California Department of Fish and Game
Petaluma River Watershed
Stream Habitat Assessment Reports

Adobe Creek

Surveyed 2007

STREAM INVENTORY REPORT

Adobe Creek

Survey conducted summer 2007
Report completed March 2008

INTRODUCTION

A stream inventory was conducted during 8/1/2007 to 8/8/2007 on Adobe Creek. The survey began at the confluence with Petaluma River and extended upstream 7.6 miles.

The Adobe 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 Adobe Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon 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

Adobe Creek is a tributary to Petaluma River, which flows into the Pacific Ocean, located in Sonoma County, California (Map 1). Adobe Creek's legal description at the confluence with Petaluma River is T04N R07W S2. Its location is 38°13'27" north latitude and 122°36'17" west longitude, LLID number 1226048382241. Adobe Creek is a second order stream and has approximately 11.88 miles of blue line stream according to the USGS National Hydrography Dataset (NHD). Adobe Creek drains a watershed of approximately 5.46 square miles. Elevations range from about sea level at the mouth of the creek to 2,297 feet in the headwaters. Mixed hardwood forest dominates the watershed. The watershed is mostly privately owned which accounts for 90% of the land area. The local government owns about 9.2% and the State owns 0.7%. Twenty three percent of the land is used for agriculture; 6.2% urban and 69.9% is considered natural. Vehicle access exists via Hwy 101 to Washington Road and Adobe Road. The headwaters can be accessed from Sonoma Mountain road.

METHODS

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

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. All pools except step-pools are fully sampled.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Adobe 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". Adobe 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 Adobe 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 Adobe 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 Adobe 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 Adobe 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 Adobe Creek. In addition, four sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 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 Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum 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 Adobe 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 8/1/2007 to 8/8/2007 was conducted by H Fett (CDFG), J Hanson and B Nedland (WSP). The total length of the stream surveyed was 40,269 feet.

Stream flow was not measured on Adobe Creek.

Adobe Creek is a NA channel type for 2,878 feet of the stream surveyed (Reach 1), a F4 channel type for 21,300 feet of the stream surveyed (Reach 2), an A3 channel type for 2,058 feet of the stream surveyed (Reach 3), a F3 channel type for 1,309 feet of the stream surveyed (Reach 4), a NA channel type for 7,958 feet of the stream surveyed (Reach 5) and an A3 channel type for 4,766 feet of the stream surveyed (Reach 6).

NA channels are characterized as reaches where landowner access was not obtained at the time of the survey and were therefore avoided by DFG and WSP field crew. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble dominant substrates. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 65 degrees Fahrenheit. Air temperatures ranged from 52 to 81 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were approximately 2% nosurvey units, 9% culvert units, 1% no survey due to marsh units, 8% dry units, 54% flatwater units, 2% riffle units and 25% pool units (Graph 1). Based on total length of Level II habitat types there were 25% nosurvey units, 1% culvert units, 2% nosurvey_marsh units, 22% dry units, 47% flatwater units, 1% riffle units and 3% pool units (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 9% Culvert units, 8% Glide units and 38% Step Run units (Graph 3). The most frequent habitat types based on percent total length were 25% Not Surveyed units, 22% Dry units and 39% Step Run units.

A total of 41 pools were identified (Table 3). Scour pools were the most frequently encountered, at 59%, and comprised 49% 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. Five of the 41 pools (12%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 41 pool tail-outs measured, 18 had a value of 1 (43.9%); 17 had a value of 2 (41.5%); 3 had a value of 3 (7.3%); 1 had a value of 4 (2.4%); and 2 had a value of 5 (4.9%) (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 2, flatwater habitat types had a mean shelter rating of 7 , and pool habitats had a mean shelter rating of 23 (Table 1). Of the pool types, the Scour pools had a mean shelter rating of 22, Main Channel pools had a mean shelter rating of 27,and Backwater pools had a mean shelter rating of 12 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Adobe Creek. Graph 7 describes the pool cover in Adobe Creek. Boulders are the dominant pool cover type followed by aquatic vegetation.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 34% of pool tail-outs and small Cobble observed in 41% of pool tail-outs.

The mean percent canopy density for the surveyed length of Adobe Creek was 61%. The mean percentages of hardwood and coniferous trees were 100% and 0%, respectively. Thirty-nine percent of the canopy was open. Graph 9 describes the mean percent canopy in Adobe Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 70%. The mean percent left bank vegetated was 69%. The dominant elements composing the structure of the stream banks consisted of 1% bedrock, 10% boulder, 11% cobble/gravel and 78% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 62% of the units surveyed. Additionally, 22% of the units surveyed had grass as the dominant vegetation type, and 16% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished for species composition and distribution in Adobe Creek one on September 19, 2007 and three on September 25, 2007. Water temperatures taken during the electrofishing period ranged from 54 to 58 degrees Fahrenheit. Air temperatures ranged from 61 to 74 degrees Fahrenheit. The sites were sampled by B. Nedland (WSP), J. Delbert-Hanson (WSP), D. Acomb (DFG) and D. Resnik (DFG).

No sites were sampled in Reach 1.

In reach two, one site was sampled on September 19, 2007 starting approximately at habitat unit 39 and continuing to habitat unit 41. The site yielded three young-of-the-year steelhead/ rainbow trout (SH/RT), two age 1+ SH/RT and fifteen three-spine stickleback.

In reach 3, three sites were sampled starting approximately at habitat unit 152 and continuing to habitat unit 163. The reach sites yielded three young-of-the-year SH/RT, thirteen age 1+ SH/RT, twenty five age 2+ SH/RT, ten foothill yellow-legged frog and nine pacific giant salamander.

