California Department of Fish and Game
Walker Creek Watershed
Stream Habitat Assessment Reports

Chileno Creek

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STREAM INVENTORY REPORT

Chileno Creek

Assessment Completed Septemeber 2008
Report Completed March 2009

INTRODUCTION

A stream inventory was conducted during 9/11/2008 to 9/15/2008 on Chileno Creek. The survey began at the confluence with Walker Creek and extended upstream 5.04 miles.

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

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

WATERSHED OVERVIEW

Chileno Creek is a tributary to Walker Creek, which is a tributary to Pacific Ocean, and is located in Marin County, California (Map 1). Chileno Creek's legal description at the confluence with Walker Creek is T04N R09W S04. Its location is 38° 12' 45" north latitude and 122° 51' 32" west longitude, LLID number 1228589382124. Chileno Creek is a third order stream and has approximately 30.82 miles of blue line stream according to the USGS National Hydrography Dataset (NHD). Chileno Creek drains a watershed of approximately 20.25 square miles. Elevations range from about 72 feet at the mouth of the creek to 1,381 feet in the headwater areas. Grassland and herbaceous land dominates the watershed. The watershed is primarily privately owned. Vehicle access exists via private driveway off Chileno Valley Rd.

METHODS

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

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the

survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are fully measured. 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.

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 Chileno 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". Chileno 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 Chileno 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 Chileno 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 Chileno 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 Chileno 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 Chileno Creek. In addition, 1 site was electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and 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 Chileno 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 9/11/2008 to 9/15/2008 was conducted by H. Colton, and T. Pool, (WSP). The total length of the stream surveyed was 26,634 feet.

Stream flow was not measured on Chileno Creek.

Chileno Creek is an F3 channel type for 9,835 feet of the stream surveyed (Reach 1), a NA channel type for 11,570 feet of the stream surveyed (Reach 2), and an F3 channel type for 5,229 feet of the stream surveyed (Reach 3).

NA channels are no access reaches that were not surveyed due to lack of permission from land owner to survey stream or physically inaccessible due to depth, dense vegetation or other considerations.

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 55 to 56 degrees Fahrenheit. Air temperatures ranged from 54 to 60 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 48% dry units, 38% pool units, and 8% culvert units (Graph 1). Based on total length of Level II habitat types there were 52% dry units, 43% no survey units, and 4% pool units (Graph 2).

Three Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 48% Dry units, 38% Mid-Channel Pool units, and 8% Culvert units (Graph 3). Based on percent total length there were 52% Dry units, and 43% Not Surveyed units, and 4% Mid-Channel Pool units.

A total of 20 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 100%, and comprised 100% 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. None of the 20 pools (0%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 20 pool tail-outs measured, 1 had a value of 2 (5%); 3 had a value of 3 (15%); and 16 had a value of 4 (80%), (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. Flatwater habitat types had a mean shelter rating of 4, and pool habitats had a mean shelter rating of 4 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 4 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial Vegetation is the dominant cover types in Chileno Creek. Graph 7 describes the pool cover in Chileno Creek. Terrestrial Vegetation is the dominant pool cover type followed by root mass.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Silt/clay and sand substrate types were each observed in 35% of pool tail-outs whereas gravel and cobble were each observed in 15% of pool tail-outs.

The mean percent canopy density for the surveyed length of Chileno Creek was 54%. The mean percentages of hardwood and coniferous trees were 100% and 0%, respectively. Forty-six percent of the canopy was open. Graph 9 describes the mean percent canopy in Chileno Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 90%. The mean percent left bank vegetated was 88%. The dominant elements composing the structure of the stream banks consisted of 95% cobble/gravel, 2% bedrock, and 2% sand/silt/clay. (Graph 10). Hardwood trees were the dominant vegetation type observed in 98% of the units surveyed. Additionally, 2% of the units surveyed had grass as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished for species composition and distribution in Chileno Creek on October 30, 2008. The site was sampled by H. Colton, T. Pool (WSP), D. Acomb and D. Resnik (DFG).

The site (Site 1) yielded 1 young-of-the-year steelhead/rainbow trout (SH/RT). This reach began at that mouth of the confluence of Chileno and Walker Creek and continued upstream about 300 feet. The pools that were surveyed were shallow with a lot of fines. This reach was approximately 319 feet long.

