# California Department of Fish and Wildlife
# East Marin County
# San Francisco Bay Watersheds
# Stream Habitat Assessment Reports

# Fairfax Creek

*Surveyed 2009*

*Report Completed in 2013*

# STREAM INVENTORY REPORT

## Fairfax Creek

*Survey Completed Summer 2009*

## INTRODUCTION

A stream inventory was conducted during 7/29/2009 to 8/4/2009 on Fairfax Creek. The survey began at the confluence with San Anselmo Creek and extended upstream 2.9 miles.

The Fairfax Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Fairfax Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

## WATERSHED OVERVIEW

Fairfax Creek is a tributary to San Anselmo Creek, which is a tributary to Corte Madera Creek, which is a tributary to San Francisco Bay which flows into the Pacific Ocean located in Marin County, California (Map 1). Fairfax Creek's legal description at the confluence with San Anselmo Creek is T02N R07W S26. Its location is 37°59'7.9" north latitude and 122°35'24.7" west longitude, LLID number 1225841379862. Fairfax Creek is a second order stream and has approximately 5.5 miles of blue line stream within its catchment boundary according to the USGS National Hydrography Dataset (NHD). Fairfax Creek drains a watershed of approximately 3.64 square miles. Elevations range from about 92 feet at the mouth of the creek to 1,575 feet in the headwater areas. Mixed hardwood forest dominates the watershed. The watershed is primarily privately owned and land use is considered 79.5% natural and 20.5% urban. Vehicle access exists via Sir Francis Drake Blvd in Fairfax.

## METHODS

The habitat inventory conducted in Fairfax Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). This inventory was conducted by a two-person team.

## SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are fully measured. All other habitat unit types

encountered for the first time in each reach are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Fairfax Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Fairfax Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Fairfax Creek, embeddedness was

ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Fairfax Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Fairfax Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Fairfax Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

## BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Fairfax Creek. In addition, one site was electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum 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 Fairfax

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

## HABITAT INVENTORY RESULTS

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

The habitat inventory of 7/29/2009 to 8/4/2009, was conducted by C Bell, A Villalobos, and T Macias (WSP). The total length of the stream surveyed was 15,423 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter on 7/29/2009 but there was too little flow to make an accurate measurement.

Fairfax Creek is a F4 channel type for 14,853 feet of the stream surveyed (Reach 1), and a A4 channel type for 570 feet of the stream surveyed (Reach 2).

F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 66 degrees Fahrenheit. Air temperatures ranged from 58 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 22% culvert units, 23% riffle units, 31% flatwater units, 12% pool units and 12% dry units (Graph 1). Based on total length of Level II habitat types there were 9% culvert units, 16% riffle units, 28% flatwater units, 5% pool units and 42% dry units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 22% culvert units, 17% glide units, and 22% low gradient riffle units (Graph 3). Based on percent total length of level IV habitat types there were 13% glide units, 16% low gradient riffle units, and 42% dry units.

A total of 18 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 56%, and comprised 55% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Ten of the 16 pools (62%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 16 pool tail-outs measured, 3 had a value of 1 (18.8%); 7 had a value of 2 (43.8%); 3 had a value of 3 (18.8%); and 3 had a value of 4 (18.8%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 17 (Table 1). Of the pool types, the scour pools had a mean shelter rating of 16, main channel pools had a mean shelter rating of 18 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut Banks are the dominant cover types in Fairfax Creek. Graph 7 describes the pool cover in Fairfax Creek. Bedrock Ledges are the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Sand dominance was observed in 12% of pool tail-outs, and gravel dominance was observed in 88% of pool tail-outs.

The mean percent canopy density for the surveyed length of Fairfax Creek was 84%. The mean percentages of hardwood and coniferous trees were 98% and 2%, respectively. Sixteen percent of the canopy was open. Graph 9 describes the mean percent canopy in Fairfax Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 43%. The mean percent left bank vegetated was 50%. The dominant elements composing the structure of the stream banks consisted of 18% bedrock, 8% boulder, 75% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 59% of the units surveyed. Additionally, 33% of the units surveyed had brush as the dominant vegetation type, and 3% had grass as the dominant vegetation (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

One site was electrofished for species composition and distribution in Fairfax Creek on October 28, 2009. Water temperatures taken during the electrofishing period ranged from 58 to 59 degrees Fahrenheit. Air temperatures ranged from 61 to 72 degrees Fahrenheit. The sites were sampled by C Bell, T Macias, A Villalobos (WSP), and D Acomb and D Resnik (CDFW).

**Fairfax Creek 2009**

In reach 1, one site was sampled starting at the old bridge footing near the Fairfax fire station and extending several hundred feet upstream. The reach site yielded 102 California Roach and 6 sculpin.

The following chart displays the information yielded from these sites:

2009 Fairfax Creek e-fish observations

| Date | Site # | Reference Point | Distance From Reference Point (ft.) | Steelhead/ Rainbow Trout | | | Non Salmonids Name species |
|---|---|---|---|---|---|---|---|
| | | | | 0+ | 1+ | 2+ | |
| 10/28/2009 | 741 | Old bridge footing near fire station | N/A | 0 | 0 | 0 | 102 CA Roach, 6 Sculpin |

DISCUSSION

Fairfax Creek is an F4 channel type for 14,853 feet of the stream surveyed (Reach 1), and an A4 channel type for 570 feet of the stream surveyed (Reach 2). The suitability of F4 channel types for fish habitat improvement structures is as follows: Good for bank-placed boulders; Fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover; and Poor for boulder clusters. The suitability of A4 channel types for fish habitat improvement structures is as follows: Good for bank-placed boulders; Fair for plunge weirs, opposing wing deflectors, and log cover; and poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey days 7/29/2009 to 8/4/2009, ranged from 58 to 66 degrees Fahrenheit. Air temperatures ranged from 58 to 82 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 28% of the total length of this survey, riffles 16%, and pools 5%. Dry units comprised 42% of the total length. The pools are relatively deep, with 10 of the 16 (62%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of any

log debris accumulations (LDA's) in the stream.

Ten of the 16 pool tail-outs measured had embeddedness ratings of 1 or 2. Six of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Fairfax Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fourteen of the 16 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 17. The shelter rating in the flatwater habitats was 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Undercut Banks in Fairfax Creek. Bedrock Ledges are the dominant cover type in pools followed by undercut banks. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 84%. Reach 1 had a canopy density of 84.1%, Reach 2 had a canopy density of 93%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 43% and 50%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

## GENERAL RECOMMENDATIONS

Fairfax 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.