The following chart displays the information yielded from these sites:

2007 Adobe Creek e-fish observations

Date	Site #	Reference Point	Distance From Reference Point (ft.)	Steelhead/ Rainbow Trout			Non Salmonids Name species
				0+	1+	2+	
09/25/2007	610	Above left bank of dry tributary	NA	0	0	8	6 foothill yellow-legged frogs, 7 pacific giant salamander
9/25/2007	611	Above dam	NA	0	1	4	2 foothill yellow-legged frogs, 1 pacific giant salamander

2007 Adobe Creek e-fish observations cont.

9/25/2007	612	Below Dam	NA	3	12	4	2 foothill yellow-legged frogs, 1 pacific giant salamander
9/19/2007	613	Adobe Road	0-400ft	3	2		15 threespine stickleback

DISCUSSION

Adobe Creek is a NA channel type for the first 2,878 feet of stream surveyed (Reach 1) and a F4 channel type for the next 21,300 feet (Reach 2), an A3 channel type for 2,158 feet of the stream surveyed (Reach 3), a F3 channel type for the next 1,309 feet (Reach 4), a NA channel type for 7,958 feet of the stream surveyed (Reach 5), and an A3 channel type for the remaining 4,766 feet (Reach 6).

NA channels are characterized as reaches where land owner access was not obtained at the time of the survey and were therefore avoided by DFG and WSP field crew. 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 A3 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; poor for boulder clusters and single wing-deflectors. The suitability of F3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders and single and opposing wing-deflectors; and fair for plunge weirs, boulder clusters, channel constrictors and log cover.

The water temperatures recorded on the survey days 8/1/2007 to 8/8/2007, ranged from 54 to 65 degrees Fahrenheit. Air temperatures ranged from 52 to 81 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 47% of the total length of this survey, riffles 1%, and pools 3%. The pools are relatively shallow, with only 5 of the 41 (12%) 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 the numerous log debris accumulations (LDA's) in the stream.

Thirty-five of the 41 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. Two 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 Adobe Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-one of the 41 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 23. The shelter rating in the flatwater habitats was 7. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Boulders in Adobe Creek. Boulders are the dominant cover type in pools followed by aquatic vegetation. 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 61%. Reach 1 was not measured for canopy density, Reach 2 had a canopy density of 64%, Reach 3 had a canopy density of 63%, Reach 4 had a canopy density of 33% and Reach 6 had a canopy density of 60%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was HIGH at 70% and 69%, 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

Adobe 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) Access for migrating salmonids should be assessed, monitored and improved along the stream, particularly at all road crossings and culverts. Where needed crossings and culverts should be replaced or modified to improve fish passage. Potential barriers noted in the assessment were located at the following locations: Casa Grande Rd., Adobe Rd., and the diversion structure in the City of Petaluma's Lafferty park.

2) Adobe Creek would benefit from utilizing bio-technical vegetative techniques for bank stabilization and 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.

3) There are sections where the stream is being impacted (approx. 20,000 feet from mouth) from cattle trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.

4) 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.

5) Increase the canopy on Adobe Creek 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.

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

7) 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.

8) 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.

9) 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.

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 #	Comments
0	0001.00	Start of Survey: Start of Survey at the confluence with the Petaluma River. WP031: 38.22406, 122.60544. The first unit was "not surveyed" due to a muddy deep channel, making it inaccessible.
1685	0002.00	Structures: Bridge #1, Schollenberger Park trail bridge, H.: 12 ft, W.: 72 ft, L.: 11 ft, Water to sill height: 11ft, There was no down cutting, nor retained gravel and it appeared to be having zero effect on the creek.
2878	0005.00	General Comment: Channel change from NA to F4, Reach 1 to Reach 2.
3508	0006.00	Structures: Bridge #2, Mc Dowell Rd., H.: 11ft, W.: 40ft, L.: 50ft: This double box cement bridge had zero down cutting, it was not retaining gravel, and the creek bed was dry here.
4069	0008.00	Structures: Bridge #3, Lakeville Hwy, H.: 7', W.: 30', L.: 60': This double box cement bridge had zero down cutting, it was not retaining gravel, and the creek bed was dry here.
4941	0010.00	Structures: Bridge #4, Sartori Rd., H.: 7', W.: 65', L.: 51', There is no observed down cutting and it is not retaining gravel.
7433	0019.00	Structures: Bridge #5, Ely Rd., H.: 8.5', W.: 50', L.: 70': There is no observed down cutting and it is not retaining gravel.
7718	0021.00	Structures: Bridge #6, Golf cart bridge, H.: 7', W.: 65', L.: 9': There is no observed down cutting and it is not retaining gravel.
8982	0023.00	Structures: Bridge #7, second golf cart bridge, H.: 5', W.: 65', L.: 9': There is no observed down cutting and it is not retaining gravel.
8991	0024.00	General Comment: 410' into unit on right bank cement bags retaining wall, 4' high and 100' long, on left bank the wall is 4' high and 180' long, channel is split at walls for 110', 10-15ft between channels.
9659	0025.00	Structures: Bridge #8, Casa Grande Rd., H.: 4.5', W.: 45', L.: 47', no down cutting, retaining about 3-4ft of gravel, triple box bridge, majority of flow travels through right bank box.
9706	0026.00	General Comment: 15' into unit, right bank culvert, 2' diameter and dry, 20' into unit cement bag retaining wall on right bank for 25'

