California Department of Fish and Wildlife
Sonoma County
Russian River Watershed
Stream Habitat Assessment Reports

Porter Creek

(Tributary to Mark West Creek)

Surveyed 2012

Report Completed in 2013

STREAM INVENTORY REPORT

Porter Creek

INTRODUCTION

A stream inventory was conducted 10/1/2012 to 10/15/2012 on Porter Creek. The survey began at the confluence with Mark West Creek and extended upstream 6.4 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Porter Creek.

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

Porter Creek is located in Sonoma County, California (Map 1). It is a tributary to Mark West Creek, which flows into Russian River, which flows into Pacific Ocean. Porter Creek's legal description at the confluence with Mark West Creek is T08N R08W Sec.11. Its location is (38:32:52.0N) 38.5478 north latitude and (122:42:22.0W) 122.7062 west longitude, LLID number 1227062385478. Porter Creek is a second order stream and has approximately 8.3 miles of blue line stream according to the USGS National Hydrology Dataset (NHD). Porter Creek drains a watershed of approximately 8.3 square miles. Elevations range from about 440 feet at the mouth of the creek to 2,362 feet in the headwater areas (average elevation of headwaters, not highest point). Evergreen forest dominates the watershed. The watershed is entirely privately owned, which accounts for 100% of the land area. Ninety-three percent of the land is considered natural, 7% is agricultural, and less than 1% is urban. Vehicle access exists via Porter Creek Road and Petrified Forest Road in Santa Rosa, CA.

METHODS

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide 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 Porter 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 Porter 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 Porter 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 Porter Creek.

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 Porter

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 10/1/2012 to 10/15/2012, was conducted by D. Dela Vega, C. Neill (WSP). The total length of the stream surveyed was 33,596 feet with an additional 0 feet of side channel.

Stream flow was not measured on Porter Creek.

Porter Creek is a F3 channel type for 4,590 feet of the stream surveyed (Reach 1), a NA channel type for 750 feet of the stream surveyed (Reach 2), a B4 channel type for 1,795 feet of the stream surveyed (Reach 3), a NA channel type for 600 feet of the stream surveyed (Reach 4), a B2 channel type for 2,557 feet of the stream surveyed (Reach 5), a NA channel type for 4,290 feet of the stream surveyed (Reach 6), a F4 channel type for 1,923 feet of the stream surveyed (Reach 7), a NA channel type for 3,251 feet of the stream surveyed (Reach 8), a F4 channel type for 10,479 feet of the stream surveyed (Reach 9), a NA channel type for 1,565 feet of the stream surveyed (Reach 10), a F4 channel type for 1,796 feet of the stream surveyed (Reach 11). F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width to depth ratios, and cobble-dominant substrates. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks, and gravel-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks, and boulder-dominant substrates. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width to depth ratios, and gravel-dominant substrates. NA channels had no access.

Water temperatures taken during the survey period ranged from 50 to 65 degrees Fahrenheit. Air temperatures ranged from 51 to 90 degrees Fahrenheit.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 36% dry units, 28% pool units, 23% flatwater units, 7% riffle units, 5% culvert units, and 2% not surveyed units (Graph 1). Based on total length of Level II habitat types, there were 47% dry units, 31% not surveyed units, 10% flatwater units, 9% pool units, 2% riffle units, and 1% culvert units (Graph 2).

Fifteen- Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 36% dry units, 22% mid-channel pool units, and 13% step run units (Graph 3). Based on percent total length, 47% dry units, 31% not surveyed units, and 7% mid-channel pool units.

A total of 59 pools were identified (Table 3). Main channel pools were the most frequently encountered at 90% (Graph 4), and comprised 94% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty-two of the 59 pools (38%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 59 pool tail-outs measured, 31 had a value of 1 (53%), 22 had a value of 2 (37%), 1 had a value of 3 (2%), 4 had a value of 4 (7%) (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 1, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 20 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 21, and scour pools had a mean shelter rating of 9 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Porter Creek. Graph 7 describes the pool cover in Porter Creek. Boulders are the dominant pool cover type, followed by root masses.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel substrate was observed in 55% of pool tail-outs; and small cobble substrate was observed in 34% of pool tail-outs.

The mean percent canopy density for the surveyed length of Porter Creek was 84%. Of the canopy present, the mean percentages of hardwood and coniferous trees were 94% and 6%, respectively. Sixteen percent of the canopy was open. Graph 9 describes the mean percent canopy in Porter Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 88%. The mean percent left bank vegetated was 89% (Table 7). The dominant elements composing the structure of the stream banks consisted of 37% cobble/gravel, 29% sand/silt/clay, 26% bedrock, and 9% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 86% of the units surveyed. Additionally, 9% of the units surveyed had brush as the dominant vegetation type, and 4% had coniferous trees as the dominant vegetation type (Graph 11).

DISCUSSION

Porter Creek is a F3 channel type for 4,590 feet of the stream surveyed, a NA channel type for 750 feet of the stream surveyed, a B4 channel type for 1,795 feet of the stream surveyed, a NA channel type for 600 feet of the stream surveyed, a B2 channel type for 2,557 feet of the stream surveyed, a NA channel type for 4,290 feet of the stream surveyed, a F4 channel type for 1,923 feet of the stream surveyed, a NA channel type for 3,251 feet of the stream surveyed, a F4 channel type for 10,479 feet of the stream surveyed, a NA channel type for 1,565 feet of the stream surveyed, a F4 channel type for 1,796 feet of the stream surveyed. The suitability of F3, NA, B4, B2, and F4 channel types for fish habitat improvement structures is/are as follows: F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover; NA channel types were not surveyed and suitability cannot be assessed; B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover; B2 channel types excellent for plunge weirs, single and opposing wing-deflectors, and log cover; and F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days 10/1/2012 to 10/15/2012, ranged from 50 to 65 degrees Fahrenheit. Air temperatures ranged from 51 to 90 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60° F, if sustained, is near the threshold stress level for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 10% of the total length of this survey, riffles 2%, and pools 9%. The pools are relatively shallow, with 22 of the 59 (38%) pools having a maximum residual depth greater than two 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 the numerous log debris accumulations (LDA's) in the stream.

Fifty-three of the 59 pool tail-outs measured had embeddedness ratings of 1 or 2. Five of the pool tail-outs had embeddedness ratings of 3 or 4. Zero 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 Porter Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fifty-two of the 59 pool tail-outs measured had gravel and small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools is 20. The shelter rating in the flatwater habitats is 7. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Porter Creek. Boulders are the dominant cover type in pools, followed by root masses. 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 89.3%, Reach 2 had a canopy density of N/A, Reach 3 had a canopy density of 31.6%, Reach 4 had a canopy density of N/A, Reach 5 had a canopy density of 66.1%, Reach 6 had a canopy density of N/A, Reach 7 had a canopy density of 85.3%, Reach 8 had a canopy density of N/A, Reach 9 had a canopy density of 91%, Reach 10 had a canopy density of N/A, and Reach 11 had a canopy density of 74.7%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 88% and 89%, 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

Porter 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 <u>not to remove woody debris</u> from the stream, except under extreme buildup and only under guidance by a fishery professional.

RECOMMENDATIONS

1) Access for migrating salmonids should be assessed at all road crossings and dams. Sites of particular concern include the Porter Creek road Bridge located near the entrance of Camp Newman, the Fetcher Road Bridge, and the multiple identified ford crossings located in Reach 1. Other sites include the dam site located at the upstream end of Reach 9 and the Calistoga Road/ Petrified Forest Road Intersection Bridge and it’s associated fish ladder, which should be assess regularly after high flow events. 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.

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

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

4) Increase the canopy on Porter Creek especially throughout Reaches 1- 5, 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.

5) Suitable size spawning substrate on Porter Creek is limited in reach 3. Projects should be designed at suitable sites to trap and sort spawning gravel.

6) There are a few reaches where the stream is being impacted from livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exasperate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowner, and developed if possible.

7) 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.

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	Habitat Unit #	Memo
0	0001.00	Start of survey at the confluence of Mark West Creek and Porter Creek. The survey starts in the Mark West flood plain. WP # 1 N38.54789 W122.70799
283	0002.00	The unit is still part of the Mark West Creek flood plain.