The following chart displays the information yielded from this site:

2008 Chileno Creek e-fish observations.

Date	Site #	Reference Point	Distance From Reference Point (ft.)	Steelhead/ Rainbow Trout			Coho Salmon	Non Salmonids
				0+	1+	2+	0+ and 1+	
10/30/2008	1	Mouth of creek	300 ft upstream	1	0	0	0	0

DISCUSSION

Chileno Creek is an F3 channel type for the first 9,835 feet of stream surveyed and an NA channel type for the next 11,570 feet and an F3 channel type for the remaining 5,229 feet. The suitability of F3 channel types for fish habitat improvement structures is as follows: they are good for bank placed boulders, single and opposing wing-deflectors; they are fair for plunge weirs, boulder clusters, channel constrictors, and log cover.

The water temperatures recorded on the survey days 9/11/2008 to 9/15/2008 ranged from 55 to 56 degrees Fahrenheit. Air temperatures ranged from 54 to 60 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 0.2% of the total length of this survey, riffles 0%, and pools 4.4%. The pools are relatively shallow, with only 5 of the 20 (25%) 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 (NOTE: for 3rd and 4th order streams maximum residual depth is at least three feet). 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.

One of the 20 pool tail-outs measured had embeddedness ratings of 1 or 2. Nineteen of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Chileno Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fourteen of the 20 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 4. The shelter rating in the flatwater habitats was 4. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Terrestrial Vegetation in Chileno Creek. Terrestrial Vegetation is the dominant cover type in pools followed by root mass. 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 54%. Reach 1 had a canopy density of 50%, Reach 3 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 90% and 88%, 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

Chileno 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) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives to uncontrolled riparian grazing should be explored with the grazier and developed if possible.

2) Increase the canopy on Chileno 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.

1) Chilleno 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) 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.

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

5) 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.

6) Access for migrating salmonids should be assessed at all road crossings. Where needed crossings should be replaced or modified to improve fish passage.

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 confluence with Walker Creek. Reach 1 (F3)
230	0004.00	General Comment: 650 feet into unit channel cross section taken.
1299	0005.00	General Comment: Ranch road crossing: 40 feet wide, 0.9 feet high from creek, and 11 feet long. Concrete road crossing. Possible barrier to fish migration.
5656	0017.00	General Comment: unknown fish observed.
5921	0020.00	Tributaries: 981 feet into unit Chileno tributary #1. Tributary has 1 dam and 1 bridge unit on it. The dam is 1.4 feet long, 9.2 feet tall and 15.6 feet wide. There are no flashboards but creek is down cutting and is dry.
8400	0022.00	Tributaries: left bank dry tributary 521 feet into unit.
9835	0025.00	General Comment: Large Pond too deep to measure. Reach changes from Reach 1 (F3) to Reach 2 (NA).
9925	0026.00	General Comment: Start of no access
21405	0027.00	General Comment: Channel type change from Reach 2 (NA) to Reach 3 (F3)
23041	0035.00	Structures: Culvert: Ranch road concrete culvert, 1.5 / 1.5 / 25 (H x W x L) In good condition. Possible barrier.
23126	0037.00	Structures: Bridge unit: ranch road crossing, 108 feet wide, 11 feet tall, and 10 feet long. Non-barrier and not down cutting.
23136	0038.00	Tributaries: 724 feet into unit right bank dry tributary.
25001	0039.00	Structures: bridge unit. Ranch road crossing, 67 / 7.7 / 9.2 (W x H x L).Non-barrier, and not down cutting.

Position	Habitat Unit #	Comments:
26634	0052.00	End of Survey: End of survey due to lack of access.