Position	Habitat Unit #	Comments
11631	0027.00	Structures: Culvert #1, Casa Grande Rd., L.: 46', W.: 25', H.: 4.5', There is no down cutting, it is retaining gravel – the right bank is almost completely filled in. Water does not pass through the culvert here. Left bank culvert1.5' of retaining gravel. All flow appears to pass through the left box.
12673	0033.00	Bio Sample: (E-Fish) E-Fish location, Right by Adobe Rd., Steelhead observed
12909	0036.00	Structures: Pool enhancing structure has developed a great pool and fish are present.
12963	0038.00	Structures: Large woody debris structure creating a scour pool.
13090	0040.00	General Comment: Step-pool structure consisting of 5 pools.
13145	0041.00	Structures: Culvert #2, Adobe Rd., L.: 51', W.; 11.5', H.: 8.4', There is no down cutting, it's not retaining gravel, fish ladder inside of culvert is 4' wide and extends the length of the culvert. Fish ladder should be maintained (cleaned out) regularly.
13730	0047.00	Structures: Bridge #9, State Park walking bridge, H.: 4.5', W.: 47', L.: 6': There is no observed down cutting and it is not retaining gravel.
15837	0063.00	General Comment: Steelhead observed
16721	0067.00	Fish Passage: (Dam) Possible fish barrier at top of pool, 4.5' It is a man-made concrete structure that has created a jump for fish.
16741	0068.00	Structures: Bridge #10, H.: 7.2', W.: 26.5', L.: 14', down cutting, water to sill height: 4.5': It is not retaining gravel.
18090	0081.00	Structures: Bridge #11, Manor Lane, H.: 5.9', W.: 28', L.: 23': There is no observed down cutting and it is not retaining gravel.
18706	0086.00	General Comment: Fish observed
19654	0094.00	General Comment: Pool has lots of fish 2+ and 3+ salmonids.
19990	0098.00	General Comment: Cows in the creek
24178	0121.00	General Comment: Channel type change from F4 to A3, Reach 2 to 3.
24606	0126.00	General Comment: Fish observed
26224	0140.00	Structures: Bridge #12, Private utility bridge, H.: 2', W.: 12.5', L.: 11.5', no down cutting, not retaining gravel
26236	0141.00	General Comment: Channel change from A3 to F3, Reach change from 3 to 4
26489	0143.00	General Comment: Fish observed
26934	0146.00	Structures: Collapsed concrete structure in channel.

Position	Habitat Unit #	Comments
26934	0146.00	Tributaries: #1 on left bank, 8' from the end of unit, flowing, contributes ~ 30% to flow, water temp. d/s of tributary 62F, tributary 56F, u/s of tributary 65F, accessible to fish, slope ~ 2%, checked up tributary for 100', no fish observed.
27533	0150.00	General Comment: Channel type change from F3 to NA, Reach 4 to 5.
27533	0150.00	Structures: Bridge #13, bridge to private property, H.: 12', W.: 61', L.: 12', There is no observed down cutting and it is not retaining gravel. The top of bridge is the beginning of the no access point.
27545	0151.00	General Comment: Channel type change from NA to A3, Reach change from 5 to 6.
35866	0154.00	Fish Passage: (Other) Possible fish barrier at top of unit, concrete, 13' high and 18' wide, 1' water below structure, no fish observed.
36173	0156.00	General Comment: 4' drop into pool.
36184	0157.00	General Comment: Steelhead observed
37501	0161.00	General Comment: Spring on left bank at 271' into unit
38126	0163.00	General Comment: Triple fork (tributary 2 and 3) at 780' into unit, W.P.: 058, N38.31463, W122.58612, fish observed ~1000' into unit,
38126	0163.00	Tributaries: #2 on left bank: not flowing, not accessible to fish, checked up tributary for ~100', slope >10%, no fish observed, tributary #3 on right bank, not flowing, not accessible to fish, slope >10%, no fish observed.
40269	0163.00	End of Survey: Creek seems to end here.

REFERENCES

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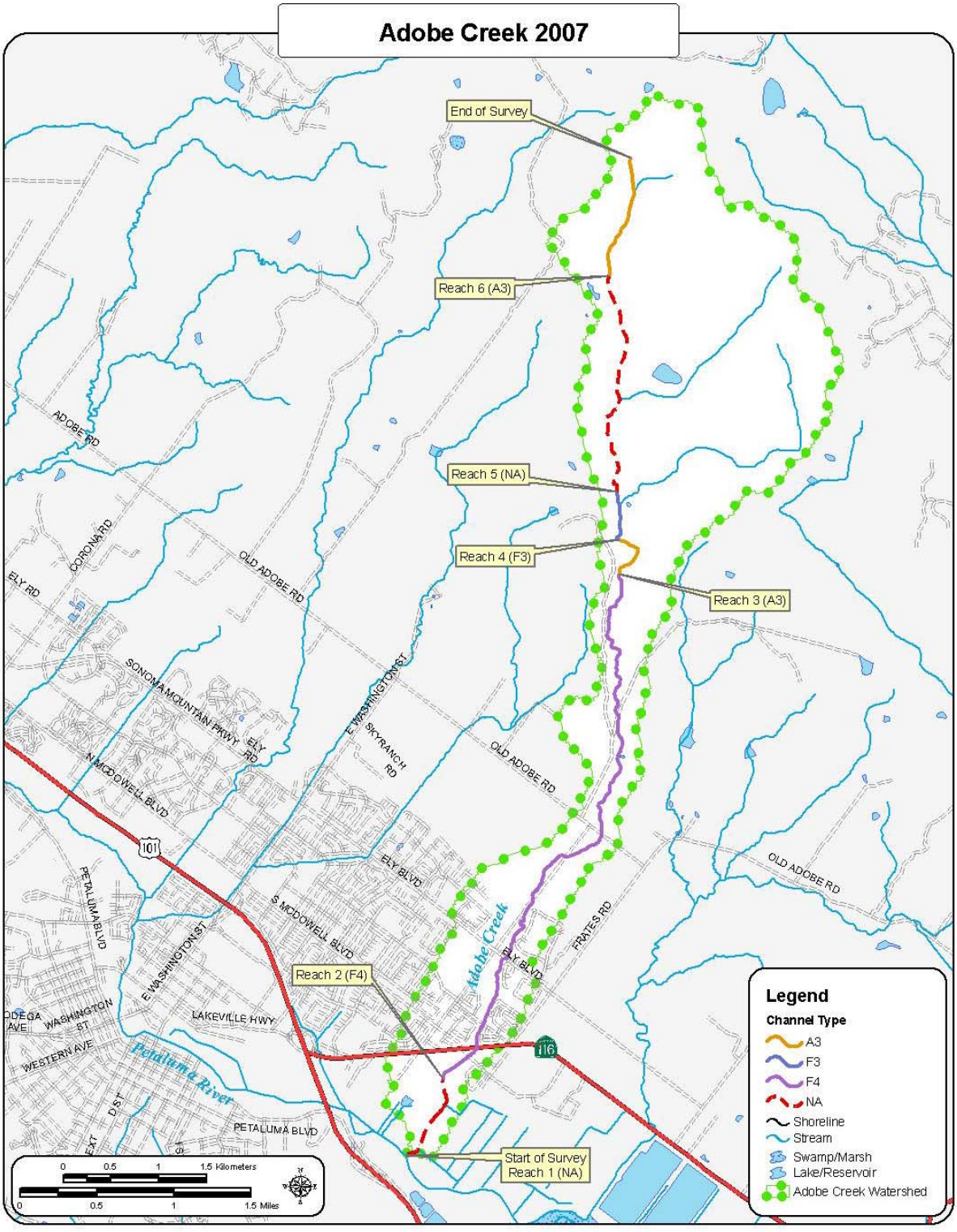
McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.