## RECOMMENDATIONS

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

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

3) Increase the canopy on Fairfax Creek, particularly in Reach 1, by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4) Access for migrating salmonids should be assessed at all road crossings and dams. Particular sites include all Dam sites in Reach 1, the Baywood Canyon Road Bridge and all other upper-watershed Private access Road Bridges, and the Bolinas Road culvert, Sir Francis Drake Road culvert, Shadow Creek Court Road culvert, the Baywood Canyon Road Culvert, and the associated Private Driveway Culvert located just upstream of the Shadow Creek Culvert. Other sites of interst include the large Police Department building in downtown Fairfax, which is spanning the stream channel near the confluence. All fish passage assessments should be done according to Part 9 of the California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1998). Where needed, crossings should be replaced or modified to improve fish passage.

5) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

6) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

7) Fairfax Creek would benefit from utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

COMMENTS AND LANDMARKS

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

| Position (ft.) | Habitat Unit # | Comments: |
|---|---|---|
| 0 | 0001.00 | Start of survey at the confluence with San Anselmo Creek and Fairfax Creek |
| 0 | 0001.00 | Culvert #1 is a single concrete box culvert in good condition, on Bolinas Road. The height is 6 ft, the width is 10 ft, the length is 453 ft, and the plunge height is 3.8 ft. The maximum depth within five feet of the outlet is 2.3 ft. The culvert is a possible barrier to juvenile and adult salmonids. |
| 548 | 0003.00 | Bridge #1 is a footbridge made of wood. The width is 14 ft, the height is 8 ft, and the length is 6 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 582 | 0005.00 | Bridge #2 is at the Fairfax Police Department buildings. It is made of concrete and wood. The width is 15 ft, the height is 8 ft, and the length is 32 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 658 | 0007.00 | Bridge #3 is a Fairfax footbridge made of wood. The width is 33 ft, the height is 9 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 663 | 0008.00 | Crayfish and roach were observed. |
| 1,381 | 0019.00 | Crayfish were observed. |
| 1,644 | 0020.00 | Bridge #4 is on Merwin Ave. It is made of concrete. The width is 18 ft, the height is 7 ft, and the length is 37 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 1,954 | 0025.00 | Bridge #5 is on Spruce Rd. It is made of concrete. The width is 17 ft, the height is 12 ft, and the length is 40 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 2,289 | 0030.00 | Bridge #6 is on Azalea Ave. It is made of concrete. The width is 15 ft, the height is 11 ft, and the length is 43 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 2,454 | 0032.00 | Bridge #7 is a footbridge made of wood and steel. The width is 17 ft, the height is 8 ft, and the length is 13 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |

**Fairfax Creek 2009**

| Position (ft.) | Habitat Unit # | Comments: |
|---|---|---|
| 2,683 | 0036.00 | Culvert #2 is a single concrete box culvert in good condition, on Scenic Road. The height is 11 ft, the width is 14 ft, the length is 45 ft, and the plunge height is 0 ft. The maximum depth within five feet of the outlet is 0.2 ft. The culvert slope unknown. The culvert is not likely a barrier to juvenile or adult salmonids. |
| 3,071 | 0044.00 | Tributary #1 on the right bank is a dry tributary which enters Fairfax Creek and is accessible to fish (we checked 10 ft up the tributary). The tributary ends at a 2 foot diameter concrete culvert with an unknown slope. No fish were observed. |
| 3,409 | 0048.00 | Bridge #8 is a footbridge made of wood. The width is 27 ft, the height is 11 ft, and the length is 6 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 3,442 | 0050.00 | Bridge #9 is a footbridge/driveway made of wood. The width is 36 ft, the height is 12 ft, and the length is 16 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 3,507 | 0052.00 | Culvert #3 is a single concrete box culvert in good condition, on Olema Road. The height is 10 ft, the width is 14 ft, the length is 40 ft, and the plunge height is 1 ft. The maximum depth within five feet of the outlet is 0.5 ft. The culvert slope is unknown. The culvert is not likely a barrier to juvenile or adult salmonids. |
| 3,547 | 0053.00 | On the right bank, there is a failing steel and wood bank stabilization that is falling into the creek. |
| 3,860 | 0056.00 | On the right bank, there is a failing metal and wood bank stabilization that is failing into the creek. |
| 4,259 | 0060.00 | Bridge #10 is a footbridge made of concrete and wood, on Marin Road. The footbridge is attached to the upstream edge of the road. The bridge width is 27 ft, the height is 8 ft, and the length is 40 ft. It is not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 5,945 | 0079.00 | Crayfish and possible salmonids were observed. |
| 6,184 | 0082.00 | Dam #1's length is 13 ft, the height is 10 ft, and the entire width is 15 ft. It is not a flashboard dam. There was down cutting occurring, and the height of the down cut is 9'. The sill to water level is 5 ft. The dam is retaining gravel and is a possible barrier to juvenile or adult salmonids. |
| 6,197 | 0083.00 | Salamanders were observed. |
| 6,547 | 0086.00 | Bridge #11 is a private footbridge made of wood and metal. The width is 21 ft, the height is 8 ft, and the length is 6 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 6,595 | 0088.00 | Bridge #12 is a private driveway made of concrete. The width is 21 ft, the height is 8 ft, and the length is 20 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |

**Fairfax Creek 2009**

| Position (ft.) | Habitat Unit # | Comments: |
|---|---|---|
| 7,804 | 0104.00 | Bridge #13 is a private footbridge made of wood. The width is 40 ft, the height is 9 ft, and the length is 6 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 8,166 | 0110.00 | Culvert #4 is a single corrugated metal culvert, on Sir Francis Drake Blvd. It is rusted with some holes and a rust line 2 ft high. The culvert height is 8 ft, the width is 8 ft, the length is 152 ft, the diameter is 8 ft, and the plunge height is 0 ft. The maximum depth within 5 ft of the outlet is 1.5 ft. The culvert slope is unknown. It is a possible barrier to juvenile or adult salmonids. |
| 8,476 | 0112.00 | Bridge #14 is a private footbridge made of wood. The width is 56 ft, the height is 12 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 8,481 | 0113.00 | Tributary #1 on the left bank enters Fairfax Creek. The Discharge is <1 cubic feet per second (cfs). It contributes an estimated 100% of its flow to the stream. The water temperature downstream of the tributary is 64F, the tributary is 64F, and upstream of the tributary is dry. The tributary is not accessible to fish. The slope is unknown. There were no fish observed while we were there. |
| 8,754 | 0115.00 | Dam #2 is home made and not a flashboard dam. The length is 3 ft, the height is 1.5 ft, and the entire width is 17 ft. It was not retaining gravel or down cutting. The dam is a possible barrier to juvenile and adult salmonids. |
| 8,796 | 0117.00 | Dam #3 is home made and not a flashboard dam. The length is 2 ft, the height is 3 ft, and the entire width is 20 ft. It was retaining gravel but not down cutting. The dam is a possible barrier to juvenile and adult salmonids. |
| 8,798 | 0118.00 | Tributary #2 on the left bank is a dry tributary which enters Fairfax Creek and is accessible to fish (we checked 30 ft up the tributary). The slope is unknown. No fish were observed while we were there. |
| 9,420 | 0119.00 | Culvert #5 is a single concrete pipe culvert is good condition, on Shadow Creek Ct. near a school. The height is 8 ft, the width is 8 ft, the length is 33 ft, and the diameter is 8 ft. The plunge height not applicable, because it was dry. The culvert slope is unknown. It poses a possible barrier to juvenile and adult salmonids. |
| 9,794 | 0121.00 | Culvert #6 is a single concrete culvert in good condition, on an unknown private road. The height is 8 ft, the width is 12 ft, and the length is 46 ft. The plunge height is not applicable, because it was dry. The maximum depth within 5 ft of the outlet is 1.5 ft. The culvert slope is unknown. It poses a possible barrier to juvenile, but not adult salmonids. |