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Position	Habitat Unit #	Memo
283	0002.00	One unidentified fish observed.
312	0003.00	600' into the unit Porter Creek is out of the Mark West Creek flood plain and out of the influence of the receiving stream.
1,405	0004.00	California roach and pacific giant salamander larvae observed.
1,584	0008.00	Two sculpin and many roach observed.
1,693	0010.00	The unit is created by two isolated pools with a large sand bar separating them. There is an oily film on the surface of the water. Two dead sculpin observed at the top of the unit.
1,693	0010.00	There were many non-salmonid young of the year (YOY) observed in both pools.
1,762	0012.00	Sculpin YOY and California Roach observed.
2,143	0018.00	At the top of the unit is an old over-grown ford crossing on the left bank.
2,163	0019.00	At the bottom of the unit is a fence and corral on the left bank.
2,643	0020.00	Bridge # 1is a private property access road. It is a road and a driveway made of wood and steel. The bridge has length = 14', height = 10.5', width = 55', and the height from the water to sill = N/A. The bridge is not retaining gravel, there is no associated downcutting, and it is not a possible barrier to salmonids. It is an old railroad bridge with concrete support beams. There is a natural stream bottom and no sill. Armored rip rap is in place on the left bank downstream side of the bridge, as well as the right bank upstream side. WP # 3 N38.55042 W122.70105.
2,740	0022.00	At the top of the unit is an old ford crossing on the left bank.
2,755	0023.00	55' into the unit is an old property boundary fence spanning the creek bed.
2,755	0023.00	Right bank tributary # 1 is 200' into the unit. It is unnamed and dry with discharge = 0 cfs. The water temperatures = N/A. The crew checked 70' up and found that it is accessible to fish. The slope measured with a clinometer = 1-2%. The crew was unable to hike up the tributary due to lack of property access. The dominant substrate is gravel and cobble. There is

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Position	Habitat Unit #	Memo
		a property fence spanning the channel. Approximately 100' into the tributary is Porter Creek Rd. WP # 4 N38.55125 W122.70110
3,365	0026.00	The unit is covered with a thick oily substance on the surface of the water.
3,365	0026.00	There were > 20 salmonid YOY observed.
3,790	0030.00	At the bottom of the unit is a man-made rock dam, which is separating the downstream unit. The water is covered in duck weed.
3,966	0031.00	38' into the unit is an old property boundary fence spanning the creek bed.
4,038	0032.00	Unidentified fish observed.
4,294	0034.00	There is an oily substance on the surface of the water.
4,540	0037.00	One salmonid YOY observed.
4,590	0038.00	Begin no access WP # 7 N38.55219 W122.69650
5,340	0039.00	End of no access, survey continues. WP # 8 N38.55426 W122.691604 The last 100' of the unit has a series of 3 rock walls, approximately 1' tall.
5,340	0039.00	Right bank tributary # 2 is 200' into the unit. It is unnamed and dry with discharge = 0 cfs. The water temperatures = N/A. The crew checked 70' up into the unit and found that it is accessible to fish. The estimated slope < 1%. The channel is overgrown with vegetation and bankfull width = 12'. The tributary leads to a reservoir. WP # 9 N38.55484 W122.69629
5,708	0040.00	Bridge # 2 is a private driveway. It is made of wood, concrete, and steel with length = 19', height = 12', width = 45', and the height from the water to sill = N/A. The bridge is not retaining gravel, there is no associated down cutting, and it is not a possible barrier to fish. There is a concrete support beam in the middle of the bridge. The thalweg of the stream is through the right bank side of the bridge. There is a natural stream bottom. WP # 10 N38.55513 W122.69620
5,727	0041.00	400' into the unit there is rip rap on the left bank.
6,520	0042.00	Bridge # 3 is Porter Creek Road. It is made of concrete and steel with length = 54', height = 23', width = 160', and the height from the water to sill =

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Position	Habitat Unit #	Memo
		N/A. The bridge is not retaining gravel, there is no associated downcutting, and it is not a possible barrier to salmonids. The flow is directed through the left bank side of the bridge. There is a series of 4 concrete support beams. The center of the bridge is supported with steel high beams. Rip rap is in place on the left bank. WP # 11 N38.55709 W122.69427
6,661	0044.00	Bridge # 4 is a footbridge. It is made of wood, concrete, and steel with length = 20', height = 13', width = 40', and the height from the water to sill = N/A. The bridge is not retaining gravel, there is no associated downcutting, and it is not a possible barrier to salmonids. There is a water pipe under the footbridge, which leaks on the left bank side. There is an old support beam in the middle of the channel, which is made of concrete and rebar. It appears to be from an old road bridge, and is falling apart. The old beam is retaining gravel. WP # 12 N38355748 W122.69415
6,681	0045.00	190' into the unit is a water pipe crossing the creek. Goats have access to the creek.
6,681	0045.00	Left bank tributary # 3 is 173' into the unit. It is unnamed and dry with discharge = 0 cfs. The crew checked up 70' and found that it is not accessible to fish. The water temperatures = N/A and the estimated slope = 1-2%. The first 60' is moderately entrenched. 40' in is a small footbridge. After 70' is a corrugated metal pipe (CMP), 1' in diameter, coming from Porter Creek Rd. The dominant substrate is gravel. WP # 13 N38.55767 W122.69355
6,989	0046.00	Lots of algae growing in the water.
7,013	0047.00	There is a garden hose contributing water to the upstream pool.
7,013	0047.00	Three unidentified fish observed in the pool.
7,077	0048.00	End of Access WP #14 N38.55804 W122.69283
7,735	0050.00	End of no access section/survey continues. WP # 15 N38.55898 W122.69115 There are a few scattered pools throughout the unit, which look as though they may dry up soon.
7,735	0050.00	Right bank tributary # 4 is 200' into the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope = 1%. The crew checked 170' up

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Position	Habitat Unit #	Memo
		and found that it is accessible to fish. The channel is well defined and over grown with vegetation. It looks suitable for fish passage and has a well mixed substrate. WP # 16 N38.55935 W122.69071
8,322	0051.00	One salmonid YOY and lots of California roach observed.
8,390	0052.00	The gradient increases throughout this unit with large boulder substrate.
8,606	0053.00	Water appears to be of poor quality with a green film on top.
8,606	0053.00	One unidentified fish observed.
8,623	0054.00	The gradient decreases after the first 40' of the unit.
8,623	0054.00	Right bank tributary # 5 is 166' into the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope = 1-2 %. The crew checked 50' up and found that it is accessible to fish. The tributary is moderately entrenched, with mixed substrate. 20' up there is a property fence spanning the channel. 40' up there is a 2' diameter CMP culvert under an access road. WP # 17 N38.55837 W122.68813
9,331	0059.00	Bridge # 5 is a private property access road. It is made of wood, concrete, and steel with length = 15', height = 9', width = 52', and the height from the water to sill = N/A. The bridge is not retaining gravel, there is no associated down cutting, and it is not a possible barrier to salmonids. There is a natural channel bottom. WP # 18 N38.55743 W122.69677
9,460	0061.00	There appears to be poor water quality.
9,492	0062.00	There is an old hose in the creek. The channel is wide with lots of willow growing. It may be a multi-threaded channel. End of access at the top of the unit.
14,582	0064.00	Survey continued. WP # 22 N38.55187 W122.67170
14,768	0067.00	Ten unidentified fish observed
14,977	0071.00	Salmonid YOY and 20 unidentified fish observed.
15,245	0076.00	Left bank tributary # 6 is 60' into the unit. It is unnamed and wet, with discharge = 0 cfs. There are intermittent pools, but no flow. The tributary contributes 0% of flow to the receiving stream. The water temperatures = N/A and the slope measured with a clinometer = 4-6%. The crew checked 75' up and found that it is accessible to fish. 60' into the

Position	Habitat Unit #	Memo
		tributary there is a concrete box culvert diverting the tributary under Porter Creek Road. The culvert is angled with a bend in it, which is how it was designed. Water is trickling out of the culvert. There is a 2' plunge at the culvert. WP # 24 N38.55048 W122.67035
15,573	0082.00	Unidentified frog observed.
15,615	0083.00	There are scattered pieces of concrete from an old bridge sill in the unit.
15,725	0086.00	Four unidentified fish observed.
15,750	0087.00	Bridge # 6 is Porter Creek Road. It is made of concrete with length = 163', height = 8', width = 30', and the height from the water to sill = 0.6'. The bridge is not retaining gravel and there is no associated downcutting. It is a possible barrier to salmonids. There is a concrete support beam in the middle of the bridge. The sill is falling apart at the outlet. The sill is relatively flat <1% slope, which could be a barrier for salmonids. At the upstream end of the bridge there is another box culvert, which is left bank tributary 7. WP # 26 N38.54930 W122.66930
15,750	0087.00	Left bank tributary # 7 is at the upstream end of Bridge # 6. It is dry. The water temperatures = N/A and the estimated slope = 2-4%. The crew checked 200' up and found that it is accessible to fish in high flows. At the confluence of the tributary is a box culvert with a 4' plunge over the first 15' of the tributary. 200' into the tributary is a concrete structure/ spillway creating a 6' plunge. The tributary is an outlet for a large upstream reservoir. WP # 26 N38.54930 W122.66930
15,913	0088.00	There is rip rap at the top of the unit on the left bank.
16,001	0089.00	At the top of the unit on the left bank is a large water tank and structure.
16,093	0090.00	There is highly eroded bedrock throughout the unit.
16,391	0095.00	Five salmonid YOY observed.
16,478	0097.00	At the top of the unit on the left bank is a road drainage with an erosion control concrete structure stabilizing the upslope. End of access at the property line.