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]	



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Prepared by: Scott Webb, December 2007

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

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: Quad: GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

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
15	0	CULVERT	9.0	32	476	1.2									
13	0	DRY	7.8	668	8688	21.5									
89	16	FLATWATER	53.6	212	18910	46.8	6.3	0.4	0.8	985	87695	419	37259		7
3	0	NOSURVEY	1.8	3348	10043	24.9									
1	0	NOSURVEY_ MARSH	0.6	782	782	1.9									
41	41	POOL	24.7	30	1227	3.0	7.9	0.8	1.6	234	9605	245	10061	189	23
4	2	RIFFLE	2.4	61	243	0.6	4.5	0.3	0.9	147	588	45	179		3

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
166	59	40369	97888	47499

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: Quad: GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

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 (%)
3	1	LGR	1.8	61	183	0.5	4.0	0.1	0.3	144	432	14	43		0	68
1	1	CAS	0.6	60	60	0.1	5.0	0.5	1.4	150	150	75	75		5	15
14	4	GLD	8.4	57	793	2.0	6.0	0.5	1.2	302	4223	152	2132		4	71
12	2	RUN	7.2	183	2193	5.4	7.0	0.5	1.0	1564	18770	782	9385		5	24
63	10	SRN	38.0	253	15924	39.4	6.0	0.3	1.2	1143	72012	452	28507		9	53
10	10	MCP	6.0	32	316	0.8	7.0	0.8	1.9	220	2199	236	2361	185	15	73
5	5	STP	3.0	41	206	0.5	13.0	0.6	1.6	463	2316	363	1814	250	50	60
3	3	CRP	1.8	33	98	0.2	6.0	0.7	2.8	185	554	176	527	133	22	95
2	2	LSR	1.2	38	75	0.2	6.0	0.8	2.2	225	449	218	437	187	30	95
4	4	LSBk	2.4	36	143	0.4	6.0	0.9	2.1	218	871	255	1021	205	35	24
8	8	LSBo	4.8	20	160	0.4	7.0	0.7	1.9	136	1090	133	1062	91	13	87
7	7	PLP	4.2	18	127	0.3	10.0	1.0	3.5	200	1399	273	1910	228	23	71
2	2	BPR	1.2	51	102	0.3	6.0	1.0	1.7	364	728	464	929	364	13	77
13	0	DRY	7.8	668	8688	21.5										67
15	0	CUL	9.0	32	476	1.2										
3	0	NS	1.8	3348	10043	24.9										0
1	0	MAR	0.6	782	782	1.9										0

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
166	59	40369	105192	50203

Table 3 - Summary of Pools Types

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: **Quad:** GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

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
15	15	MAIN	37	35	522	43	8.9	0.8	301	4514	207	3100	27
24	24	SCOUR	59	25	603	49	7.5	0.8	182	4362	163	3909	22
2	2	BACKWATER	5	51	102	8	6.0	1.0	364	728	364	728	13

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
41	41	1227	9605	7737

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

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: Quad: GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
2	LSR	5	0	0	1	50	1	50	0	0	0	0
7	PLP	17	0	0	5	71	1	14	1	14	0	0
5	STP	12	0	0	5	100	0	0	0	0	0	0
3	CRP	7	0	0	2	67	1	33	0	0	0	0
10	MCP	24	0	0	10	100	0	0	0	0	0	0
4	LSBk	10	0	0	3	75	1	25	0	0	0	0
8	LSBo	20	0	0	8	100	0	0	0	0	0	0
2	BPR	5	0	0	2	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
41			0	0	36	88	4	10	1	2	0	0

Mean Maximum Residual Pool Depth (ft.): 1.6

Table 5 - Summary of Mean Percent Cover by Habitat Type

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: **Quad:** GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
3	1	LGR	0	0	0	0	0	0	0	0	0
1	1	CAS	0	0	0	0	0	0	100	0	0
4	2	TOTAL RIFFLE	0	0	0	0	0	0	50	0	0
14	4	GLD	0	0	0	0	13	13	0	25	0
12	2	RUN	0	0	0	0	0	35	0	15	0
63	11	SRN	0	0	0	0	5	7	5	55	0
89	17	TOTAL FLAT	0	0	0	0	6	11	3	44	0
10	10	MCP	3	0	10	15	13	30	5	23	0
5	5	STP	0	0	8	0	0	6	24	62	0
3	3	CRP	33	0	0	33	0	0	0	33	0
2	2	LSR	20	20	0	60	0	0	0	0	0
4	4	LSBk	0	3	3	15	0	29	3	6	43
8	8	LSBo	0	0	0	0	6	0	21	73	0
7	7	PLP	0	6	4	0	6	16	23	45	0
2	2	BPR	0	0	0	70	15	15	0	0	0
41	41	TOTAL POOL	4	2	4	14	6	14	12	38	4
15	0	CUL									
3	0	NS									
1	0	MAR									
166	60	TOTAL	3	2	3	10	6	13	11	38	3

Table 6 - Summary of Dominant Substrates by Habitat Type

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007 **Dry Units:** 13

Confluence Location: **Quad:** GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
3	1	LGR	0	0	100	0	0	0	0
1	1	CAS	0	0	0	0	0	100	0
14	4	GLD	25	0	50	25	0	0	0
12	2	RUN	0	0	100	0	0	0	0
63	11	SRN	0	0	18	27	36	18	0
10	10	MCP	60	0	0	30	10	0	0
5	5	STP	0	0	40	0	0	60	0
3	3	CRP	0	0	67	33	0	0	0
2	2	LSR	50	0	50	0	0	0	0
4	4	LSBk	0	0	50	50	0	0	0
8	8	LSBo	13	25	50	13	0	0	0
7	7	PLP	43	0	43	14	0	0	0
2	2	BPR	50	0	0	50	0	0	0
15	0	CUL	0	0	0	0	0	0	0
3	0	NS	0	0	0	0	0	0	0
1	0	MAR	0	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: **Quad:** GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
61	0	100	18	70	69