**Fairfax Creek 2009**

| Position (ft.) | Habitat Unit # | Comments: |
|---|---|---|
| 9,850 | 0123.00 | Dam #4 is not a flashboard dam. The length is 2 ft, the height is 5 ft, and the entire width is 10 ft. Down cutting is occurring with the height of the down cut at 4 ft. The dam is also retaining gravel. It poses a possible barrier to juvenile and adult salmonids. It is 15 ft upstream from Culvert #6. |
| 10,155 | 0125.00 | Dam #5 is a flashboard dam with the boards not installed. The length is 10 ft, the height is 4 ft, the entire width is 22 ft, and the flashboard width is 11 ft. Down cutting is occurring with the height of the down cut at 2 ft. The dam is also retaining gravel. It poses a possible barrier to juvenile and adult salmonids. |
| 10,165 | 0126.00 | Tributary #2 on the right bank is a dry tributary which enters Fairfax Creek 600 ft into the unit and is accessible to fish (we checked 35 ft up the tributary). The slope is unknown. No fish were observed while we were there |
| 10,916 | 0127.00 | Bridge #15 is a private driveway made of steel. The width is 36 ft, the height 8 ft, and the length is 26 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to fish. |
| 11,078 | 0129.00 | We encountered a culvert dissolving into the stream on the left bank. |
| 11,078 | 0129.00 | Dam #6 is not a flashboard dam. The length is 25 ft, the height is 1 ft, and the entire width is 37 ft. Down cutting is occurring with the height of the down cut at 2 ft. The dam is also retaining gravel. It poses a possible barrier to juvenile and adult salmonids. |
| 11,101 | 0130.00 | Tributary #3 on the right bank is a dry tributary which enters Fairfax Creek and is accessible to fish (we checked 200 ft up the tributary). The slope is unknown. No fish were observed while we were there. |
| 12,096 | 0131.00 | Bridge #16 is made of concrete on a private road. The width is 8 ft, the height is 6 ft, and the length 40 ft. The bridge is retaining gravel but not down cutting. It is not a barrier to fish. |
| 13,242 | 0133.00 | Bridge #17 is made of concrete on Baywood Canyon Road. The width is 16 ft, the height is 6 ft, and the length is 35 ft. The bridge is retaining gravel but not down cutting. It is not a barrier to fish. |
| 13,735 | 0135.00 | Bridge #18 is a private driveway made of concrete. The width is 16 ft, the height is 6 ft, and the length is 45 ft. The bridge is retaining gravel but not down cutting. It is not a barrier to fish. |
| 14,292 | 0137.00 | Bridge #19 is a private driveway made of concrete. The width is 16 ft, the height is 6 ft, and the length is 19 ft. The bridge is retaining gravel but not down cutting. It poses a possible barrier to salmonids. |
| 14,311 | 0138.00 | Riprap four feet high spans the stream channel and is located twelve feet into the unit. |

**Fairfax Creek 2009**

| Position (ft.) | Habitat Unit # | Comments: |
|---|---|---|
| 14,878 | 0141.00 | Water was flowing out of the left bank between the lower greywacke and upper poorly sorted angular clast. The soil is dominated by silt and sand. |
| 14,904 | 0142.00 | Tributary #3 on the left bank is a dry tributary which enters Fairfax Creek. |
| 15,291 | 0143.00 | Culvert #7 is a single oval corrugated metal pipe arch culvert in fair condition. The rust line height is 0.4 ft. The culvert height is 11 ft, the width is 10 ft, and the length is 100 ft. The slope is estimated at 10%. The culvert is a possible barrier to juvenile and adult salmonids. |
| 15,423 | 0144.00 | End of survey at a four step greywacke cascade about 100 ft long and 90 ft high. Cascade unit could be a potential barrier to salmonid fish passage. |