Porter Creek

Position	Habitat Unit #	Memo
16,478	0097.00	End of access WP # 28 N38.54957 W122.66758
19,756	0099.00	Begin access/ survey continued. There is a spring on the left bank just below the start of the unit. WP # 29 N38.55327 W122.66227
19,984	0104.00	Rubber piping crosses the creek approximately 15' high. It is attached to a large tank upslope on the right bank. It follows the road up on the left bank.
20,316	0109.00	Bridge # 7 is a private property bridge. It is made of concrete and steel, with length = 13', height =13', width = 42', and the height of the sill to the water = N/A. The bridge is not retaining gravel, there is no associated down cutting, and it is not a possible barrier to salmonids. There are large concrete blocks supporting the bridge on the left bank. There is rip rap on the right and left bank under the bridge, which extends upstream on the left bank. There are remnants of the old bridge sill and columns approximately 15' upslope on the right and left bank. WP # 31 N38.55313 W122.66059
20,483	0112.00	There are two 1" pvc pipes coming down the left bank.
20,513	0113.00	An old road leads to the creek near the bottom of the unit. 45' into the unit is a right bank drainage from the road.
20,721	0115.00	At the top of the unit on the left bank there is a pvc pipe coming out of a metal cylindrical container. A spring is exposed and water is coming out from under the cylinder.
20,824	0117.00	Left bank tributary # 8 is at the top of the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope >10%. The crew checked 120' up and found that it is not accessible to fish. The tributary is steep and moderately entrenched. WP # 32 N38.55376 W122.65879
20,824	0117.00	Two unidentified YOY observed.
21,089	0121.00	130' into the unit is an old car on the right bank.
21,371	0123.00	There is rip rap on the right bank from the road down to the creek.
21,497	0125.00	One salmonid YOY observed.
21,636	0127.00	There is a black pipe on the right bank.
21,636	0127.00	Approximately five steelhead YOY observed.

Porter Creek

Position	Habitat Unit #	Memo
21,849	0130.00	Right bank tributary # 9 is 85' into the unit. It is unnamed and dry. The water temperatures = N/A and the slope measured with a clinometer = 35-40%. The crew checked 70' up and found that it is not accessible to fish. 70' the channel is lined with rip rap. At the top of the slope is Porter Creek Rd. There appears to be no culvert. WP # 35 N38.55355 W122.65601
21,998	0132.00	One sculpin observed.
22,232	0134.00	Seven steelhead YOY and one bullfrog tadpole observed.
22,308	0135.00	Thirty feet into the unit is a 3' diameter CMP culvert on the right bank, with a 10' plunge from the culvert to the creek. The slope of the culvert is 1-2%. It is in good condition. The tributary beyond the culvert is not accessible to fish.
22,364	0136.00	A metal retaining wall is in place on the right bank. It follows the road beginning 90' into the unit.
22,364	0136.00	Left bank tributary 10 is at the bottom of the unit. It is unnamed and dry with discharge = 0 cfs. The water temperatures = N/A and the slope measured with a clinometer ≤ 50%. The crew checked 200' up and found that it is not accessible to fish. The channel is moderately entrenched and the dominant substrate is silt and sand. It is filled with debris. WP # 36 N38.55304 W122.65477.
22,474	0137.00	The metal wall on the right bank ends at the top of the unit.
22,474	0137.00	Six steelhead YOY observed.
22,584	0138.00	20' into the unit is a 1' diameter CMP on the right bank.
22,685	0140.00	There is lots o f trash in the creek. There is a spring on the left bank near the top of the unit.
22,739	0141.00	Two steelhead YOY observed.
22,886	0143.00	Right bank tributary # 11 is at the top of the unit. It is unnamed and dry. The water temperatures = N/A and the slope measured with a clinometer = 35-40%. The crew checked 70' up and found that it is not accessible to fish. Past 70' there is a CMP culvert, 1' diameter, under Porter Creek Rd. Beyond that point the tributary is draining from the road. WP # 38

Porter Creek

Position	Habitat Unit #	Memo
		N38.55217 W122.65298
23,348	0149.00	Right bank tributary 12 is at the top of the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope = 4-6%. The crew checked 50' up and found that it is not accessible to fish. After 50' there is a 1' diameter culvert under Porter Creek Road. The channel appears to be inactive, with no distinct channel. There is a lot of trash in the tributary. WP # 40 N38.55197 W122.65418
23,660	0154.00	Bridge # 8 is Petrified Forest Road/ Calistoga Road. It is made of concrete with length = 148', height = 12', width = 33', and the height from the water to sill = 2-3'. The bridge is retaining gravel, there is associated downcutting, and it is a possible barrier to salmonids. The sill is slanted and broken at the outlet. There is a small fish ladder on the left bank side. At the inlet the right bank side of the bridge has a shorter sill wall than the left bank side. The fish ladder is filled with gravel. The bridge has a concrete bottom. WP 41 N38.55127 W122.65093
23,808	0155.00	There is oil on the surface of the water. Sac-crete is in place on the right and left bank.
23,808	0155.00	Left bank tributary 13 is at the bottom of the unit. It is unnamed and dry with discharge = 0 cfs. The water temperatures = N/A and the estimated slope - 1-2%. The crew checked 200' up and found that it is accessible to fish. The tributary is a concrete spillway, which is approximately 400' long. WP # 41 N38.55127 W122.65093
23,808	0155.00	One salmonid YOY observed
24,045	0159.00	One steelhead YOY observed
24,272	0161.00	Large and small wood in the unit is backing up gravel upstream.
24,543	0163.00	Three 1+ salmonids and three salmonid YOY observed.
25,188	0173.00	One 1+ steelhead observed
25,226	0174.00	At the bottom of the unit is an old 1" pvc pipe embedded in the channel.
25,679	0179.00	There is a small gravel bar in the middle of the channel separating the upstream unit.
25,699	0180.00	The water quality is poor. There is an oily substance

Position	Habitat Unit #	Memo
		on the surface of the water.
25,699	0180.00	Right bank tributary # 14 is 30' into the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope = 6-10%. The crew checked 125' up and found that it is not accessible to fish. There is a 3' plunge at the confluence of the creek. 50' into the tributary is a CMP culvert on the left bank. 75' up is a 6' plunge creating a box due to an old road in the channel, which is creating scour. 125' up is a CMP culvert under Petrified Forest Road. There is a 4' plunge associated with the culvert. WP # 45 N38.55039 W122.64494 Left bank tributary # 15 is 30' into the unit. It is unnamed and dry. The water temperatures = N/A and the slope measured with a clinometer = 25-30%. The crew checked 50' up and found that it was not accessible to fish. The channel is canyon- like and very entrenched. The dominant substrate is silt. WP # 45 38.55309 W122.64494
25,699	0180.00	Three salmonid YOY observed.
25,754	0181.00	The channel is overgrown with vegetation, primarily sedges and mint.
26,388	0185.00	Right bank tributary # 16 is 400' into the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope = 4-6%. The crew checked 200' up and found it accessible to fish. 150' up is a CMP culvert, 2' diameter, under Petrified Forest Road. The culvert is in good condition and has an estimated slope = 1-2%. The tributary is overgrown at the confluence. WP # 47 N38.55426 W122.64184
26,919	0187.00	90' into the unit is a drainage off the mountain side on the left bank.
27,890	0190.00	Six 1+ steelhead observed.
27,915	0191.00	Dam # 1 has length = 10', height = N/A, width(o)= 32', width(d) = 38', and the height from the water to the sill = 4'. There are no flashboards. There is downcutting with a height = 3'. The dam is retaining gravel. It is a possible barrier to juvenile and adult salmonids. There is a 2' diameter culvert under a part of the dam sill, which is clogged with sediment. The dam has no flashboard installment capabilities. WP # 49 N38.55494 W122.63799

Porter Creek

Position	Habitat Unit #	Memo
27,925	0192.00	There are large bedrock units throughout the unit. 2000' into the unit is a ford crossing.
29,998	0194.00	The channel is overgrown with vegetation. End of access.
31,800	0196.00	Begin access/ continue survey WP # 52 N38.55894 W122.62709
32,075	0197.00	There is an old car on the right bank near the bottom of the unit.
32,265	0199.00	There is a rock wall along the left bank, which continues into the next unit. The water quality is poor.
32,279	0200.00	The wall extends 31' into this unit. It is made of large cobble and boulder and is approximately 5' tall.
32,634	0201.00	Bridge # 9 is Fetcher Rd. It is made of concrete, wood, and steel with length = 35', height = 9', and width = 20'. There is a 2' plunge off the sill to the bottom of the channel. The bridge is retaining gravel, there is associated down cutting, and it is a possible barrier to salmonids. 35' downstream of the bridge is erosion control. WP # 53 N38.55764 W122.62478
32,669	0202.00	On the right bank at the top of the unit there is a water pipe, 1-2" diameter, leading to the creek from a building.
32,688	0203.00	46' into the unit along the left bank is erosion control, 120' long, made of wire and plywood and back-filled with brush.
32,992	0205.00	Left bank tributary 17 is at the top of the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope =1-2%. The crew checked 50' up and found that it is accessible to fish. The tributary is not entrenched and overgrown with blackberry. WP#54 N38.55695 W122.62352
33,126	0207.00	Right bank tributary 18 is 25' into the unit. It is unnamed and dry. The water temperatures = N/A and the estimated slope = 1-2%. The crew checked 200' up and found that it is accessible to fish. The channel is littered with old metal trash, such as car parts, mattress springs, etc. These are located primarily near the right bank and may have been used as a form of erosion control. The tributary is 48' upstream of WP # 54 N38.55695 W122.62352

Porter Creek

Position	Habitat Unit #	Memo
33,295	0211.00	Willow has been lopped off in the channel throughout this section.
33,596	0214.00	End of survey due to lack of landowner access. Crew could not continue the survey upstream. WP # 55 N38.55697 W122.62191

<u>REFERENCES</u>

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.