REFERENCES

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

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

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

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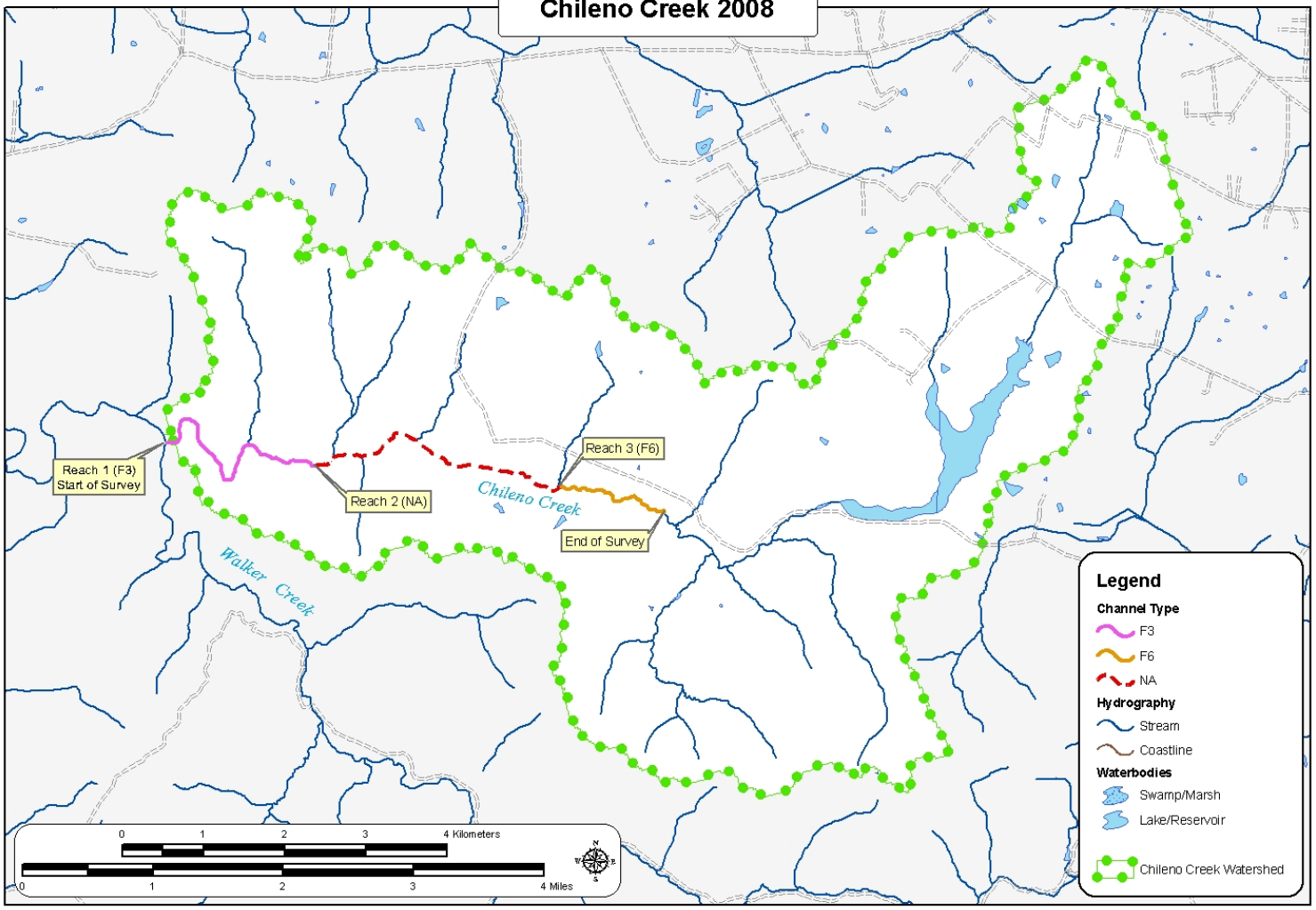

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Prepared by: Scott Webb, November 2008

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]	

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

Stream Name: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: Quad: POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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
4	0	CULVERT	7.7	14	56	0.2									
25	0	DRY	48.1	552	13797	51.8									
1	1	FLATWATER	1.9	47	47	0.2	18.0	0.4	0.6	846	846	338	338		4
1	0	NOSURVEY	1.9	11480	11480	43.1									
1	0	NOSURVEY_MARS	1.9	90	90	0.3									
20	20	POOL	38.5	58	1164	4.4	11.9	1.2	1.5	756	15118	881	17622	881	4

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
52	21	26634	15964	17961

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: Quad: POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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 (%)
1	1	GLD	1.9	47	47	0.2	18.0	0.4	0.6	846	846	338	338		4	48
20	20	MCP	38.5	58	1164	4.4	12.0	1.2	2.7	756	15118	881	17622	881	4	55
25	0	DRY	48.1	552	13797	51.8										
4	0	CUL	7.7	14	56	0.2										
1	0	NS	1.9	11480	11480	43.1										
1	0	MAR	1.9	90	90	0.3										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume
52	21	26634	15964	17961(cu.ft.)