REFERENCES

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

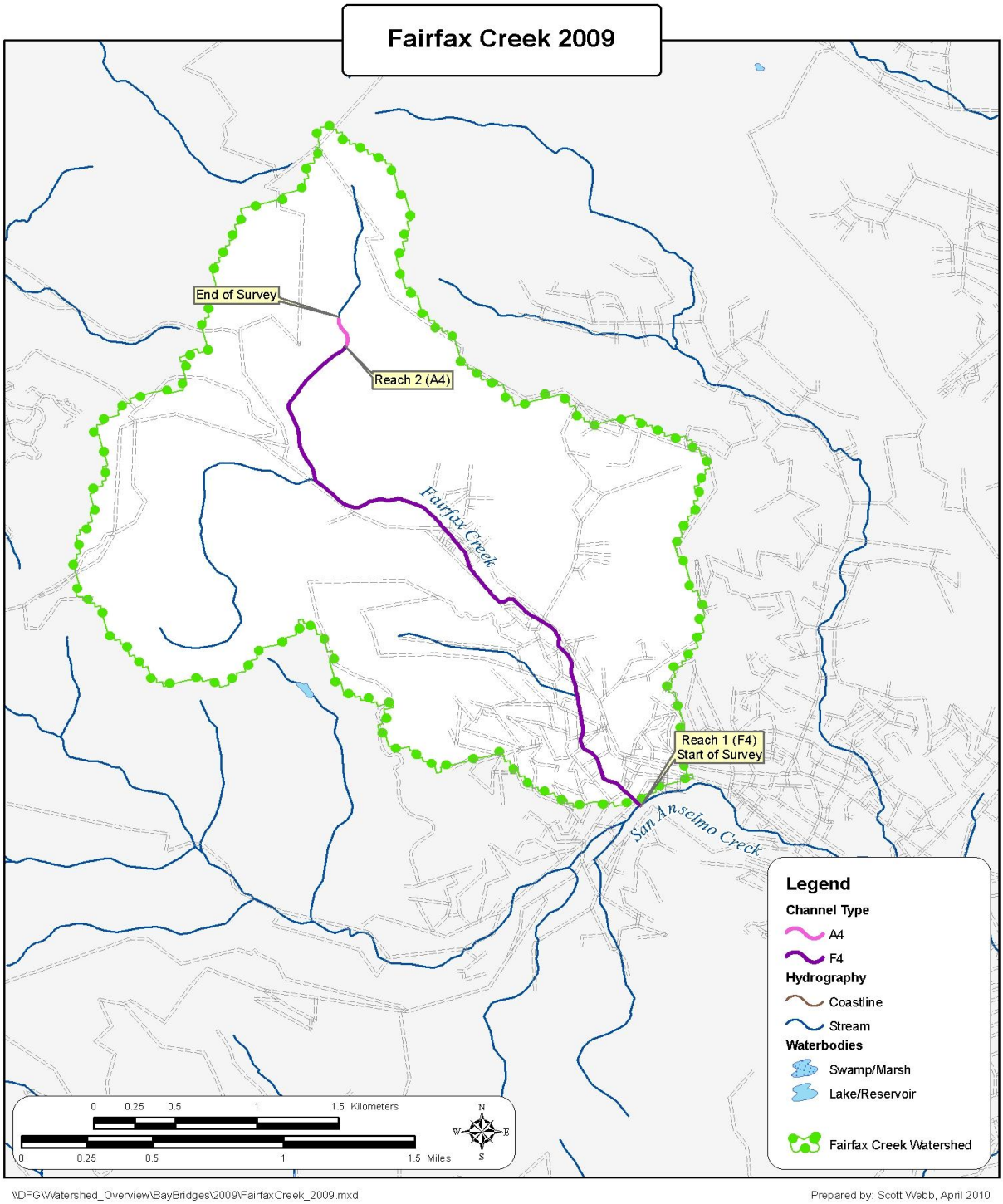
McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.

Rosgen, D.L., 1994. A Classification of Natural Rivers. Catena, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

LEVEL III and LEVEL IV HABITAT TYPES

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

**Fairfax Creek 2009**



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

**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location:** **Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 0 | CULVERT | 22.2 | 42 | 1357 | 8.8 | | | | | | | | | 0 |
| 17 | 0 | DRY | 11.8 | 380 | 6468 | 41.9 | | | | | | | | | |
| 44 | 44 | FLATWATER | 30.6 | 98 | 4314 | 28.0 | 6.8 | 0.5 | 1.2 | 644 | 28333 | 351 | 15432 | | 6 |
| 18 | 18 | POOL | 12.5 | 42 | 757 | 4.9 | 11.2 | 0.9 | 2.2 | 475 | 8558 | 527 | 8430 | 449 | 17 |
| 33 | 33 | RIFFLE | 22.9 | 77 | 2527 | 16.4 | 6.6 | 0.2 | 0.4 | 348 | 11494 | 59 | 1962 | | 0 |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|---|---|---|---|---|
| 144 | 95 | 15423 | 48386 | 25824 |

## Fairfax Creek 2009

## Table 2 - Summary of Habitat Types and Measured Parameters

**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

| 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 | Mean Canopy (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 31 | LGR | 21.5 | 78 | 2404 | 15.6 | 7.0 | 0.2 | 1.2 | 359 | 11125 | 62 | 1925 | | 0 | 87 |
| 2 | 2 | BRS | 1.4 | 62 | 123 | 0.8 | 3.0 | 0.1 | 0.1 | 185 | 369 | 18 | 37 | | 0 | |
| 3 | 3 | POW | 2.1 | 76 | 229 | 1.5 | 5.0 | 0.5 | 1.0 | 330 | 989 | 154 | 461 | | 0 | 91 |
| 24 | 24 | GLD | 16.7 | 81 | 1946 | 12.6 | 8.0 | 0.6 | 2.4 | 668 | 16021 | 391 | 9381 | | 6 | 84 |
| 7 | 7 | RUN | 4.9 | 107 | 748 | 4.8 | 5.0 | 0.5 | 2.2 | 642 | 4492 | 436 | 3051 | | 14 | 70 |
| 10 | 10 | SRN | 6.9 | 139 | 1391 | 9.0 | 5.0 | 0.4 | 2.5 | 683 | 6831 | 254 | 2539 | | 4 | 90 |
| 10 | 10 | MCP | 6.9 | 42 | 416 | 2.7 | 11.0 | 1.0 | 3.2 | 498 | 4980 | 616 | 5546 | 540 | 18 | 79 |
| 4 | 4 | LSR | 2.8 | 48 | 193 | 1.3 | 9.0 | 0.6 | 2.0 | 457 | 1829 | 435 | 1306 | 353 | 22 | 85 |
| 3 | 3 | LSBk | 2.1 | 44 | 133 | 0.9 | 10.0 | 0.8 | 2.4 | 473 | 1419 | 449 | 1347 | 370 | 13 | 84 |
| 1 | 1 | PLP | 0.7 | 15 | 15 | 0.1 | 22.0 | 0.5 | 1.5 | 330 | 330 | 231 | 231 | 165 | 5 | 65 |
| 17 | 0 | DRY | 11.8 | 380 | 6468 | 41.9 | | | | | | | | | | 97 |
| 32 | 0 | CUL | 22.2 | 42 | 1357 | 8.8 | | | | | | | | | 0 | |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume |
|---|---|---|---|---|
| 144 | 95 | 15423 | 48386 | 25824 |

## Table 3 - Summary of Pool Habitat Types

**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location:** **Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 10 | MAIN | 56 | 42 | 416 | 55 | 11.4 | 1.0 | 498 | 4980 | 540 | 4856 | 18 |
| 8 | 8 | SCOUR | 44 | 43 | 341 | 45 | 11.0 | 0.7 | 447 | 3578 | 333 | 2333 | 16 |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|---|---|---|---|---|
| 18 | 18 | 757 | 8558 | 7190 |