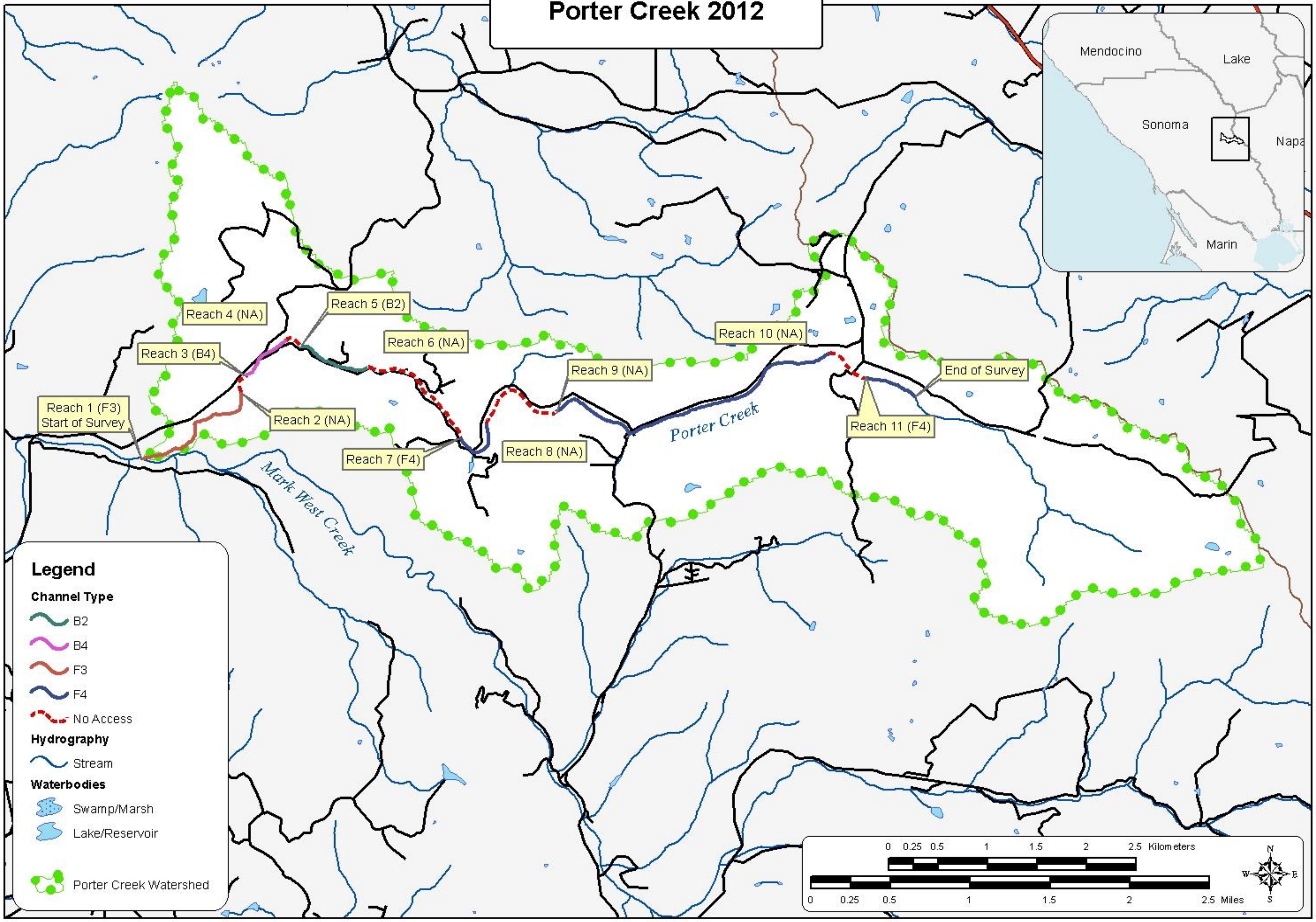
Rosgen, D.L., 1994. A Classification of Natural Rivers. Catena, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

Porter Creek

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 marsh	(MAR)	[9.1]	

Porter Creek 2012



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Prepared by: Scott Webb, December 2012

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

Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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
14	7	RIFFLE	6.5	51	715	2.1	3.1	0.2	0.3	110	1546	29	404		1
49	16	FLATWATER	22.9	66	3223	9.6	5.5	0.4	0.8	444	21760	186	9118		7
59	59	POOL	27.6	52	3058	9.1	9.5	0.9	1.8	474	27952	494	28649	467	20
77	0	DRY	36.0	203	15653	46.6									
10	0	CULVERT	4.7	49	491	1.5									
5	0	NOSURVEY	2.3	2091	10456	31.1									

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
214	82	33596	51258	38171

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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 (%)
11	4	LGR	5.1	46	508	1.5	3.0	0.1	0.4	69	763	7	76		1	88
3	3	BRS	1.4	69	207	0.6	3.0	0.2	0.7	165	496	58	174		2	84
3	2	GLD	1.4	112	337	1.0	8.0	0.6	1.0	979	2938	557	1670		23	95
18	4	RUN	8.4	28	511	1.5	5.0	0.5	1.2	272	4887	154	2770		3	84
28	10	SRN	13.1	85	2375	7.1	5.0	0.3	1.1	406	11370	125	3496		5	90
2	2	TRP	0.9	68	135	0.4	10.0	1.6	3.3	675	1350	1166	2331	1134	40	89
48	48	MCP	22.4	52	2485	7.4	9.0	0.9	3.2	486	23316	490	23019	458	21	88
1	1	CCP	0.5	60	60	0.2	8.0	0.8	1.5	456	456	365	365	365	5	72
2	2	STP	0.9	91	182	0.5	11.0	1.7	3.1	525	1049	738	1477	738	13	64
2	2	LSR	0.9	40	81	0.2	15.0	0.9	2.6	505	1010	474	948	474	18	80
3	3	LSBk	1.4	30	90	0.3	5.0	0.8	2.5	157	471	120	359	120	5	69
1	1	PLP	0.5	25	25	0.1	12.0	0.5	1.0	300	300	150	150	150	5	95
77	0	DRY	36.0	203	15653	46.6										77
10	0	CUL	4.7	49	491	1.5										
5	0	NS	2.3	2091	10456	31.1										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume
214	82	33596	48406	36835(cu.ft.)

Table 3 - Summary of Pool Habitat Types

Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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
53	53	MAIN	90	54	2862	94	9.5	1.0	494	26172	493	25630	21
6	6	SCOUR	10	33	196	6	9.7	0.8	297	1781	243	1457	9

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
59	59	3058	27952	27087

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

Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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
2	TRP	3	0	0	1	50	0	0	1	50	0	0
47	MCP	81	1	2	29	62	16	34	1	2	0	0
1	CCP	2	0	0	1	100	0	0	0	0	0	0
2	STP	3	0	0	0	0	1	50	1	50	0	0
2	LSR	3	0	0	1	50	1	50	0	0	0	0
3	LSBk	5	0	0	2	67	1	33	0	0	0	0
1	PLP	2	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
58	1	2	35	60	19	33	3	5	0	0

Mean Maximum Residual Pool Depth (ft.): 2

Table 5 - Summary of Mean Percent Cover By Habitat

Stream Name: Porter Creek **Dry Units:** 77 **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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
11	4	LGR	0	0	0	0	0	0	0	25	0
3	3	BRS	0	0	0	0	0	0	0	33	0
14	7	TOTAL RIFFLE	0	0	0	0	0	0	0	29	0
3	2	GLD	0	20	20	0	0	60	0	0	0
18	4	RUN	0	0	0	0	13	0	0	13	25
28	10	SRN	0	4	9	6	0	0	0	49	12
49	16	TOTAL FLAT	0	5	8	4	3	8	0	34	14
2	2	TRP	0	0	0	38	0	0	0	25	38
48	48	MCP	17	9	5	21	3	6	0	26	12
1	1	CCP	0	0	0	0	0	0	0	0	100
2	2	STP	0	0	0	15	0	0	0	20	65
2	2	LSR	25	50	0	25	0	0	0	0	0
3	3	LSBk	0	0	0	0	0	0	0	30	37
1	1	PLP	0	0	0	0	0	0	0	0	100
59	59	TOTAL POOL	14	9	4	19	3	5	0	24	18
10	0	CUL									
5	0	NS									
214	82	TOTAL	10	8	5	15	3	5	0	27	16

