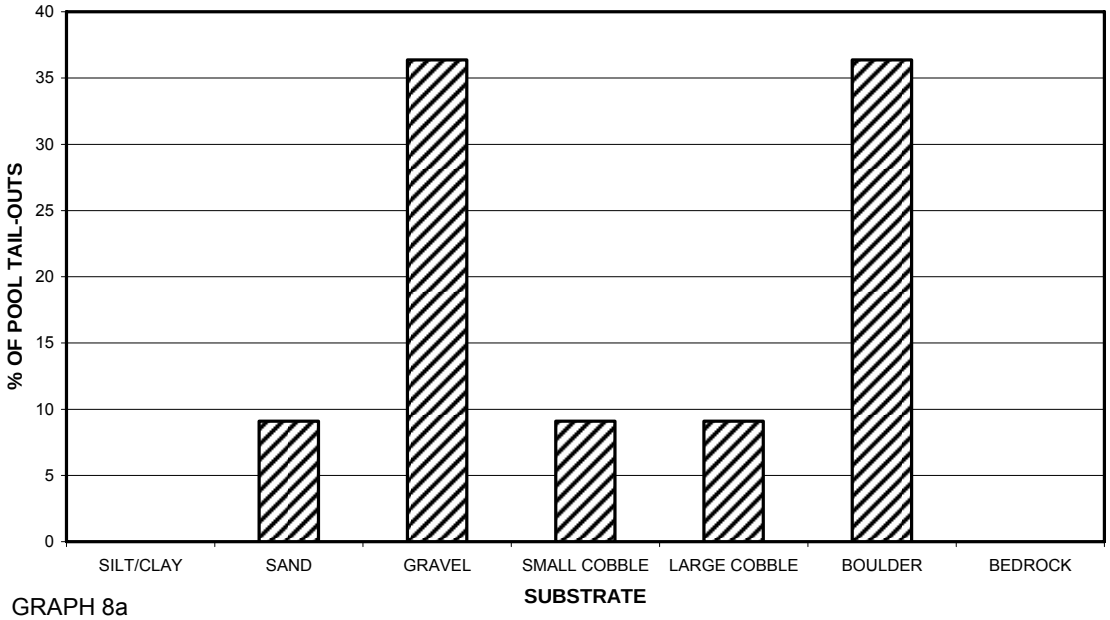
GRAPH 6a

FRASIER CREEK, TRIB 1 2000
MEAN PERCENT COVER TYPES IN POOLS



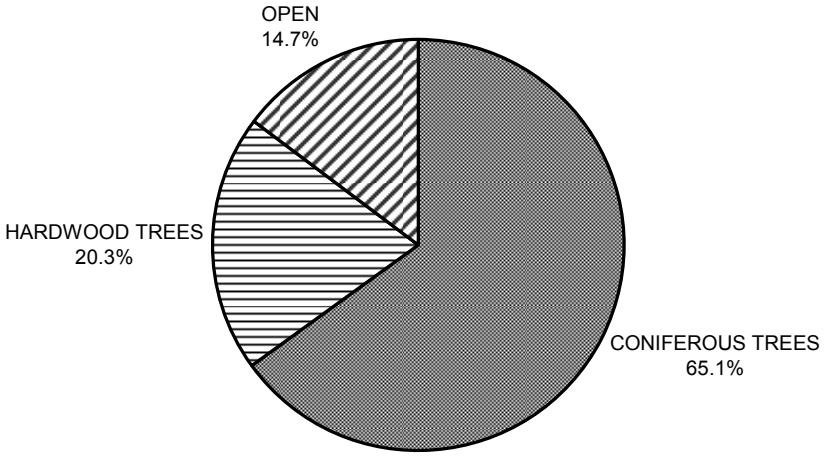
GRAPH 7a

FRASIER CREEK, TRIB 1 2000
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



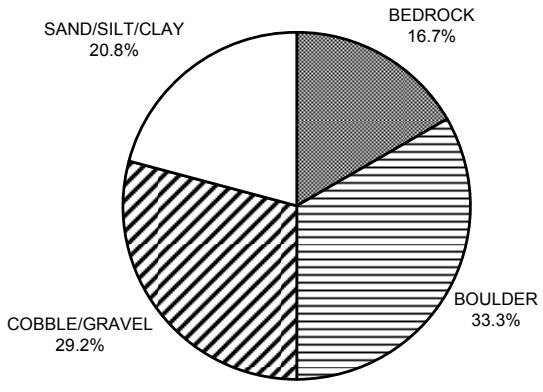
GRAPH 8a

FRASIER CREEK, TRIB 1 2000
MEAN PERCENT CANOPY



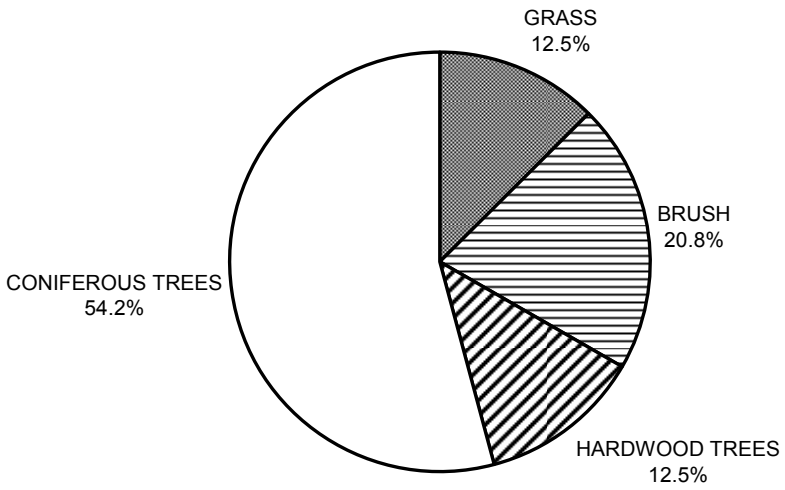