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

**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

| 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 Occurence | 3 < 4 Feet Maximum Residual Depth | 3 < 4 Feet Percent Occurrence | >= 4 Feet Maximum Residual Depth | >= 4 Feet Percent Occurrence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | MCP | 56 | 0 | 0 | 2 | 22 | 6 | 67 | 1 | 11 | 0 | 0 |
| 3 | LSR | 19 | 0 | 0 | 2 | 67 | 1 | 33 | 0 | 0 | 0 | 0 |
| 3 | LSBk | 19 | 0 | 0 | 1 | 33 | 2 | 67 | 0 | 0 | 0 | 0 |
| 1 | PLP | 6 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

| Total Units | Total < 1 Foot Max Resid. Depth | Total < 1 Foot % Occurrence | Total 1< 2 Feet Max Resid. Depth | Total 1< 2 Feet % Occurrence | Total 2< 3 Feet Max Resid. Depth | Total 2< 3 Feet % Occurrence | Total 3< 4 Feet Max Resid. Depth | Total 3< 4 Feet % Occurrence | Total >= 4 Feet Max Resid. Depth | Total >= 4 Feet % Occurrence |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0 | 0 | 6 | 38 | 9 | 56 | 1 | 6 | 0 | 0 |

Mean Maximum Residual Pool Depth (ft.): 2

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

**Stream Name:** Fairfax Creek **Dry Units:** 17 **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

## Fairfax Creek 2009

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 31 | LGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 2 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 33 | TOTAL RIFFLE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | |
| 3 | 3 | POW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 24 | GLD | 14 | 0 | 0 | 7 | 0 | 0 | 0 | 13 | 0 |
| 7 | 7 | RUN | 23 | 0 | 0 | 0 | 13 | 7 | 0 | 6 | 9 |
| 10 | 10 | SRN | 5 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 10 |
| 44 | 44 | TOTAL FLAT | 13 | 0 | 0 | 5 | 2 | 1 | 0 | 8 | 4 |
| | | | | | | | | | | | |
| 10 | 10 | MCP | 26 | 5 | 0 | 15 | 15 | 0 | 0 | 9 | 20 |
| 4 | 3 | LSR | 37 | 0 | 0 | 30 | 0 | 0 | 0 | 33 | 0 |
| 3 | 3 | LSBk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 1 | 1 | PLP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 18 | 17 | TOTAL POOL | 22 | 3 | 0 | 14 | 9 | 0 | 0 | 11 | 35 |
| | | | | | | | | | | | |
| 32 | 1 | CUL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 144 | 95 | TOTAL | 10 | 1 | 0 | 5 | 3 | 1 | 0 | 6 | 8 |

**Fairfax Creek 2009**

## Table 6 - Summary of Dominant Substrates By Habitat Type

**Stream Name:** Fairfax Creek **Dry Units:** 17 **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location:** **Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 31 | 31 | LGR | 0 | 26 | 48 | 23 | 3 | 0 | 0 |
| 2 | 2 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 3 | 3 | POW | 0 | 100 | 0 | 0 | 0 | 0 | 0 |
| 24 | 24 | GLD | 4 | 21 | 71 | 4 | 0 | 0 | 0 |
| 7 | 7 | RUN | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 10 | 10 | SRN | 0 | 0 | 90 | 0 | 0 | 0 | 10 |
| 10 | 10 | MCP | 0 | 40 | 60 | 0 | 0 | 0 | 0 |
| 4 | 4 | LSR | 0 | 50 | 50 | 0 | 0 | 0 | 0 |
| 3 | 3 | LSBk | 0 | 33 | 67 | 0 | 0 | 0 | 0 |
| 1 | 1 | PLP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 32 | 0 | CUL | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Fairfax Creek 2009

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

**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location:** **Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Hardwood | Mean Percent Open Units | Mean Right Bank % Cover | Mean Left Bank % Cover |
|---|---|---|---|---|---|
| 84 | 2 | 98 | 0 | 43 | 50 |

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.

# Fairfax Creek 2009

## Table 8 - Fish Habitat Inventory Data Summary

Stream Fairfax Creek LLID: 1225841379862 Drainage San Rafael

Survey Dates: 7/29/2009 to 8/4/2009 Survey Length (ft.): 15423 Main Channel (ft.): 15423 Side Channel (ft.): 0

Confluence Location: Quad SAN RAFAEL Legal Description: T02NR07WS26 Latitude: 37:59:10.0N Longitude: 122:35:03.0W

### Summary of Fish Habitat Elements By Stream Reach

**STREAM REACH: 1**

Channel Type: F4
Reach Length (ft.): 14853
Riffle/Flatwater Mean Width (ft.): 6.8
BFW:
Range (ft.): 9.00 to 37.00
Mean (ft.): 17.41
Std. Dev.: 6.63
Base Flow (cfs): na
Water (F): 58 - 66 Air (F): 58 - 82
Dry Channel (ft.): 6035

Canopy Density (%): 84.1
Coniferous Component (%): 2.4
Hardwood Component 97.6
Dominant Bank Hardwood Trees
Vegetative Cover (%): 47.1
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length 5.1
Pool Frequency (%): 13.0
Residual Pool Depth (%):
< 2 Feet Deep: 37.5
2 to 2.9 Feet Deep: 56.3
3 to 3.9 Feet Deep: 6.3
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 2.18
Mean Pool Shelter 17

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 12.5 Gravel: 87.5 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 18.8 2. 43.8 3. 18.8 4. 18.8 5. 0.0

**STREAM REACH: 2**

Channel Type: A4
Reach Length (ft.): 570
Riffle/Flatwater Mean Width (ft.): 3.0
BFW:
Range (ft.): 11.00 to 11.00
Mean (ft.): 11.00
Std. Dev.: 0.00
Base Flow (cfs): na
Water (F): 0 - 60 Air (F): 58 - 77
Dry Channel (ft.): 433

Canopy Density (%): 93.0
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Brush
Vegetative Cover (%): 26.3
Dominant
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat: 0

Pools by Stream Length 0.0
Pool Frequency (%): 0.0
Residual Pool Depth (%):
< 2 Feet Deep:
2 to 2.9 Feet Deep:
3 to 3.9 Feet Deep:
>= 4 Feet Deep:
Mean Max Residual Pool Depth
Mean Pool Shelter

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

## Table 9 -Mean Percentage of Dominant Substrate and Vegetation

**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location:** **Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

### Mean Percentage of Dominant Stream Bank Substrate

| Dominant Class of Substrate | Number of Units Right Bank | Number of Units Left Bank | Total Mean Percentage (%) |
|---|---|---|---|
| Bedrock | 19 | 15 | 17.5 |
| Boulder | 10 | 5 | 7.7 |
| Cobble/Gravel | 0 | 0 | 0.0 |
| Sand/Silt/Clay | 68 | 77 | 74.7 |

### Mean Percentage of Dominant Stream Bank Vegetation

| Dominant Class of Vegetation | Number of Units Right Bank | Number of Units Left Bank | Total Mean Percentage |
|---|---|---|---|
| Grass | 3 | 3 | 3.1 |
| Brush | 27 | 37 | 33.0 |
| Hardwood | 58 | 57 | 59.3 |
| Coniferous | 2 | 0 | 1.0 |
| No Vegetation | 7 | 0 | 3.6 |