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Porter Creek **Dry Units:** 77 **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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
11	4	LGR	0	0	50	25	0	0	25
3	3	BRS	0	0	0	0	0	0	100
3	2	GLD	0	0	100	0	0	0	0
18	4	RUN	25	0	50	25	0	0	0
28	10	SRN	0	0	60	30	0	0	10
2	2	TRP	0	0	0	0	0	0	100
48	48	MCP	0	15	48	23	0	6	8
1	1	CCP	0	0	0	0	0	0	100
2	2	STP	0	0	50	0	0	50	0
2	2	LSR	0	0	100	0	0	0	0
3	3	LSBk	0	0	100	0	0	0	0
1	1	PLP	0	100	0	0	0	0	0
10	0	CUL	0	0	0	0	0	0	0
5	0	NS	0	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
84	6	94	0	88	89

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 8 - Fish Habitat Inventory Data Summary

Stream	Porter Creek		LLID: 1227062385478		Drainage	Russian River - Middle	
Survey Dates:	10/1/2012 to 10/15/2012	Survey Length (ft.):	33596	Main Channel (ft.):	33596	Side Channel (ft.):	0
Confluence Location:	Quad MARK WEST	Legal Description:	T08NR08WS11	Latitude:	38:32:52.0N	Longitude:	122:42:22.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3
Reach Length (ft.): 4590
Riffle/Flatwater Mean Width (ft.): 5.0
BFW:
Range (ft.): 22.00 to 34.00
Mean (ft.): 30.11
Std. Dev.: 4.18
Base Flow (cfs):
Water (F): 0 - 61 Air (F): 79 - 90
Dry Channel (ft.): 2957

Canopy Density (%): 89.3
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 91.3
Dominant Boulders
Dominant Bank Substrate Cobble/Gravel
Occurrence of LWD (%): 5.6
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length 14.7
Pool Frequency (%): 29.7
Residual Pool Depth (%):
< 2 Feet Deep: 54.5
2 to 2.9 Feet Deep: 45.5
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.73
Mean Pool Shelter 13

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 72.7 Sm Cobble: 27.3 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 45.5 2. 54.5 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: NA
Reach Length (ft.): 750
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 22.00 to 22.00
Mean (ft.): 22.00
Std. Dev.: 0.00
Base Flow (cfs): 0
Water (F): 61 - 61 Air (F): 81 - 81
Dry Channel (ft.): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component
Dominant Bank
Vegetative Cover (%): 0.0
Dominant
Dominant Bank Substrate
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles:
Pools:
Flat:

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

Porter Creek

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B4
Reach Length (ft.): 1795
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 46.00 to 46.00
Mean (ft.): 46.00
Std. Dev.: 0.00
Base Flow (cfs):
Water (F): 0 - 0 Air (F): 69 - 69
Dry Channel (ft.): 1614

Canopy Density (%): 31.6
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 17.5
Dominant Boulders
Dominant Bank Substrate Bedrock
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools: 0
Flat:

Pools by Stream Length 4.9
Pool Frequency (%): 20.0
Residual Pool Depth (%):
< 2 Feet Deep: 50.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 50.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 2.4
Mean Pool Shelter 8

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

STREAM REACH: 4

Channel Type: NA
Reach Length (ft.): 600
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 25.00 to 25.00
Mean (ft.): 25.00
Std. Dev.: 0.00
Base Flow (cfs): 0
Water (F): 57 - 57 Air (F): 79 - 79
Dry Channel (ft.): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component
Dominant Bank
Vegetative Cover (%): 0.0
Dominant
Dominant Bank Substrate
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles:
Pools:
Flat:

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

Porter Creek

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: B2	Canopy Density (%): 66.1	Pools by Stream Length 5.0
Reach Length (ft.): 2557	Coniferous Component (%): 0.0	Pool Frequency (%): 30.8
Riffle/Flatwater Mean Width (ft.): 5.0	Hardwood Component 100.0	Residual Pool Depth (%):
BFW:	Dominant Bank Hardwood Trees	< 2 Feet Deep: 100.0
Range (ft.): 19.00 to 25.00	Vegetative Cover (%): 95.0	2 to 2.9 Feet Deep: 0.0
Mean (ft.): 23.15	Dominant Boulders	3 to 3.9 Feet Deep: 0.0
Std. Dev.: 2.77	Dominant Bank Substrate Boulder	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth 1.325
Water (F): 57 - 57 Air (F): 79 - 81	LWD per 100 ft.:	Mean Pool Shelter 14
Dry Channel (ft.): 2383	Riffles:	
	Pools: 0	
	Flat: 0	

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 50.0 Sm Cobble: 50.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0

Embeddedness Values (%): 1. 75.0 2. 25.0 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 6

Channel Type: NA	Canopy Density (%):	Pools by Stream Length 0.0
Reach Length (ft.): 4290	Coniferous Component (%):	Pool Frequency (%): 0.0
Riffle/Flatwater Mean Width (ft.):	Hardwood Component	Residual Pool Depth (%):
BFW:	Dominant Bank	< 2 Feet Deep:
Range (ft.): 19.00 to 19.00	Vegetative Cover (%): 0.0	2 to 2.9 Feet Deep:
Mean (ft.): 19.00	Dominant	3 to 3.9 Feet Deep:
Std. Dev.: 0.00	Dominant Bank Substrate	>= 4 Feet Deep:
Base Flow (cfs):	Occurrence of LWD (%):	Mean Max Residual Pool Depth
Water (F): 0 - 0 Air (F): 81 - 81	LWD per 100 ft.:	Mean Pool Shelter
Dry Channel (ft.): 0	Riffles:	
	Pools:	
	Flat:	

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder Bedrock:

Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

Porter Creek

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 7

Channel Type:	F4	Canopy Density (%):	85.3	Pools by Stream Length	30.2
Reach Length (ft.):	1923	Coniferous Component (%):	19.3	Pool Frequency (%):	29.4
Riffle/Flatwater Mean Width (ft.):	5.3	Hardwood Component	80.7	Residual Pool Depth (%):	
BFW:		Dominant Bank	Hardwood Trees	< 2 Feet Deep:	88.9
Range (ft.):	12.00 to 20.00	Vegetative Cover (%):	92.0	2 to 2.9 Feet Deep:	11.1
Mean (ft.):	15.88	Dominant	Boulders	3 to 3.9 Feet Deep:	0.0
Std. Dev.:	2.78	Dominant Bank Substrate	Bedrock	>= 4 Feet Deep:	0.0
Base Flow (cfs):		Occurrence of LWD (%):	0.0	Mean Max Residual Pool Depth	1.38
Water (F): 0 - 65	Air (F): 60 - 73	LWD per 100 ft.:		Mean Pool Shelter	30
Dry Channel (ft.):	398	Riffles:	0		
		Pools:	0		
		Flat:	0		

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 77.8 Sm Cobble: 22.2 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0

Embeddedness Values (%): 1. 55.6 2. 44.4 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 8

Channel Type:	NA	Canopy Density (%):		Pools by Stream Length	0.0
Reach Length (ft.):	3251	Coniferous Component (%):		Pool Frequency (%):	0.0
Riffle/Flatwater Mean Width (ft.):		Hardwood Component		Residual Pool Depth (%):	
BFW:		Dominant Bank		< 2 Feet Deep:	
Range (ft.):	20.00 to 20.00	Vegetative Cover (%):	0.0	2 to 2.9 Feet Deep:	
Mean (ft.):	20.00	Dominant		3 to 3.9 Feet Deep:	
Std. Dev.:	0.00	Dominant Bank Substrate		>= 4 Feet Deep:	
Base Flow (cfs):	0	Occurrence of LWD (%):		Mean Max Residual Pool Depth	
Water (F): 65 - 65	Air (F): 73 - 73	LWD per 100 ft.:		Mean Pool Shelter	
Dry Channel (ft.):	0	Riffles:			
		Pools:			
		Flat:			

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder Bedrock:

Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

Porter Creek

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 9

Channel Type:	F4	Canopy Density (%):	91.0	Pools by Stream Length	13.9
Reach Length (ft.):	10479	Coniferous Component (%):	5.6	Pool Frequency (%):	29.2
Riffle/Flatwater Mean Width (ft.):	4.8	Hardwood Component	94.4	Residual Pool Depth (%):	
BFW:		Dominant Bank	Hardwood Trees	< 2 Feet Deep:	50.0
Range (ft.):	13.00 to 36.00	Vegetative Cover (%):	86.3	2 to 2.9 Feet Deep:	42.9
Mean (ft.):	22.21	Dominant	Boulders	3 to 3.9 Feet Deep:	7.1
Std. Dev.:	8.05	Dominant Bank Substrate	Cobble/Gravel	>= 4 Feet Deep:	0.0
Base Flow (cfs):	0	Occurrence of LWD (%):	7.4	Mean Max Residual Pool Depth	1.95
Water (F): 50 - 55	Air (F): 51 - 60	LWD per 100 ft.:		Mean Pool Shelter	22
Dry Channel (ft.):	6869	Riffles:	0		
		Pools:	1		
		Flat:	1		