GRAPH 9a

FRASIER CREEK, TRIB 1 2000
DOMINANT BANK COMPOSITION



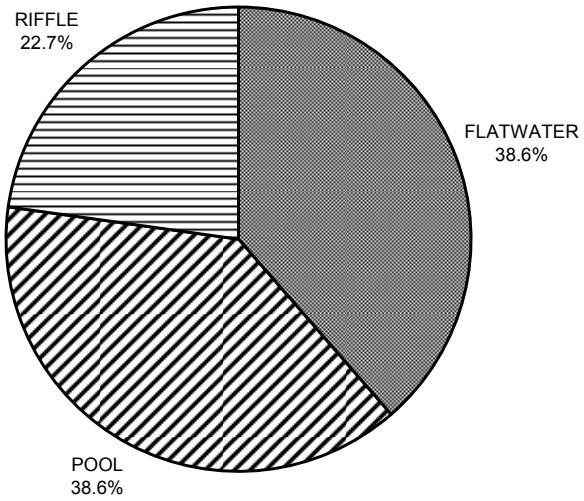
GRAPH 10a

FRASIER CREEK, TRIB 1 2000
DOMINANT BANK VEGETATION



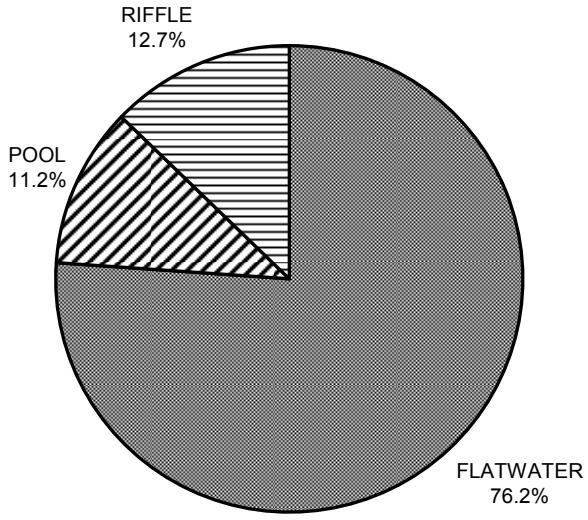
GRAPH 11a

FRASIER CREEK, TRIB 2 2000
HABITAT TYPES BY PERCENT OCCURRENCE



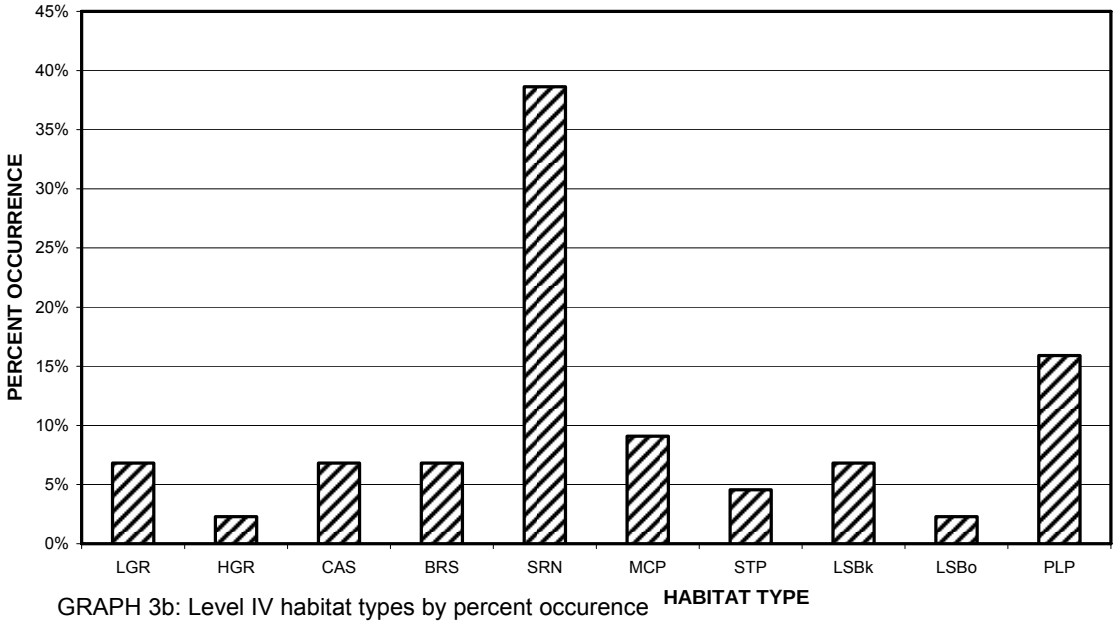
GRAPH 1b: Level II habitat types by percent occurence