**Total Stream Cobble Embeddedness Values:** 2

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

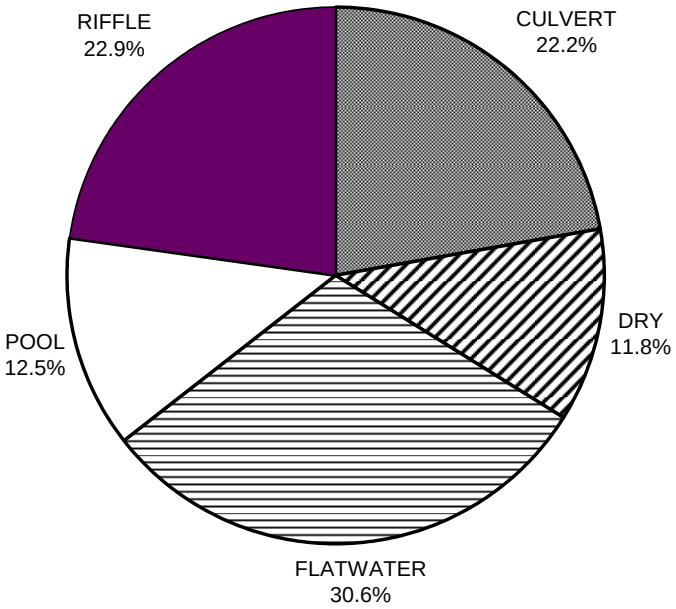
**Stream Name:** Fairfax Creek **LLID:** 1225841379862 **Drainage:** San Rafael

**Survey** 7/29/2009 to 8/4/2009

**Confluence Location:** **Quad:** SAN RAFAEL **Legal Description:** T02NR07WS26 **Latitude:** 37:59:10.0N **Longitude:** 122:35:03.0W

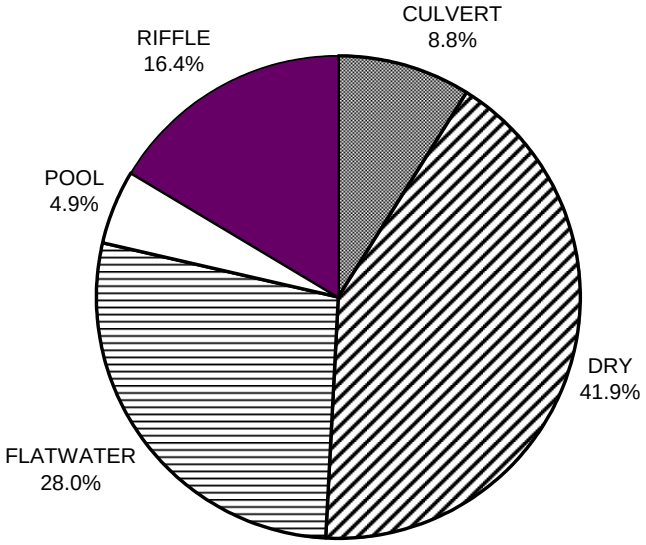
| | Riffles | Flatwater | Pools |
|---|---|---|---|
| UNDERCUT BANKS (%) | 0 | 13 | 22 |
| SMALL WOODY DEBRIS (%) | 0 | 0 | 3 |
| LARGE WOODY DEBRIS (%) | 0 | 0 | 0 |
| ROOT MASS (%) | 0 | 5 | 14 |
| TERRESTRIAL VEGETATION | 0 | 2 | 9 |
| AQUATIC VEGETATION (%) | 0 | 1 | 0 |
| WHITEWATER (%) | 0 | 0 | 0 |
| BOULDERS (%) | 0 | 8 | 11 |
| BEDROCK LEDGES (%) | 0 | 4 | 35 |