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 Name: Adobe Creek LLID: 1226048382241 Drainage: Petaluma River
Survey Dates: 8/1/2007 to 8/8/2007 Survey Length (ft.): 40369 Main Channel (ft.): 40269 Side Channel (ft.): 100
Confluence Location: Quad: GLEN ELLEN Legal Description: T04NR07WS02 Latitude: 38:13:27.0N Longitude: 122:36:17.0W

Summary of Fish Habitat Elements by Stream Reach

STREAM REACH: 1

Channel Type: NA
Reach Length (ft.): 2878
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.):
Mean (ft.):
Std. Dev.:
Base Flow (cfs):
Water (F): Air (F):
Dry Channel (ft.):

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

Pools by Stream Length (%):
Pool Frequency (%):
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 (ft.):
Mean Pool Shelter Rating:

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

STREAM REACH: 2

Channel Type: F4
Reach Length (ft.): 21300
Riffle/Flatwater Mean Width (ft.): 5.7
BFW:
Range (ft.): 11 to 30
Mean (ft.): 14.91
Std. Dev.: 3.55
Base Flow (cfs): NA
Water (F): 61 - 65 Air (F): 52 - 81
Dry Channel (ft.): 8523

Canopy Density (%): 64.2
Coniferous Component (%): 0.0
Hardwood Component (%): 100.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 74.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 2.8
LWD per 100 ft.:
Riffles: 0
Pools: 1
Flat: 0

Pools by Stream Length (%): 4.3
Pool Frequency (%): 23.3
Residual Pool Depth (%):
< 2 Feet Deep: 81.5
2 to 2.9 Feet Deep: 14.8
3 to 3.9 Feet Deep: 3.7
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.70
Mean Pool Shelter Rating: 22

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 33.3 Sm Cobble: 44.4 Lg Cobble: 18.5 Boulder: 3.7 Bedrock: 0.0
Embeddedness Values (%): 1. 55.6 2. 33.3 3. 7.4 4. 0.0 5. 3.7

Summary of Fish Habitat Elements by Stream Reach

STREAM REACH: 3

Channel Type: A3
Reach Length (ft.): 2058
Riffle/Flatwater Mean Width (ft.): 11.0
BFW:
Range (ft.): 14 to 32
Mean (ft.): 25.22
Std. Dev.: 6.25
Base Flow (cfs): NA
Water (F): 57 - 65 Air (F): 54 - 66
Dry Channel (ft.): 0

Canopy Density (%): 62.8
Coniferous Component (%): 0.0
Hardwood Component (%): 100.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 55.2
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 3.6
LWD per 100 ft.:
Riffles:
Pools: 2
Flat: 0

Pools by Stream Length (%): 10.8
Pool Frequency (%): 43.5
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.47
Mean Pool Shelter Rating: 25

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 50.0 Sm Cobble: 10.0 Lg Cobble: 40.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 20.0 2. 50.0 3. 10.0 4. 10.0 5. 10.0

STREAM REACH: 4

Channel Type: F3
Reach Length (ft.): 1309
Riffle/Flatwater Mean Width (ft.): 8.0
BFW:
Range (ft.): 22 to 22
Mean (ft.): 22
Std. Dev.: 0
Base Flow (cfs): NA
Water (F): 65 - 65 Air (F): 64 - 66
Dry Channel (ft.): 0

Canopy Density (%): 33.0
Coniferous Component (%): 0.0
Hardwood Component (%): 100.0
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 64.2
Dominant Shelter: Aquatic Vegetation
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools: 0
Flat: 0

Pools by Stream Length (%): 4.0
Pool Frequency (%): 10.0
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.5
Mean Pool Shelter Rating: 80

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 0.0 Sm Cobble: 100. Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 100.0 3. 0.0 4. 0.0 5. 0.0

Summary of Fish Habitat Elements by Stream Reach

STREAM REACH: 5

Channel Type: NA
Reach Length (ft.): 7958
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs):
Water (F): Air (F):
Dry Channel (ft.):

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

Pools by Stream Length (%):
Pool Frequency (%):
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 (ft.):
Mean Pool Shelter Rating:

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

STREAM REACH: 6

Channel Type: A3
Reach Length (ft.): 4766
Riffle/Flatwater Mean Width (ft.): 4.7
BFW:
Range (ft.): 17 to 25
Mean (ft.): 23.67
Std. Dev.: 2.98
Base Flow (cfs): N/A
Water (F): 54 - 58 Air (F): 52 - 70
Dry Channel (ft.): 165

Canopy Density (%): 59.7
Coniferous Component (%): 0.0
Hardwood Component (%): 100.0
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 65.8
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 4.2
LWD per 100 ft.:
Riffles: 0
Pools: 9
Flat: 0

Pools by Stream Length (%): 0.7
Pool Frequency (%): 25.0
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 10

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 0.0 Sm Cobble: 100. Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 33.3 2. 66.7 3. 0.0 4. 0.0 5. 0.0

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: **Quad:** GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

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	1	0	0.8
Boulder	6	6	10.0
Cobble/Gravel	5	8	10.8
Sand/Silt/Clay	48	46	78.3

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	15	12	22.5
Brush	11	8	15.8
Hardwood Trees	34	40	61.7
Coniferous Trees	0	0	0.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