FRASIER CREEK, TRIB 2 2000
HABITAT TYPES BY PERCENT TOTAL LENGTH



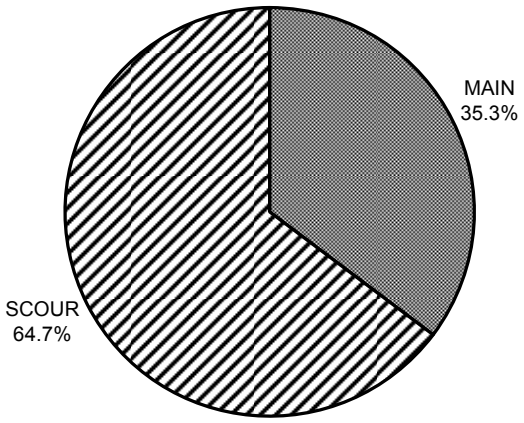
GRAPH 2b: Level II habitat types by percent total length

FRASIER CREEK, TRIB 2 2000
HABITAT TYPES BY PERCENT OCCURRENCE



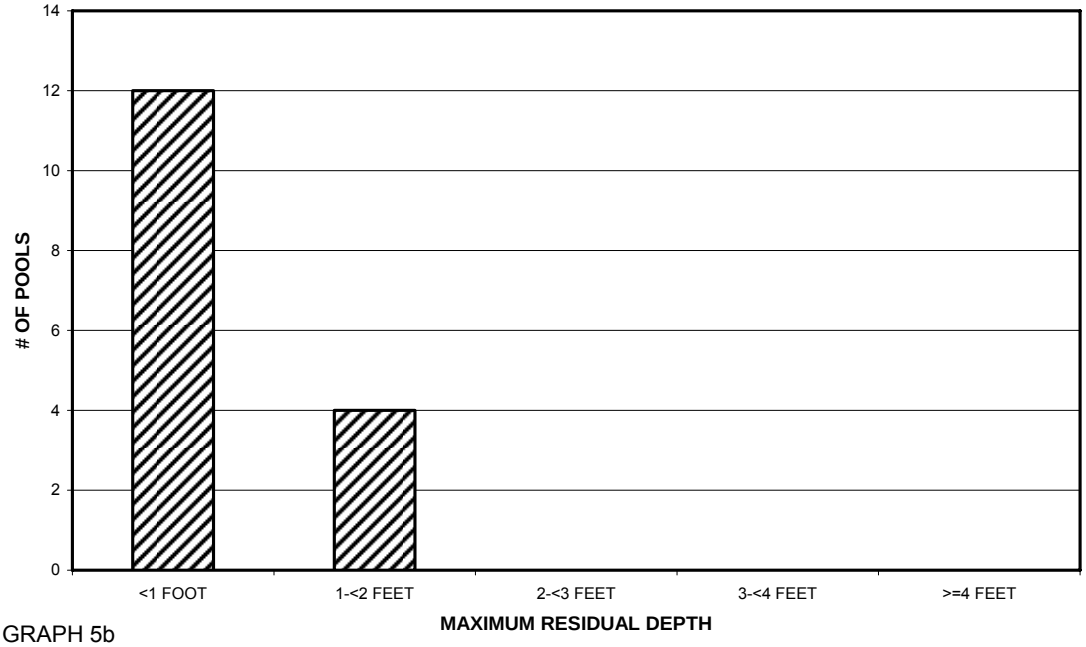
GRAPH 3b: Level IV habitat types by percent occurence