## FAIRFAX CREEK 2009
## HABITAT TYPES BY PERCENT OCCURRENCE



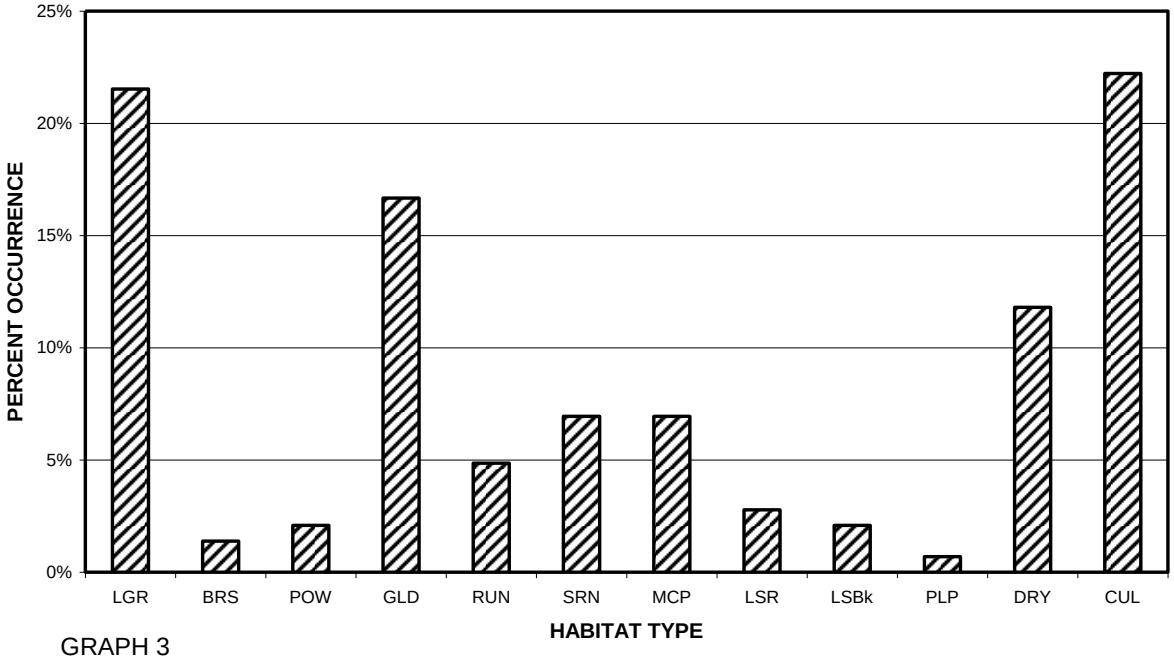

GRAPH 1

## FAIRFAX CREEK 2009
## HABITAT TYPES BY PERCENT TOTAL LENGTH



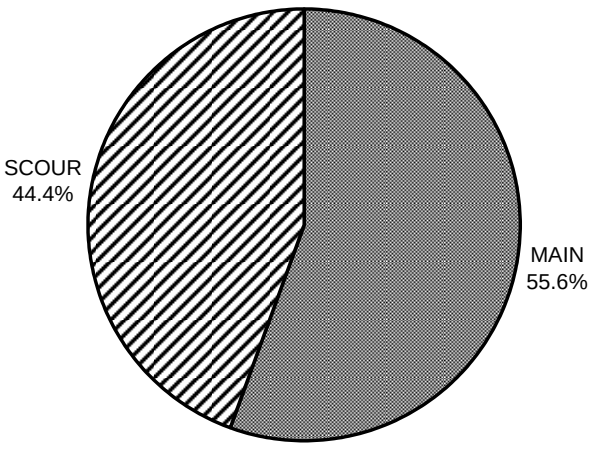

GRAPH 2

## FAIRFAX CREEK 2009
## HABITAT TYPES BY PERCENT OCCURRENCE

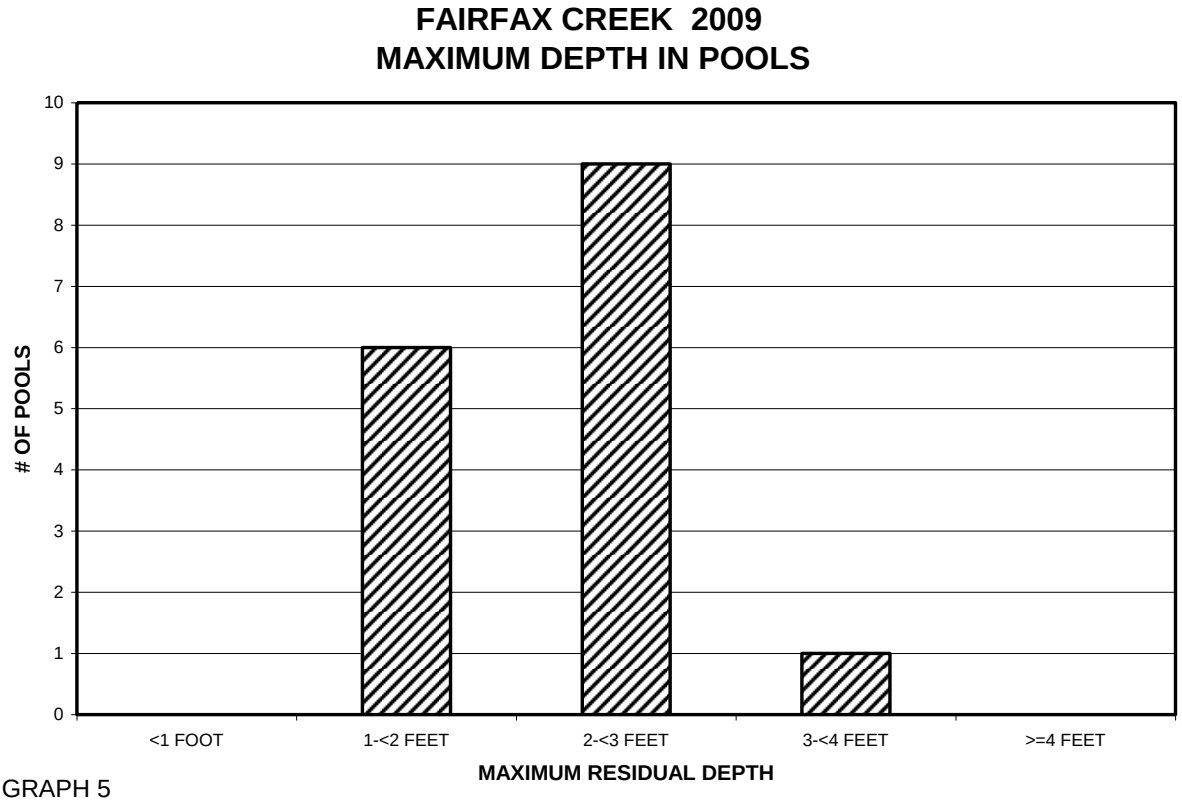



GRAPH 3

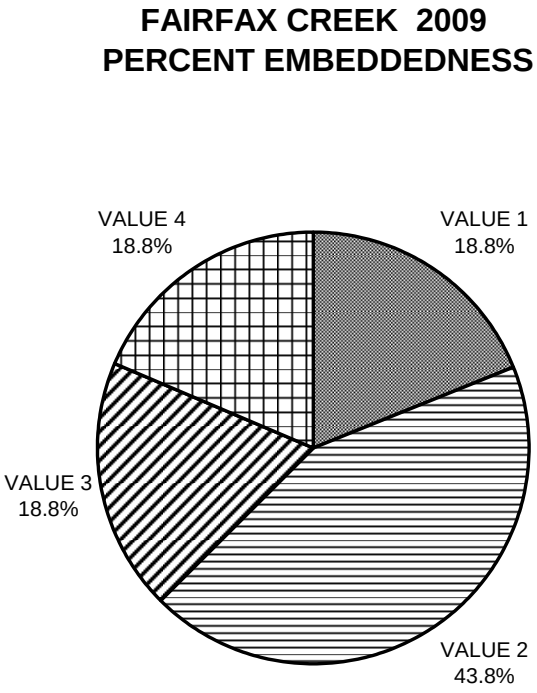
## FAIRFAX CREEK 2009
## POOL TYPES BY PERCENT OCCURRENCE