Table 3 - Summary of Pools Types

Stream Name: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: **Quad:** POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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
20	20	MAIN	100	58	1164	100	11.9	1.2	756	15118	881	17622	4

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
20	20	1164	15118	17622

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

Stream Name: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: Quad: POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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
20	MCP	100	4	20	11	55	5	25	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
20	4	20	11	55	5	25	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 2

Table 5 - Summary of Mean Percent Cover By Habitat Types

Stream Name: Chileno Creek **Dry Units:** 25 **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: Quad: POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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
0	0	TOTAL RIFFLE									
1	1	GLD	20	20	0	0	60	0	0	0	0
1	1	TOTAL FLAT	20	20	0	0	60	0	0	0	0
20	20	MCP	8	10	1	17	39	0	0	5	2
20	20	TOTAL POOL	8	10	1	17	39	0	0	5	2
4	0	CUL									
1	0	NS									
1	0	MAR									
52	21	TOTAL	8	10	0	16	40	0	0	5	1

Table 6 - Summary of Dominant Substrates By Habitat Types

Stream Name: Chileno Creek **Dry Units:** 25 **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: **Quad:** POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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
1	1	GLD	0	100	0	0	0	0	0
20	20	MCP	25	60	0	10	0	0	5
4	0	CUL	0	0	0	0	0	0	0
1	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: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: **Quad:** POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
54	0	100	5	90	88

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: Chileno Creek LLID: 1228589382124 Drainage: Tomales Bay
Survey Dates: 9/11/2008 to 9/15/2008 Survey Length (ft.): 26634 Main Channel (ft.): 26634 Side Channel (ft.): 0
Confluence Location: Quad: POINT REYES NE Legal Description: T04NR09WS04 Latitude: 38:12:45.0N Longitude: 122:51:32.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3
Reach Length (ft.): 9835
Riffle/Flatwater Mean Width (ft.): 18.0
BFW:
Range (ft.): 15 to 23
Mean (ft.): 18.3
Std. Dev.: 3.94
Base Flow (cfs): 0
Water (F): 55 - 56 Air (F): 54 - 55
Dry Channel (ft.): 9094

Canopy Density (%): 49.5
Coniferous Component (%): 0.0
Hardwood Component (%): 100.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 92.0
Dominant Shelter: Terrestrial Veg.
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools: 0
Flat: 0

Pools by Stream Length (%): 6.9
Pool Frequency (%): 41.7
Residual Pool Depth (%):
< 2 Feet Deep: 90.0
2 to 2.9 Feet Deep: 10.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.23
Mean Pool Shelter Rating: 3

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 40.0 Gravel: 30.0 Sm Cobble: 30.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 10.0 3. 30.0 4. 60.0 5. 0.0

STREAM REACH: 2

Channel Type: NA
Reach Length (ft.): 11570
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 15 to 22
Mean (ft.): 18.5
Std. Dev.: 3.5
Base Flow (cfs): 0
Water (F): 55 - 56 Air (F): 54 - 55
Dry Channel (ft.): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component (%):
Dominant Bank Vegetation:
Vegetative Cover (%): 0.0
Dominant Shelter:
Dominant Bank Substrate Type:
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 (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. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: F6
Reach Length (ft.): 5229
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 18 to 22
Mean (ft.): 20.9
Std. Dev.: 1.77
Base Flow (cfs): 0
Water (F): 55 - 55 Air (F): 54 - 60
Dry Channel (ft.): 4703

Canopy Density (%): 59.5
Coniferous Component (%): 0.0
Hardwood Component (%): 100.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 86.0
Dominant Shelter: Terrestrial Veg.
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 1.0
LWD per 100 ft.:
Riffles:
Pools: 0
Flat:

Pools by Stream Length (%): 9.2
Pool Frequency (%): 38.5
Residual Pool Depth (%):
< 2 Feet Deep: 60.0
2 to 2.9 Feet Deep: 40.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.85
Mean Pool Shelter Rating: 4

Pool Tail Substrate (%): Silt/Clay: 70.0 Sand: 30.0 Gravel: 0.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 0.0 4. 100.0 5. 0.0

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: **Quad:** POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

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	0	1	2.4
Boulder	0	0	0.0
Cobble/Gravel	20	20	95.2
Sand/Silt/Clay	1	0	2.4

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	1	2.4
Brush	0	0	0.0
Hardwood	21	20	97.6
Coniferous	0	0	0.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 4