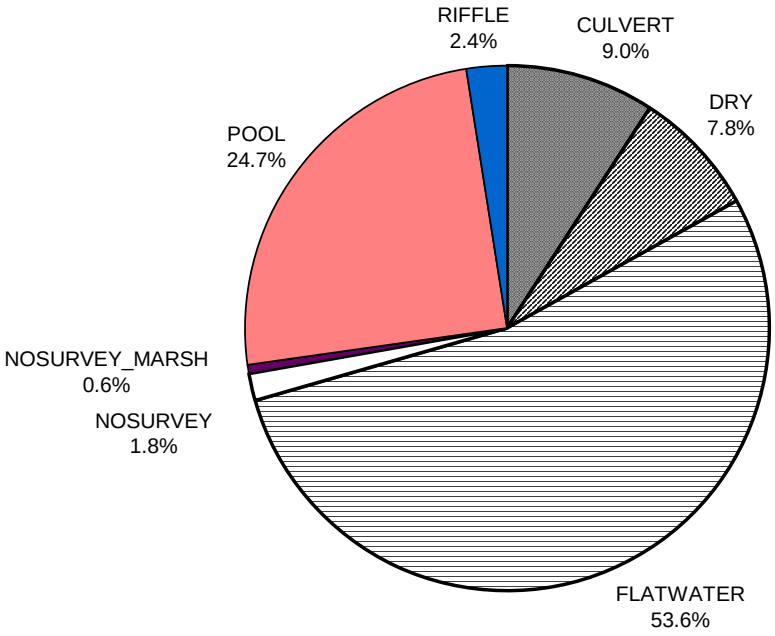
Stream Name: Adobe Creek **LLID:** 1226048382241 **Drainage:** Petaluma River

Survey Dates: 8/1/2007 to 8/8/2007

Confluence Location: Quad: GLEN ELLEN **Legal Description:** T04NR07WS02 **Latitude:** 38:13:27.0N **Longitude:** 122:36:17.0W

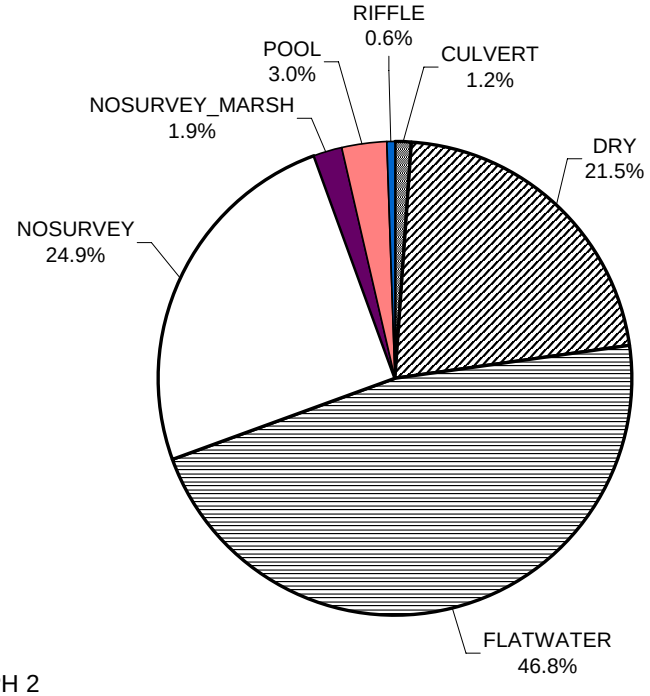
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	4
SMALL WOODY DEBRIS (%)	0	0	2
LARGE WOODY DEBRIS (%)	0	0	4
ROOT MASS (%)	0	0	14
TERRESTRIAL VEGETATION (%)	0	6	6
AQUATIC VEGETATION (%)	0	11	14
WHITEWATER (%)	50	3	12
BOULDERS (%)	0	44	38
BEDROCK LEDGES (%)	0	0	4