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 50.0 Sm Cobble: 42.9 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 7.1

Embeddedness Values (%): 1. 60.7 2. 32.1 3. 0.0 4. 7.1 5. 0.0

STREAM REACH: 10

Channel Type:	NA	Canopy Density (%):		Pools by Stream Length	0.0
Reach Length (ft.):	1565	Coniferous Component (%):		Pool Frequency (%):	0.0
Riffle/Flatwater Mean Width (ft.):		Hardwood Component		Residual Pool Depth (%):	
BFW:		Dominant Bank		< 2 Feet Deep:	
Range (ft.):	17.00 to 17.00	Vegetative Cover (%):	0.0	2 to 2.9 Feet Deep:	
Mean (ft.):	17.00	Dominant		3 to 3.9 Feet Deep:	
Std. Dev.:	0.00	Dominant Bank Substrate		>= 4 Feet Deep:	
Base Flow (cfs):	0	Occurrence of LWD (%):		Mean Max Residual Pool Depth	
Water (F): 52 - 52	Air (F): 52 - 52	LWD per 100 ft.:		Mean Pool Shelter	
Dry Channel (ft.):	0	Riffles:			
		Pools:			
		Flat:			

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder Bedrock:

Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

Porter Creek

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 11

Channel Type:	F4	Canopy Density (%):	74.7	Pools by Stream Length	7.6
Reach Length (ft.):	1796	Coniferous Component (%):	0.0	Pool Frequency (%):	21.1
Riffle/Flatwater Mean Width (ft.):	3.7	Hardwood Component	100.0	Residual Pool Depth (%):	
BFW:		Dominant Bank	Hardwood Trees	< 2 Feet Deep:	75.0
Range (ft.):	18.00 to 20.00	Vegetative Cover (%):	98.6	2 to 2.9 Feet Deep:	25.0
Mean (ft.):	18.95	Dominant	Boulders	3 to 3.9 Feet Deep:	0.0
Std. Dev.:	1.00	Dominant Bank Substrate	Bedrock	>= 4 Feet Deep:	0.0
Base Flow (cfs):		Occurrence of LWD (%):	0.0	Mean Max Residual Pool Depth	1.6
Water (F):	0 - 56 Air (F): 69 - 74	LWD per 100 ft.:		Mean Pool Shelter	11
Dry Channel (ft.):	1432	Riffles:	0		
		Pools:	0		
		Flat:	0		

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 25.0 Sm Cobble: 25.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 50.0

Embeddedness Values (%): 1. 25.0 2. 25.0 3. 0.0 4. 50.0 5. 0.0

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

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	25	17	25.6
Boulder	5	10	9.1
Cobble/Gravel	34	26	36.6
Sand/Silt/Clay	18	29	28.7

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	0	2	1.2
Brush	8	7	9.1
Hardwood	70	71	86.0
Coniferous	4	2	3.7
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

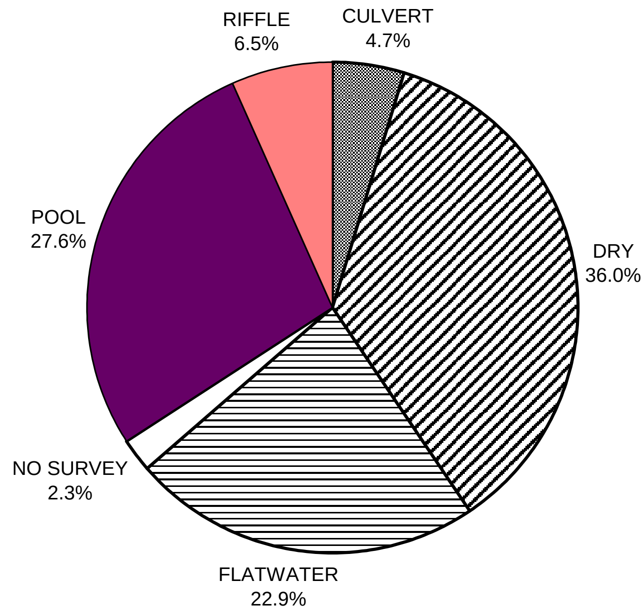
Stream Name: Porter Creek **LLID:** 1227062385478 **Drainage:** Russian River - Middle

Survey 10/1/2012 to 10/15/2012

Confluence Location: Quad: MARK WEST SPRINGS **Legal Description:** T08NR08WS11 **Latitude:** 38:32:52.0N **Longitude:** 122:42:22.0W

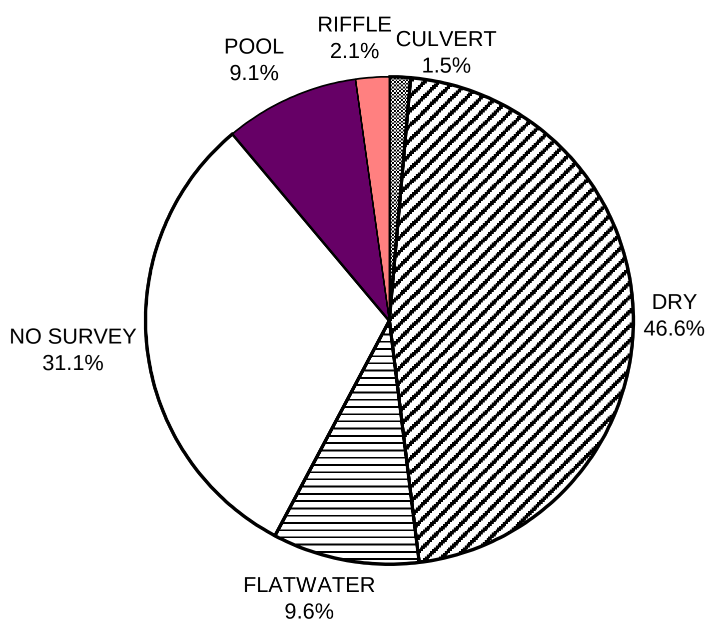
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	14
SMALL WOODY DEBRIS (%)	0	5	9
LARGE WOODY DEBRIS (%)	0	8	4
ROOT MASS (%)	0	4	19
TERRESTRIAL VEGETATION	0	3	3
AQUATIC VEGETATION (%)	0	8	5
WHITEWATER (%)	0	0	0
BOULDERS (%)	29	34	24
BEDROCK LEDGES (%)	0	14	18