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

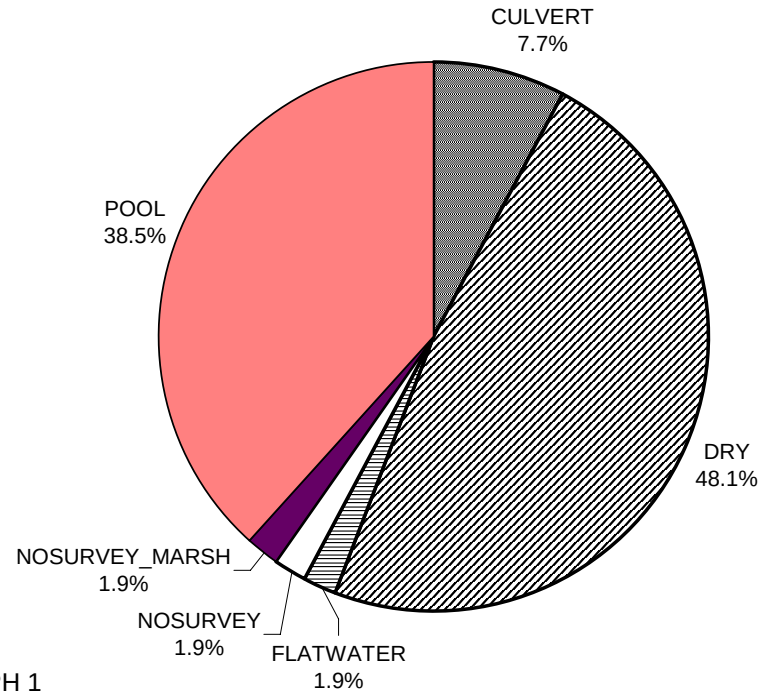
Stream Name: Chileno Creek **LLID:** 1228589382124 **Drainage:** Tomales Bay

Survey 9/11/2008 to 9/15/2008

Confluence Location: **Quad:** POINT REYES NE **Legal Description:** T04NR09WS04 **Latitude:** 38:12:45.0N **Longitude:** 122:51:32.0W

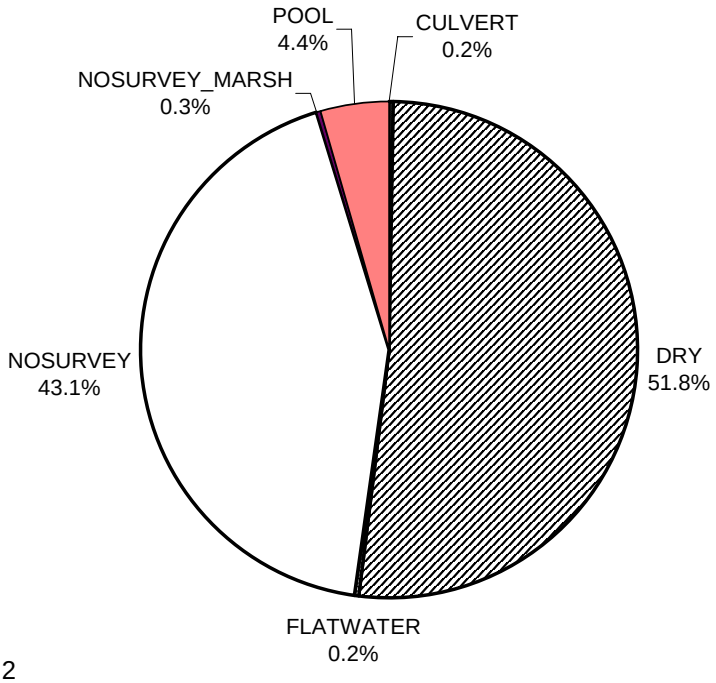
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)		20	8
SMALL WOODY DEBRIS (%)		20	10
LARGE WOODY DEBRIS (%)		0	1
ROOT MASS (%)		0	17
TERRESTRIAL VEGETATION		60	39
AQUATIC VEGETATION (%)		0	0
WHITEWATER (%)		0	0
BOULDERS (%)		0	5
BEDROCK LEDGES (%)		0	2