FRASIER CREEK, TRIB 2 2000
POOL TYPES BY PERCENT OCCURRENCE



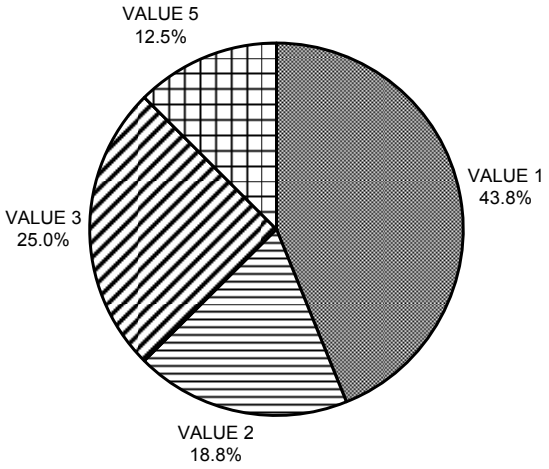
GRAPH 4b: Level I pool types by percent occurence

FRASIER CREEK, TRIB 2 2000
MAXIMUM DEPTH IN POOLS



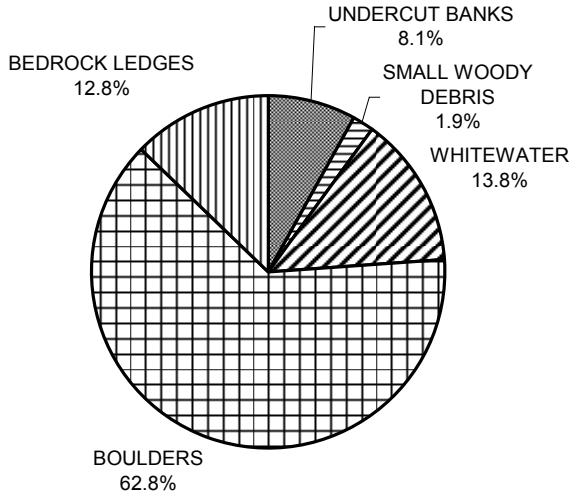
GRAPH 5b

FRASIER CREEK, TRIB 2 2000
PERCENT EMBEDDEDNESS



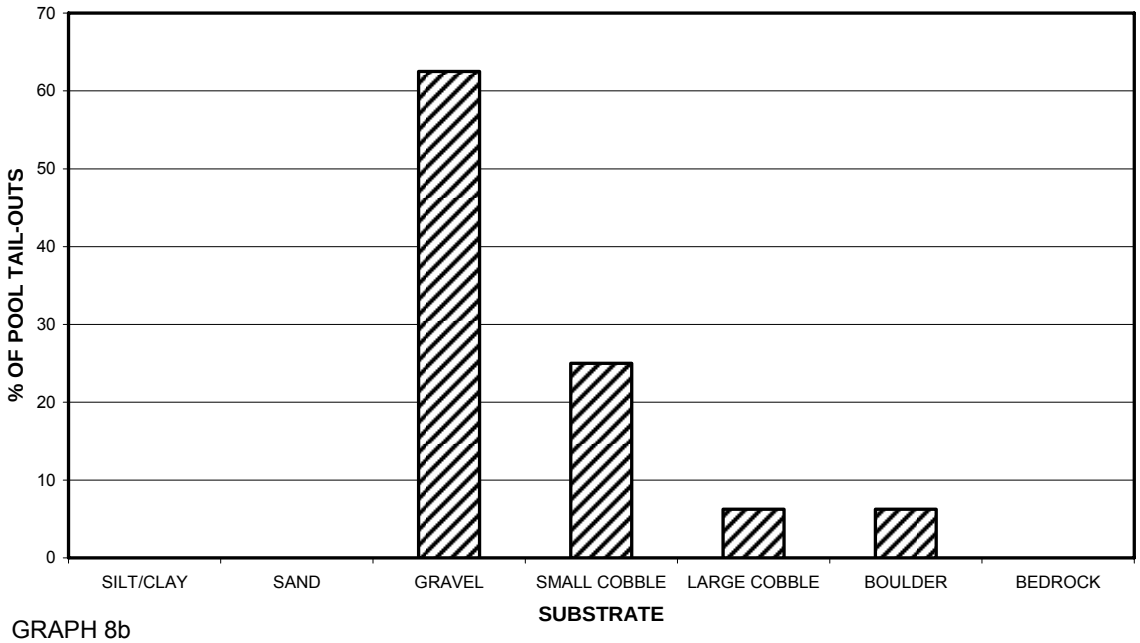
GRAPH 6b

FRASIER CREEK, TRIB 2 2000