GRAPH 4

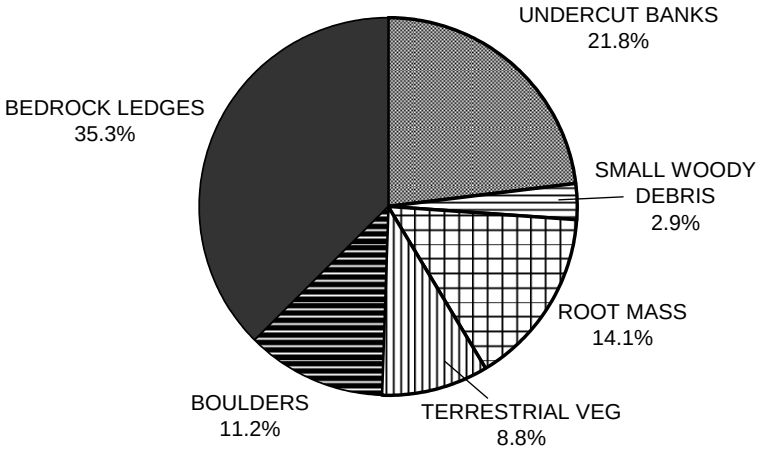



GRAPH 5



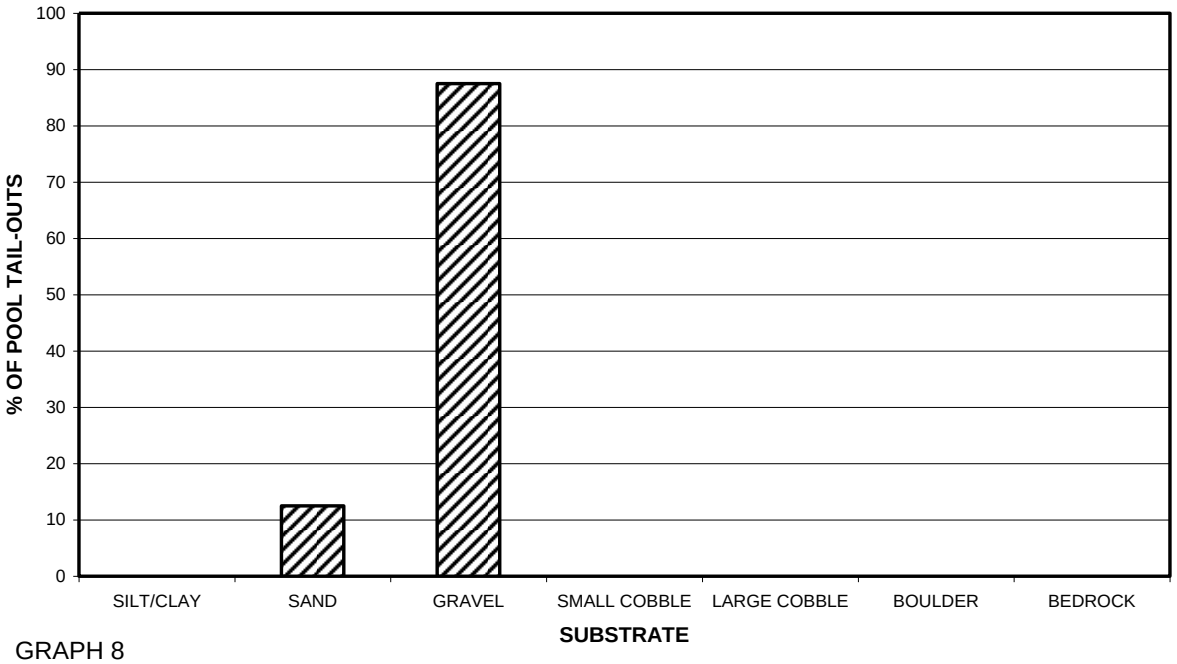

GRAPH 6

## FAIRFAX CREEK 2009
## MEAN PERCENT COVER TYPES IN POOLS



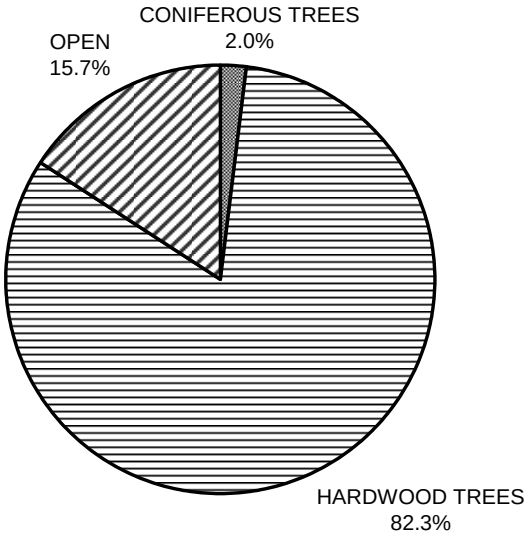

GRAPH 7

## FAIRFAX CREEK 2009
## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



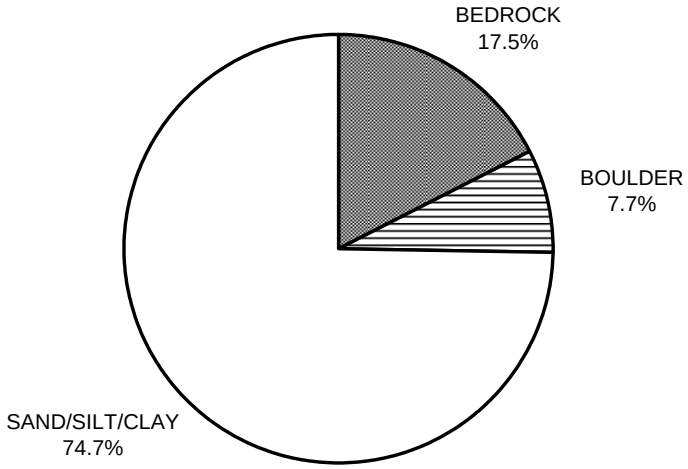

GRAPH 8

## FAIRFAX CREEK 2009
## MEAN PERCENT CANOPY



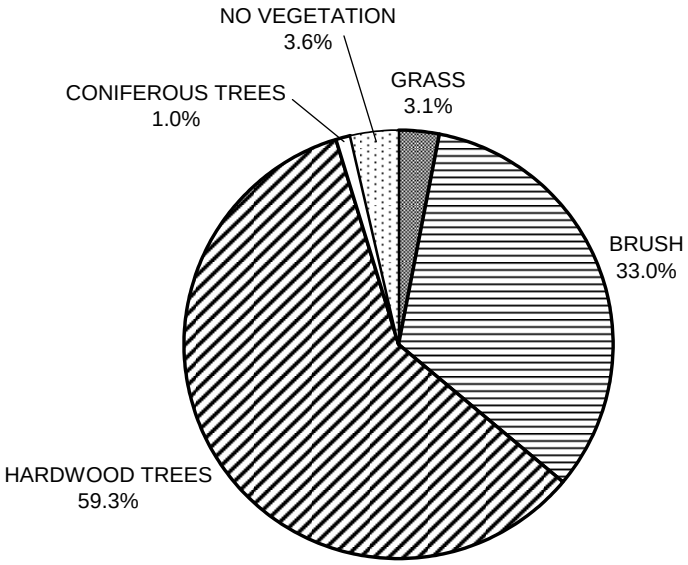

GRAPH 9

## FAIRFAX CREEK 2009
## DOMINANT BANK COMPOSITION IN SURVEY REACH




GRAPH 10

## FAIRFAX CREEK 2009
## DOMINANT BANK VEGETATION IN SURVEY REACH




GRAPH 11