Chileno Creek 2008
HABITAT TYPES BY PERCENT OCCURRENCE



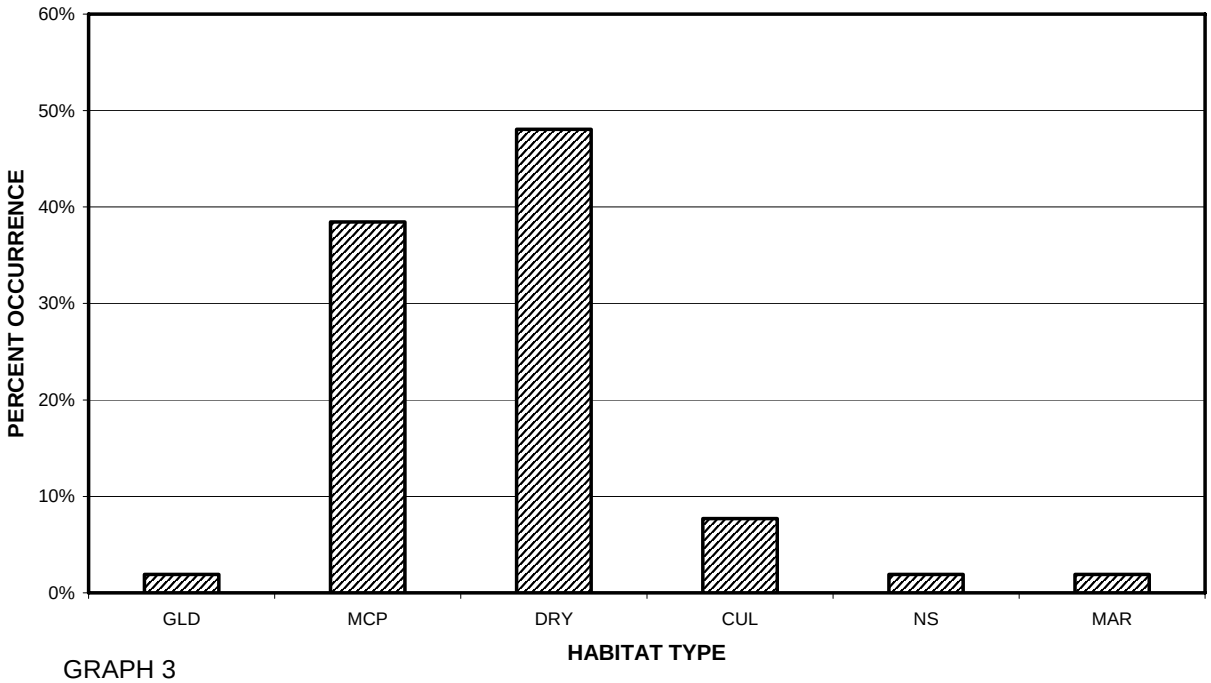
GRAPH 1

Chilneo Crrek 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH



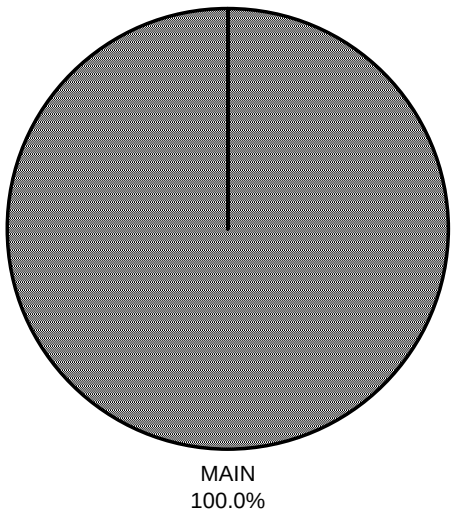
GRAPH 2