MEAN PERCENT COVER TYPES IN POOLS



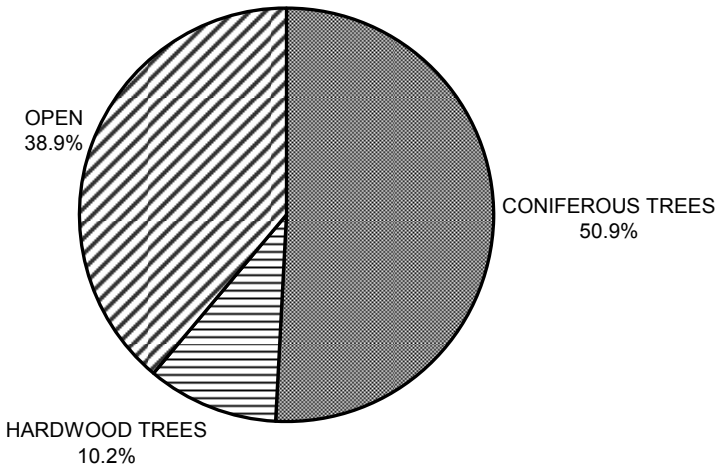
GRAPH 7b

FRASIER CREEK, TRIB 2 2000
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



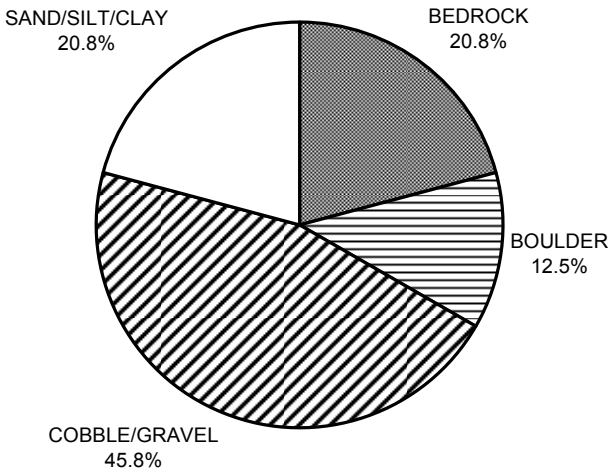
GRAPH 8b

FRASIER CREEK, TRIB 2 2000
MEAN PERCENT CANOPY



GRAPH 9b

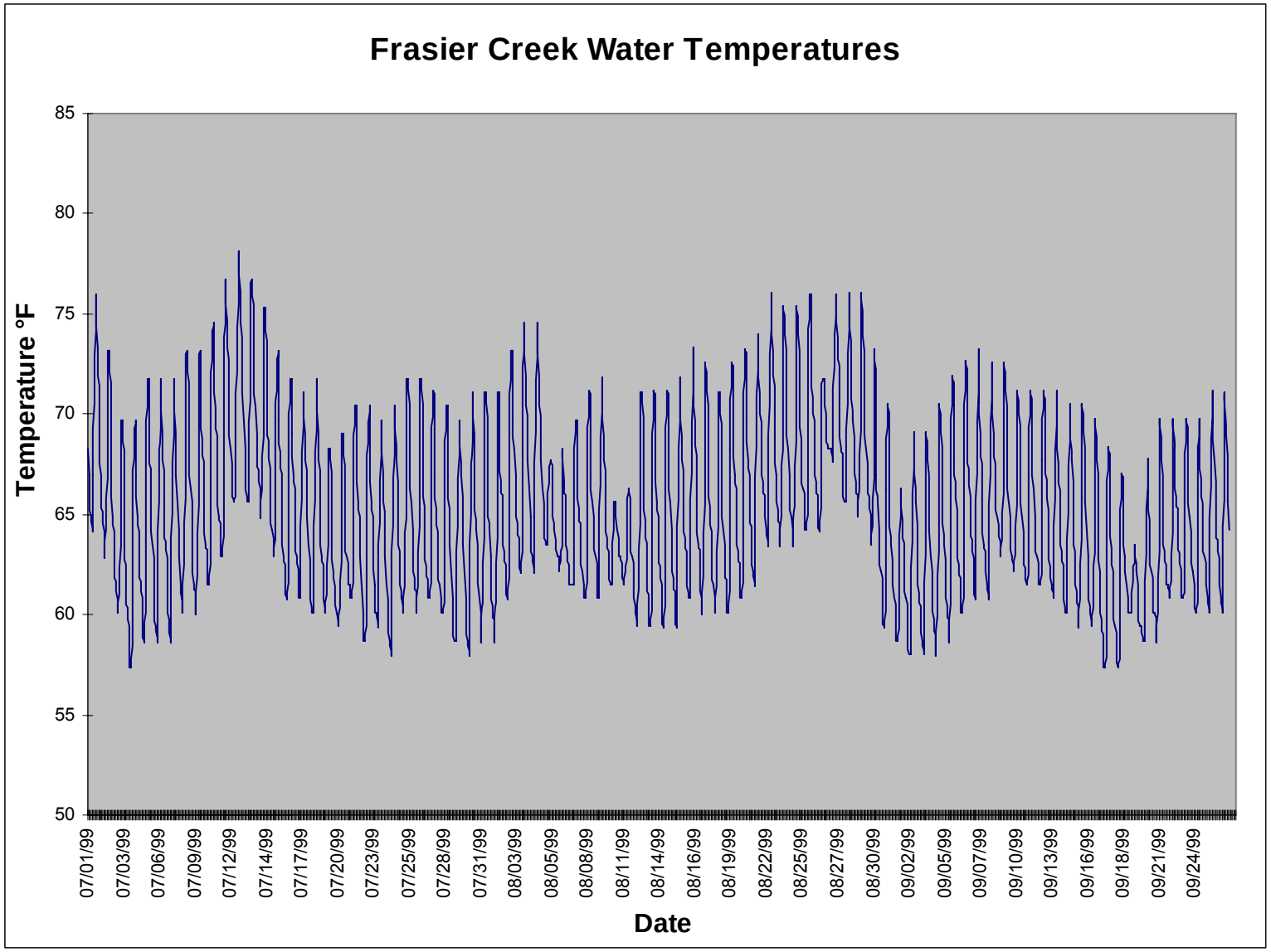
FRASIER CREEK, TRIB 2 2000
DOMINANT BANK COMPOSITION