ADOBE CREEK 2007
HABITAT TYPES BY PERCENT OCCURRENCE



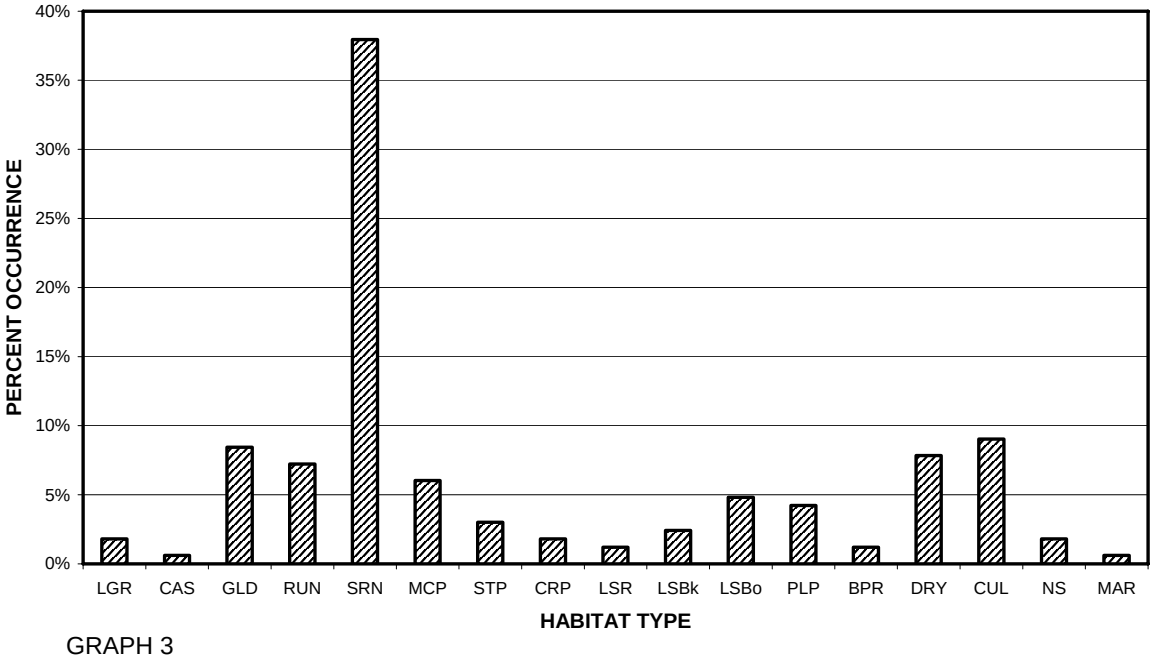
GRAPH 1

ADOBE CREEK 2007
HABITAT TYPES BY PERCENT TOTAL LENGTH



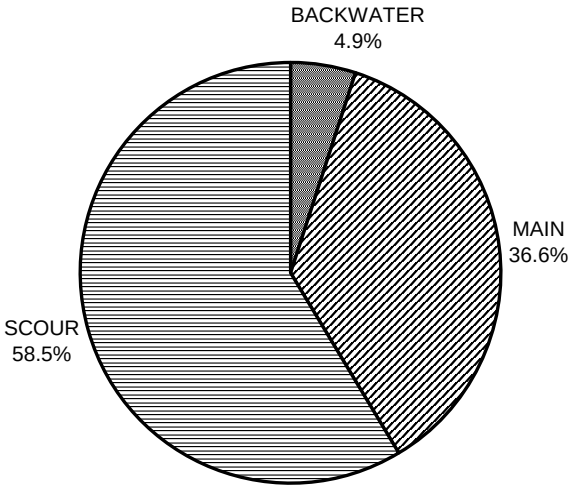
GRAPH 2

ADOBE CREEK 2007
HABITAT TYPES BY PERCENT OCCURRENCE

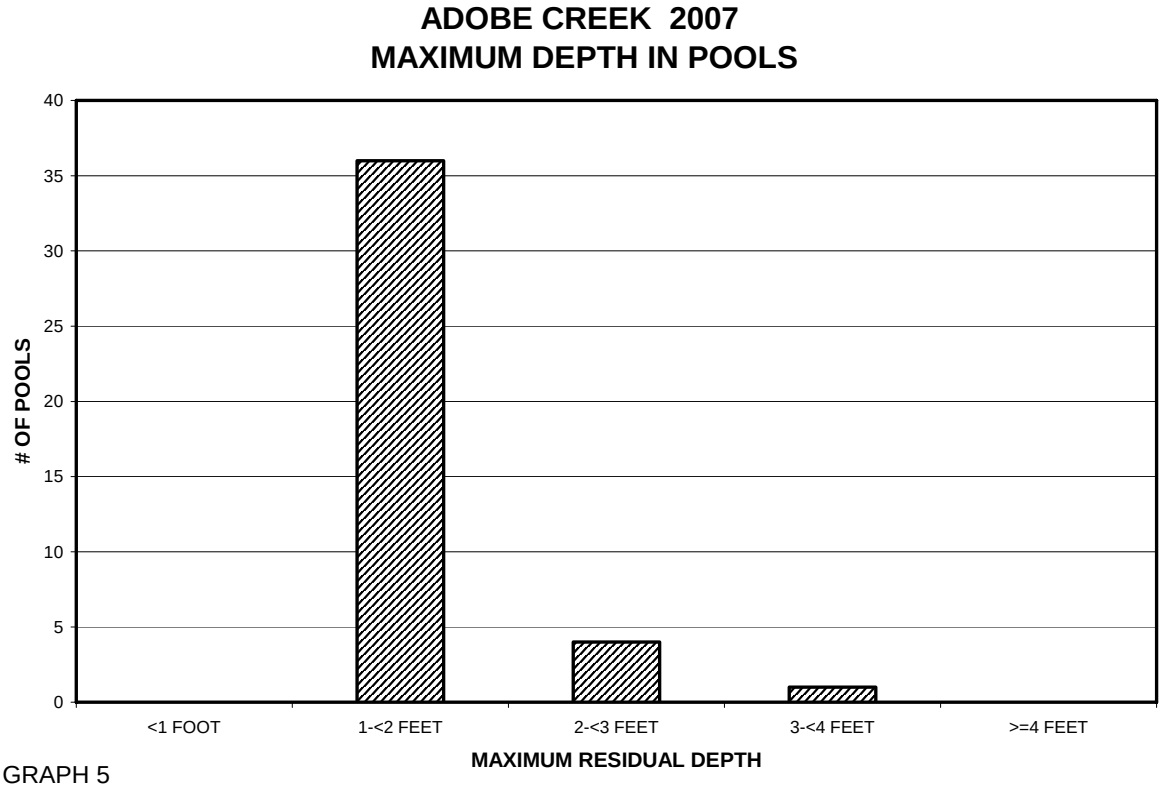


GRAPH 3

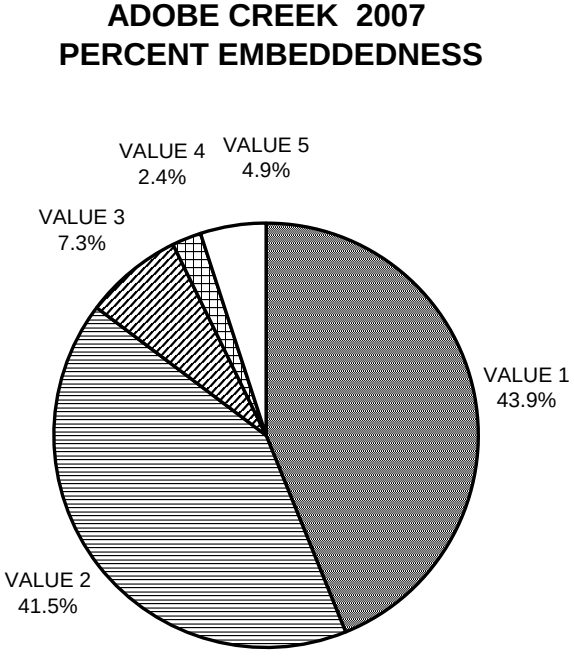
ADOBE CREEK 2007
POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