PORTER CREEK 2012
HABITAT TYPES BY PERCENT OCCURRENCE



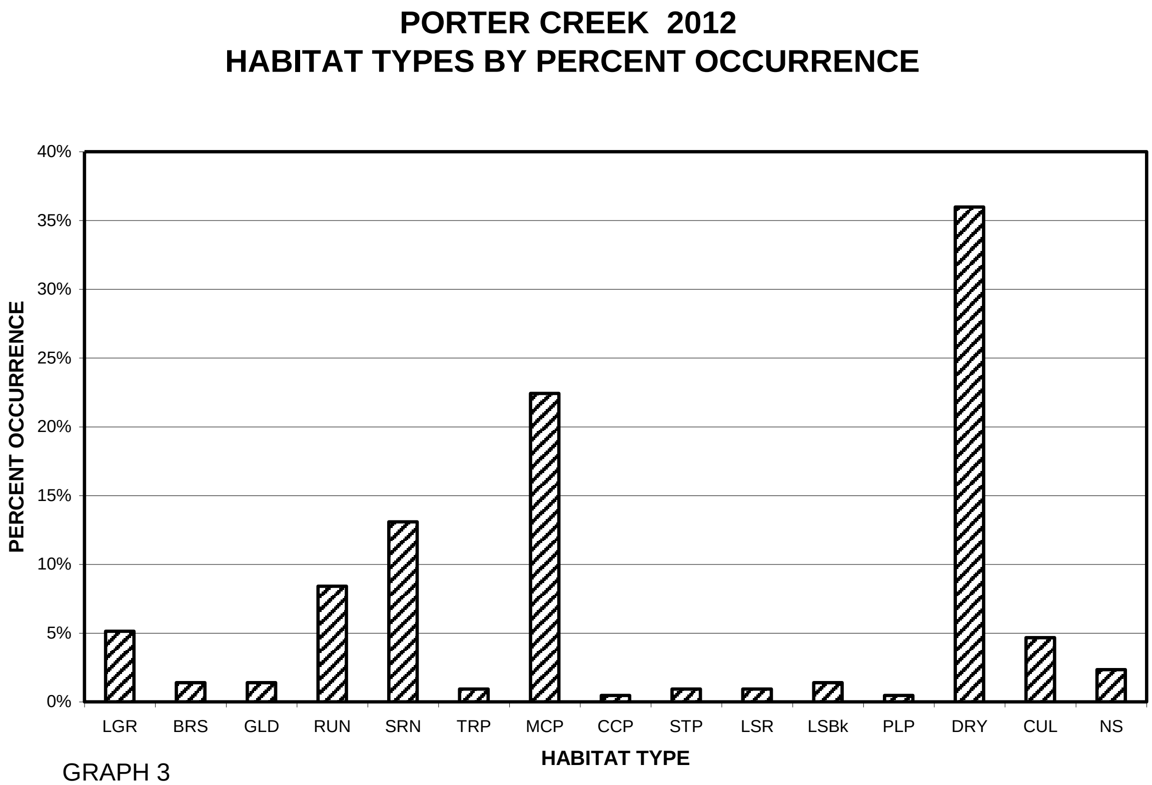
GRAPH 1

PORTER CREEK 2012
HABITAT TYPES BY PERCENT TOTAL LENGTH

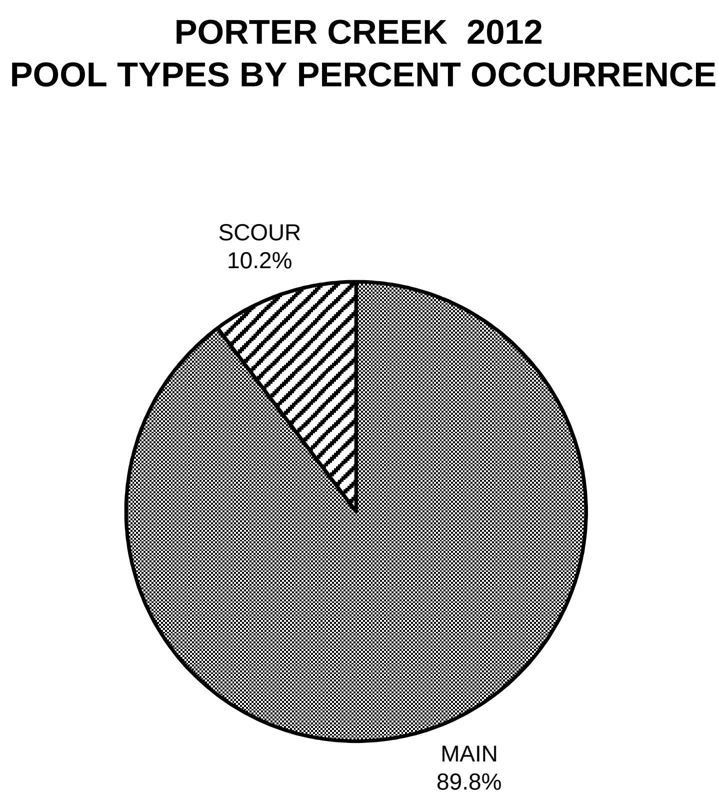


GRAPH 2

Porter Creek

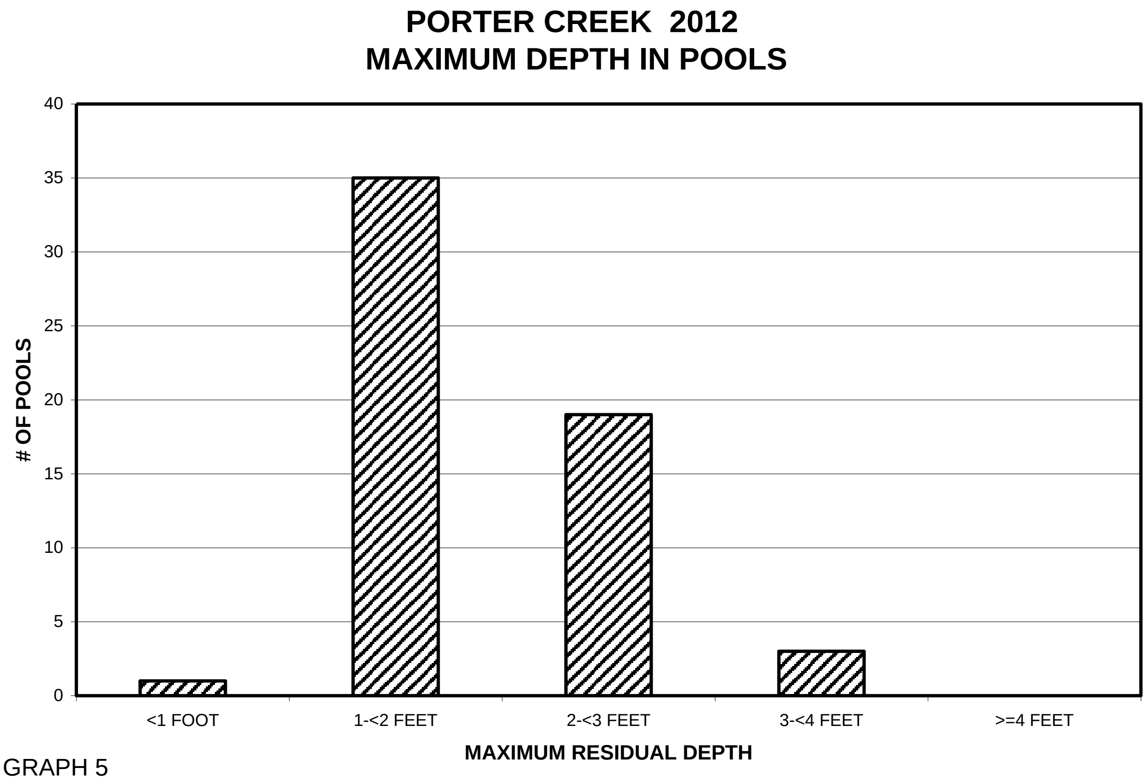


GRAPH 3

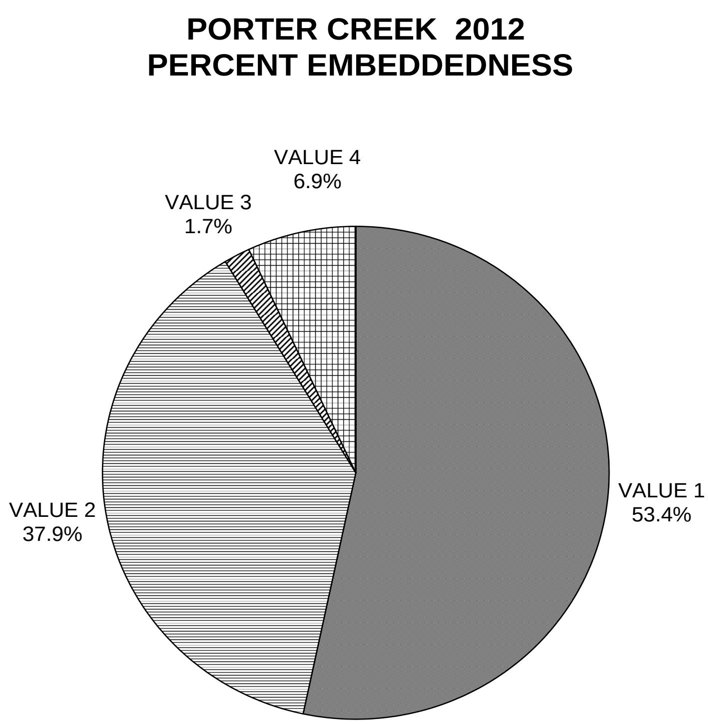