GRAPH 10b

FRASIER CREEK, TRIB 2 2000
DOMINANT BANK VEGETATION

GRAPH 11b


Frasier Creek Water Temperatures
Temperature °F
85
80
75
70
65
60
55
50
07/01/99
07/03/99
07/06/99
07/09/99
07/12/99
07/14/99
07/17/99
07/20/99
07/23/99
07/25/99
07/28/99
07/31/99
08/03/99
08/05/99
08/08/99
08/11/99
08/14/99
08/16/99
08/19/99
08/22/99
08/25/99
08/27/99
08/30/99
09/02/99
09/05/99
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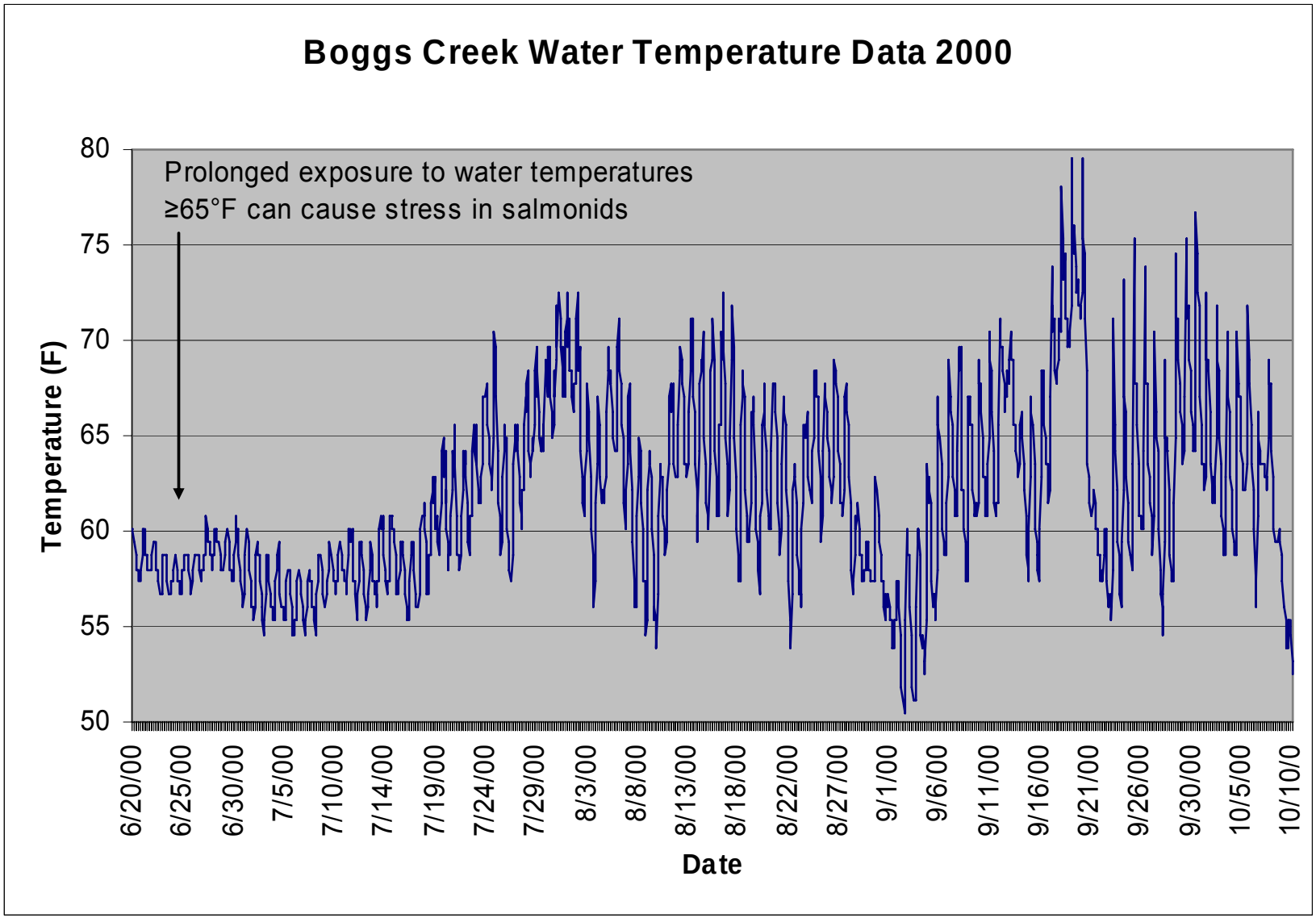
09/10/99
09/13/99
09/16/99
09/18/99
09/21/99
09/24/99
Date