Chileno Creek 2008
HABITAT TYPES BY PERCENT OCCURRENCE

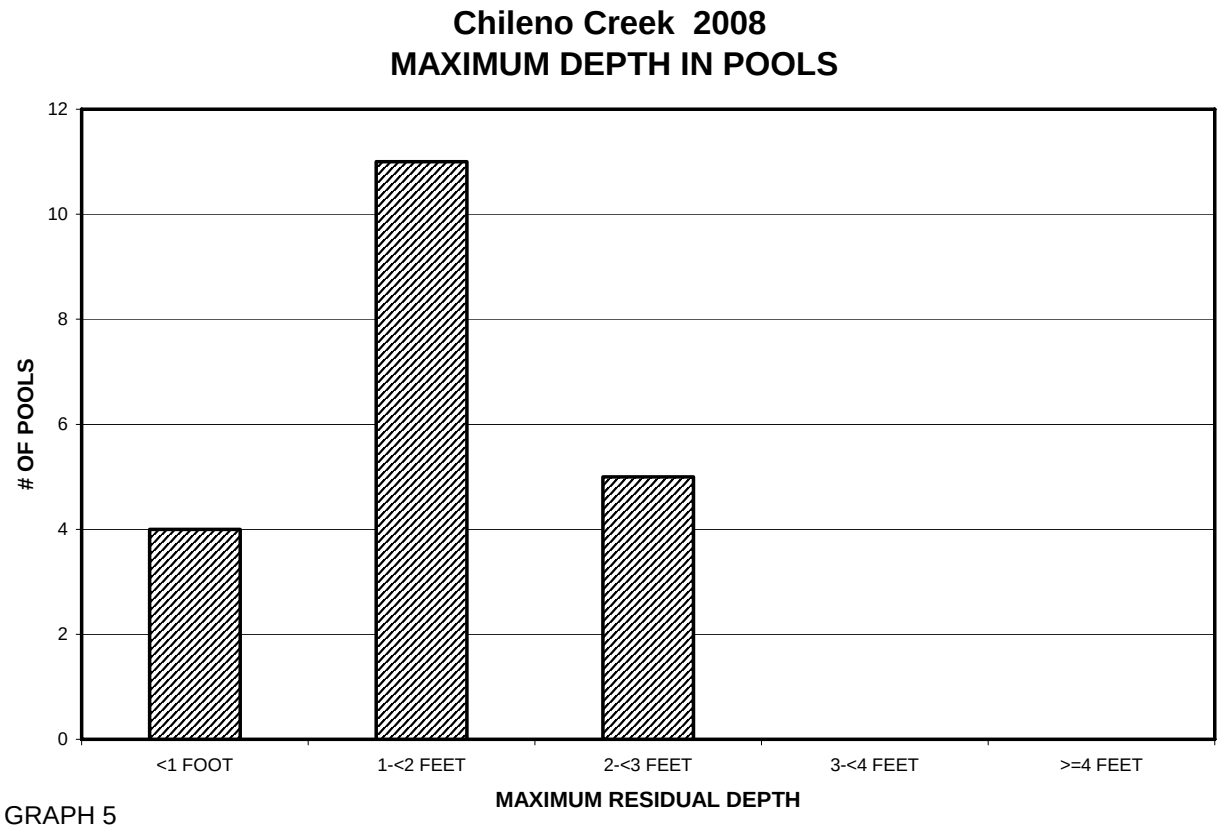


GRAPH 3

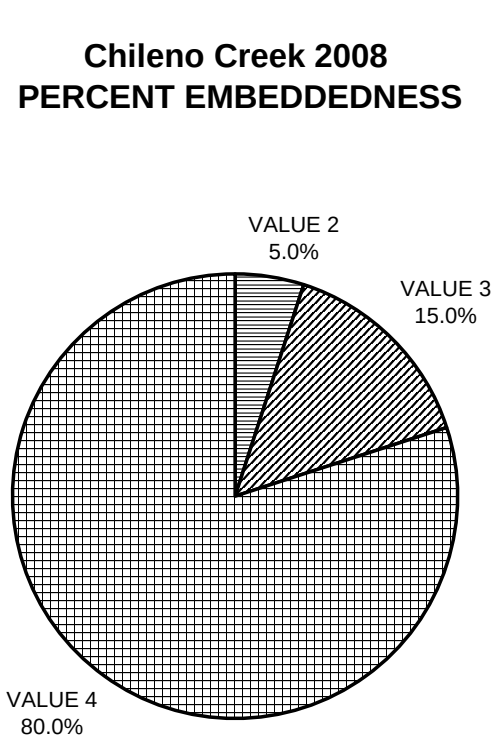
Chileno Creek 2008
POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