GRAPH 4

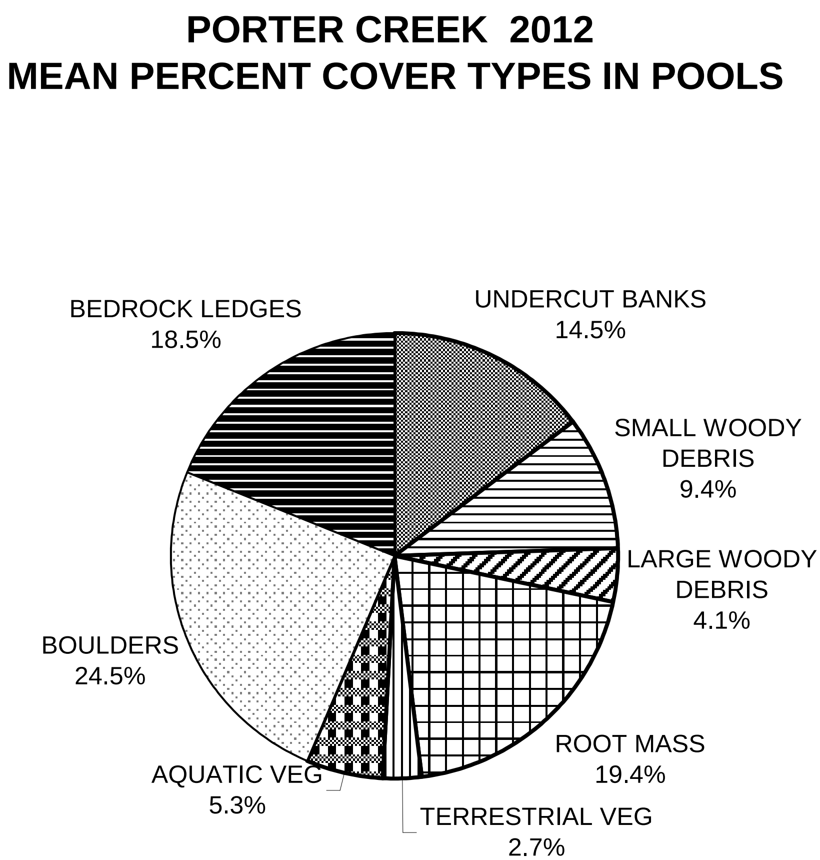
Porter Creek



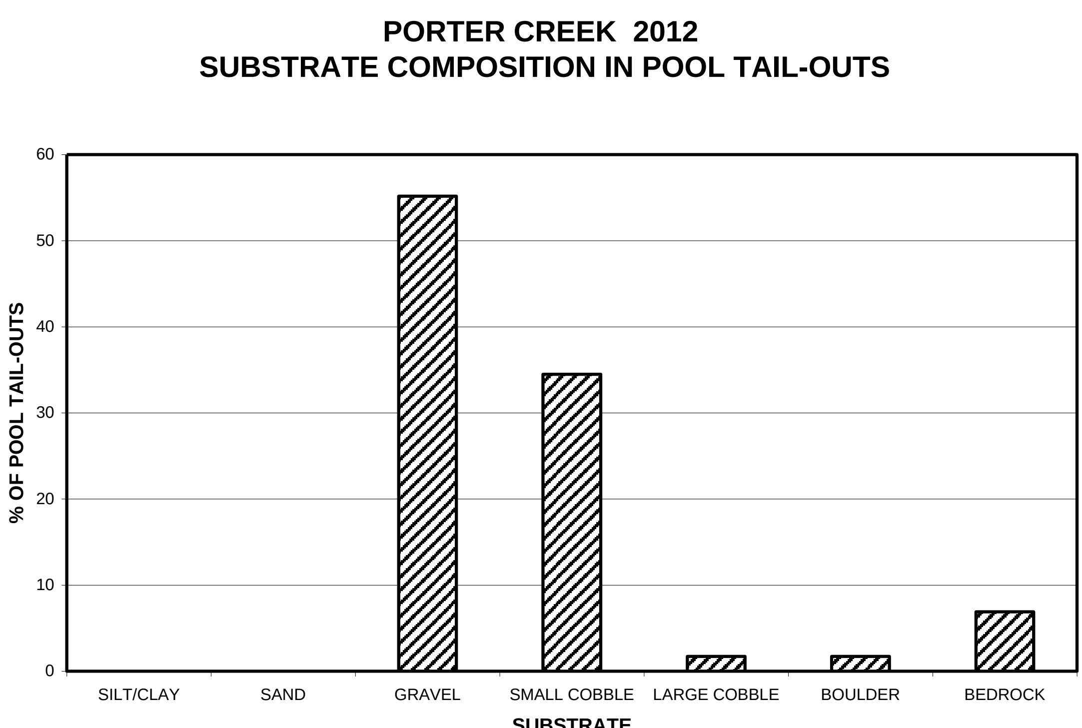
GRAPH 5



GRAPH 6

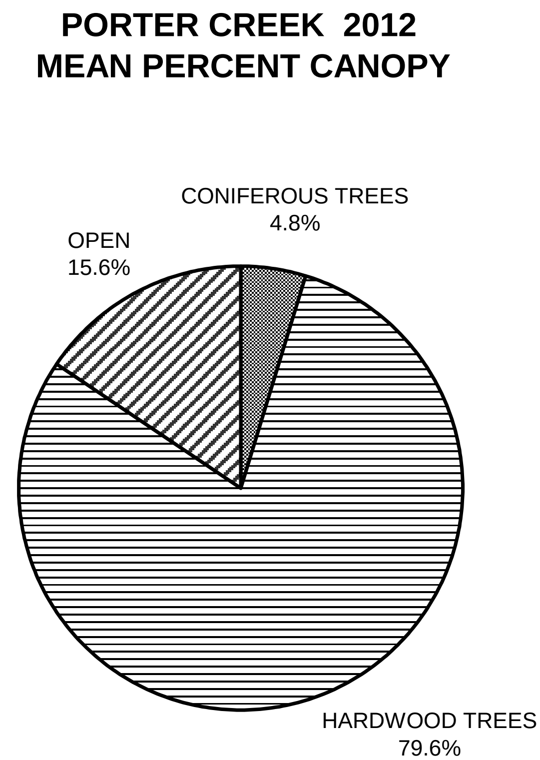


GRAPH 7

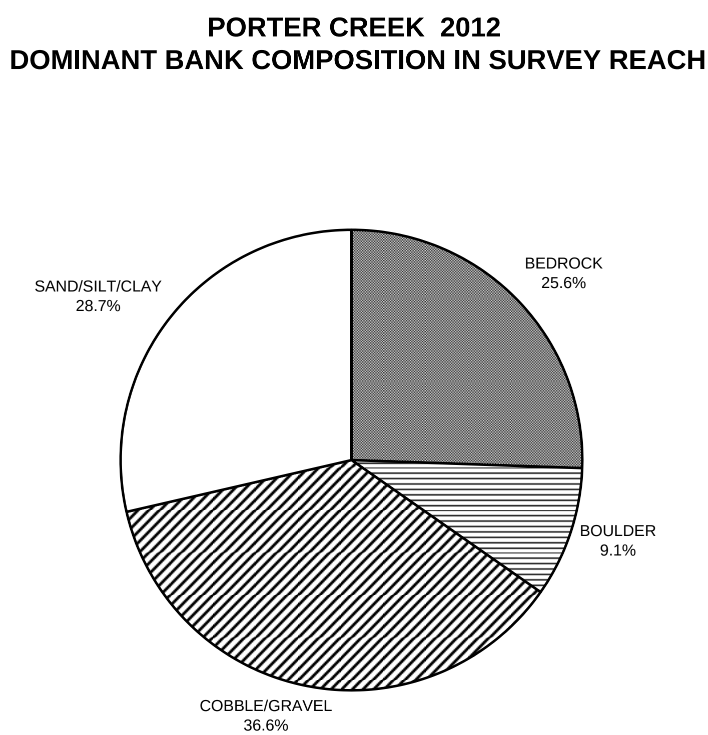


GRAPH 8

Porter Creek

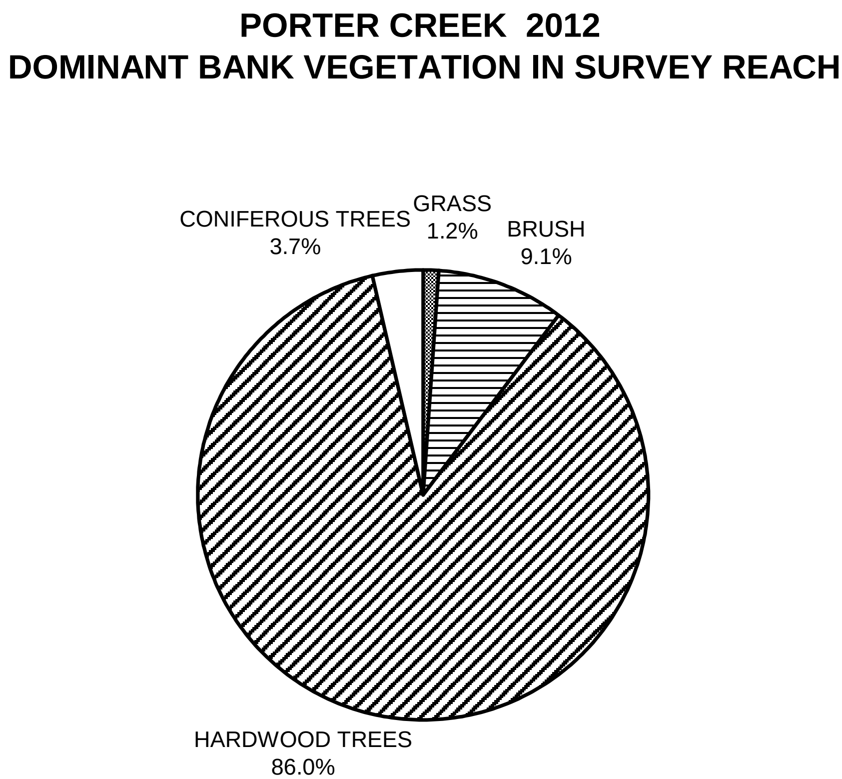


GRAPH 9



GRAPH 10

Porter Creek



GRAPH 11