Boggs Creek Water Temperature Data 2000
Prolonged exposure to water temperatures
≥65°F can cause stress in salmonids
Temperature (F)
80
75
70
65
60
55
50
6/20/00
6/25/00
6/30/00
7/5/00
7/10/00
7/14/00
7/19/00
7/24/00
7/29/00
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9/1/00
9/6/00
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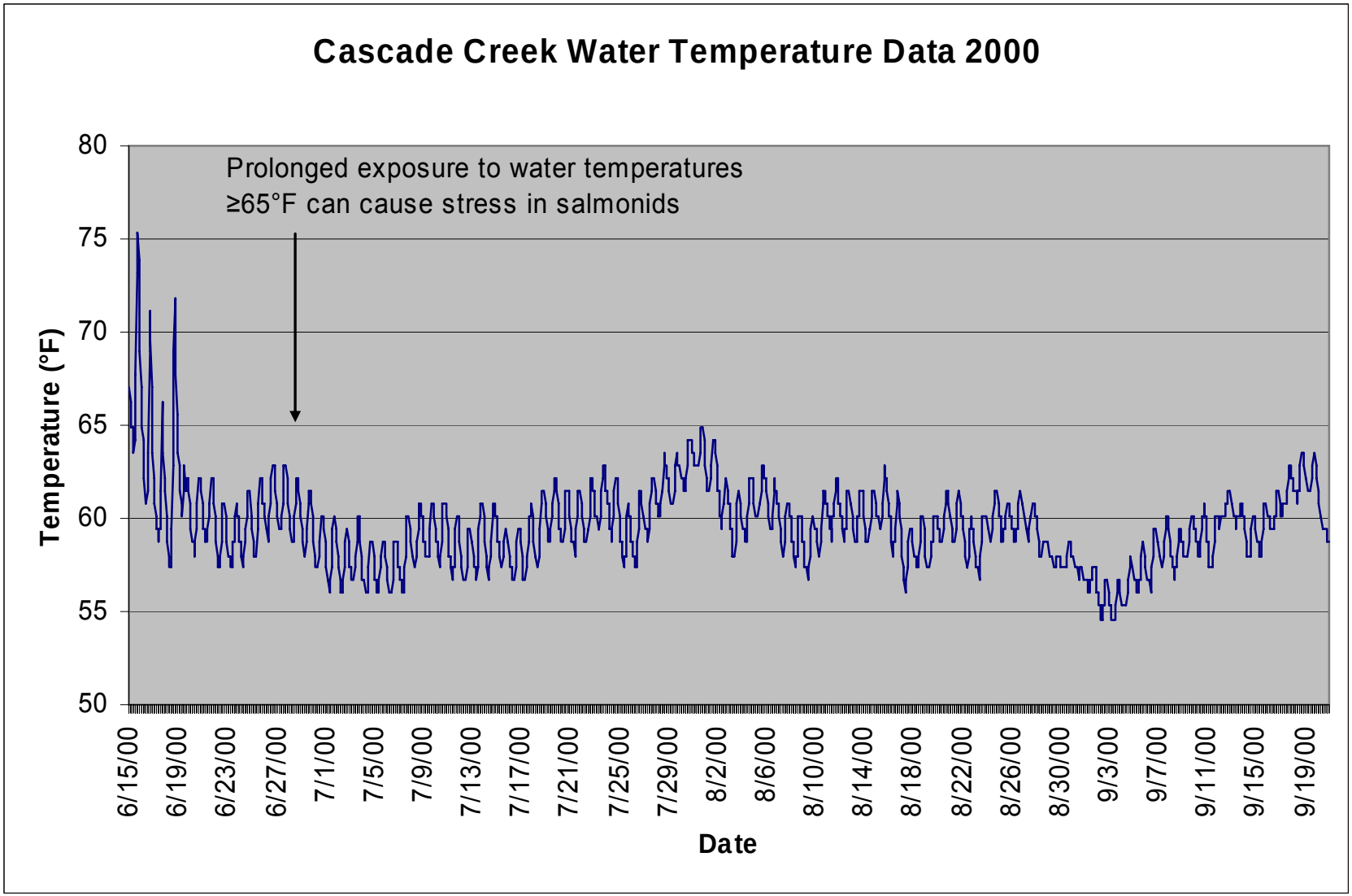
9/16/00
9/21/00
9/26/00
9/30/00
10/5/00
10/10/0
Date