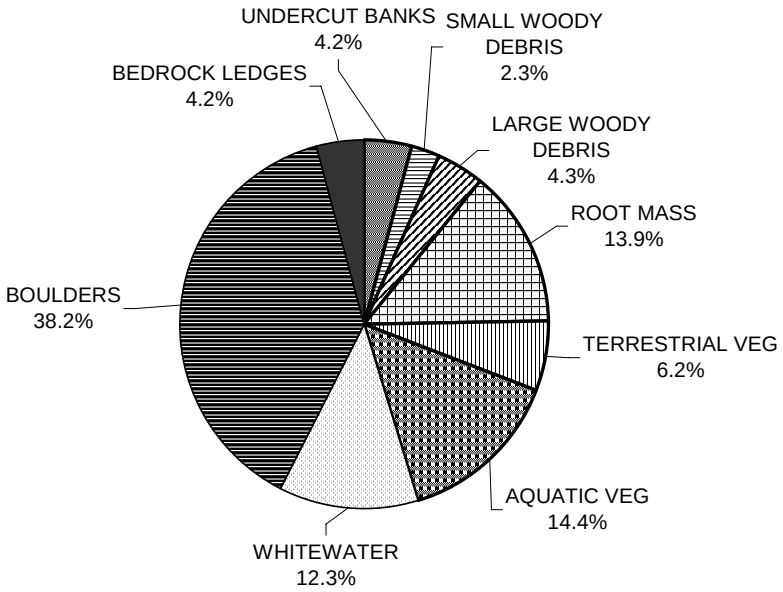


GRAPH 5



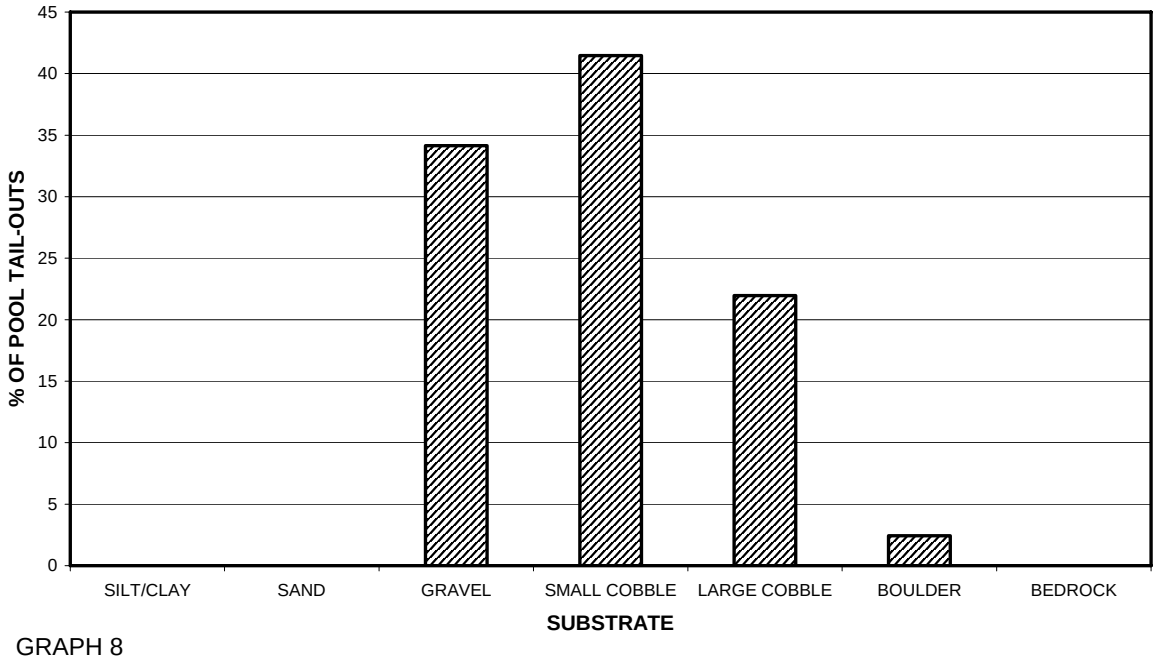
GRAPH 6

ADOBE CREEK 2007
MEAN PERCENT COVER TYPES IN POOLS



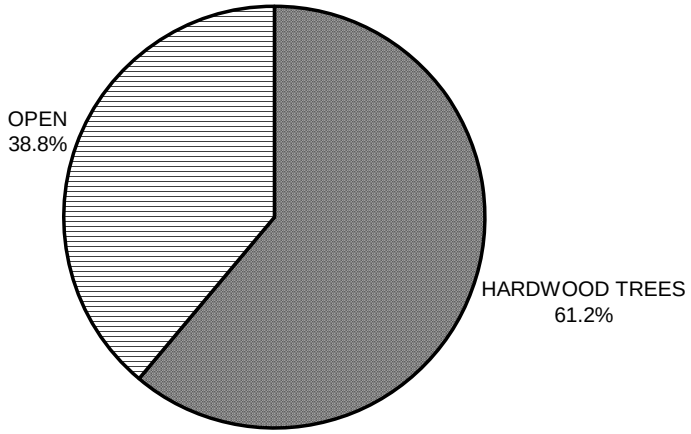
GRAPH 7

ADOBE CREEK 2007
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



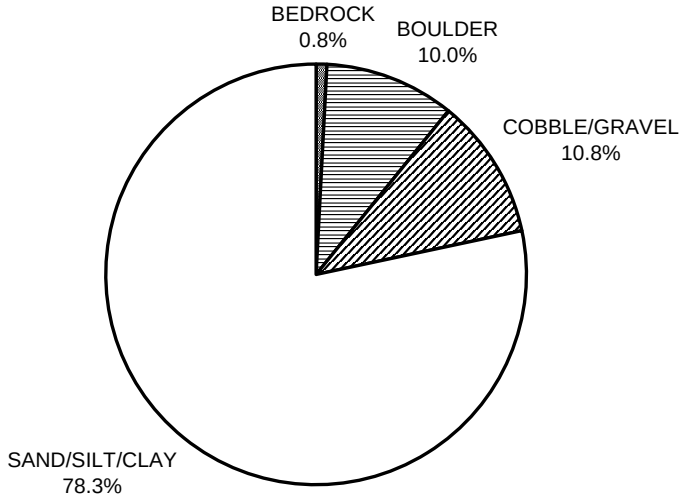
GRAPH 8

ADOBE CREEK 2007
MEAN PERCENT CANOPY



GRAPH 9

ADOBE CREEK 2007
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

ADOBE CREEK 2007
DOMINANT BANK VEGETATION IN SURVEY REACH

GRAPH 11