Cascade Creek Water Temperature Data 2000
Prolonged exposure to water temperatures
≥65°F can cause stress in salmonids
Temperature (°F)
80
75
70
65
60
55
50
6/15/00
6/19/00
6/23/00
6/27/00
7/1/00
7/5/00
7/9/00
7/13/00
7/17/00
7/21/00
7/25/00
7/29/00
8/2/00
8/6/00
8/10/00
8/14/00
8/18/00
8/22/00
8/26/00
8/30/00
9/3/00
9/7/00
9/11/00
9/15/00
9/19/00
Date

Watershed Hydroid **418** Frasier Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	**LLId: (1:24k)**	**County:**
Frasier Creek	1229105388281	Mendocino/Sonom

Tributary to Big Sulphur Creek
Tributary to Russian River
Tributary to

Location: **T:** 11N **R:** 09W **S:** 6 **Latitude:** 38.8281261027088 **Longitude** 122.910516542223

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: 4 **Total Length:** 2.91 Miles 4.70 Km

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 987 Hectares; 2439 Acres; 3.81 sq. mi.

Elevations: Mouth: 715 feet; Headwaters: 2966 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.

Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): None

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	2438.7
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for owneship data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	**Hardwood:**	**Conifer:**	**Agriculture:**	**Urban:**
188.57 acres	1548.72	16.98	0.00	0.00
7.7 %	63.5 %	0.7 %	0.0 %	0.0 %

Shrub:	**Herbaceous:**	**Barren/rock:**	**Water:**
297.45	387.18	0.00	0.00
12.2 %	15.9 %	0.0 %	0.0 %

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

Watershed HydroId **418** Frasier Creek

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
ASTI	38122G8

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Ukiah	111431	Upper Russian River	0.14
Sulphur Creek	111426	Middle Russian River	99.86

Watershed Hydroid **419** Frasier Creek, Trib 1

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Frasier Creek, Trib 1	1229162388332	Mendocino/Sonom

Tributary to Frasier Creek
Tributary to Big Sulphur Creek
Tributary to Russian River

Location: **T:** 11N **R:** 10W **S:** 1 **Latitude:** 38.8332644300653 **Longitude** 122.916283775555

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: 2

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Total Length: 1.45 Miles / 2.34 Km

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 200 Hectares / 494 Acres / 0.77 sq. mi.

Elevations: Mouth: 830 feet; Headwaters: 2851 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.

Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): None

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	494.5
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for owneship data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
67.64 acres	273.82	0.00	0.00	0.00
13.7 %	55.4 %	0.0 %	0.0 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
84.63	67.95	0.00	0.00
17.1 %	13.7 %	0.0 %	0.0 %

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

Watershed HydroId **419** Frasier Creek, Trib 1

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
ASTI	38122G8

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Sulphur Creek	111426	Middle Russian River	100

Watershed Hydroid **420** Frasier Creek, Trib 2

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Frasier Creek, Trib 2	1229238388347	Mendocino/Sonom

Tributary to Frasier Creek
Tributary to Big Sulphur Creek
Tributary to Russian River

Location: **T:** 11N **R:** 10W **S:** 1 **Latitude:** 38.8347402929409 **Longitude** 122.923881884615

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: 3 **Total Length:** 1.84 Miles 2.96 Km

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 262 Hectares; 647 Acres; 1.01 sq. mi.

Elevations: Mouth: 994 feet; Headwaters: 2966 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.

Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): None

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	646.6
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for owneship data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
29.49 acres	422.85	0.00	0.00	0.00
4.5 %	65.3 %	0.0 %	0.0 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
103.16	91.73	0.00	0.00
15.9 %	14.2 %	0.0 %	0.0 %

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

Watershed HydroId **420** Frasier Creek, Trib 2

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
ASTI	38122G8

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Ukiah	111431	Upper Russian River	0.14
Sulphur Creek	111426	Middle Russian River	99.86