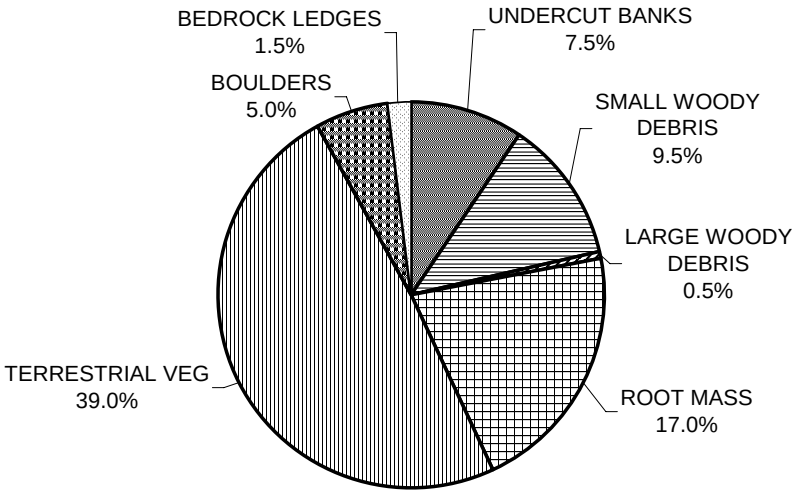


GRAPH 5



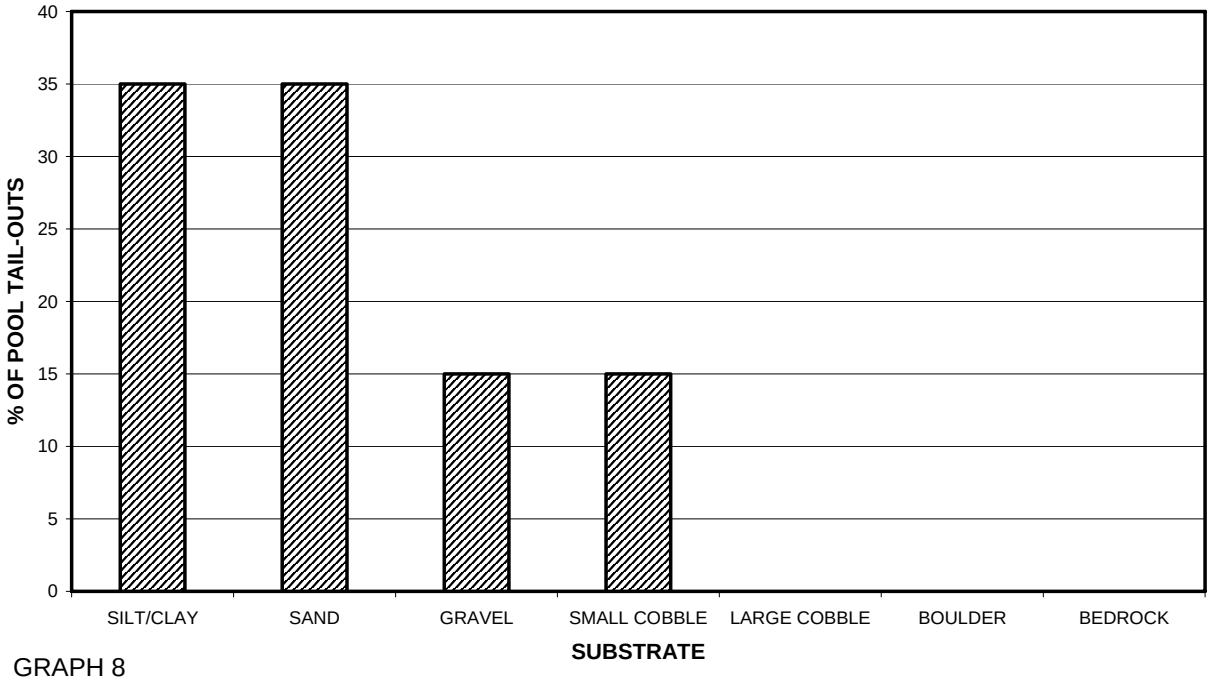
GRAPH 6

Chileno Creek 2008
MEAN PERCENT COVER TYPES IN POOLS



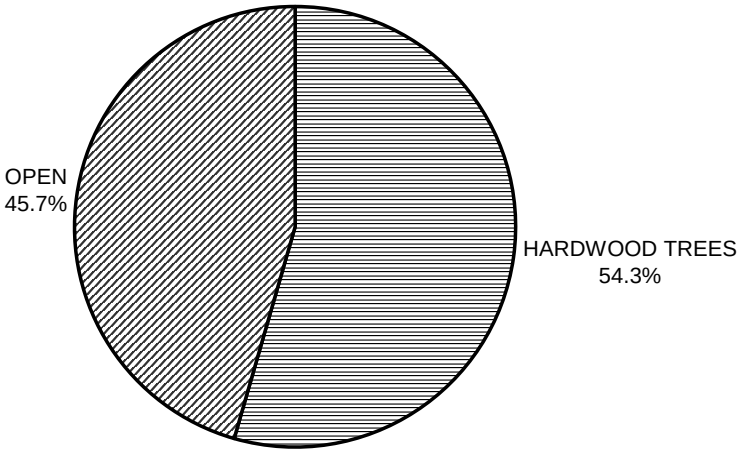
GRAPH 7

Chileno Creek 2008
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



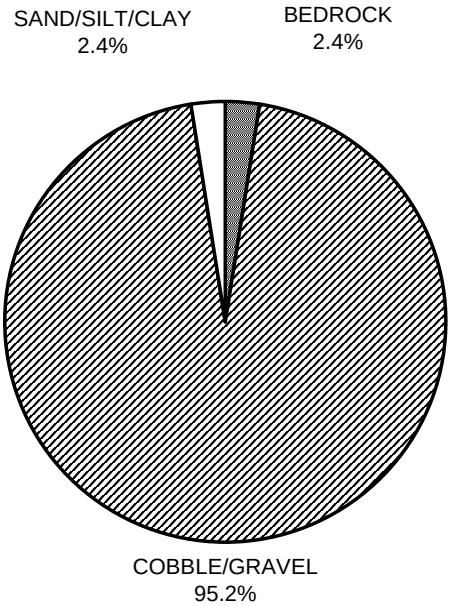
GRAPH 8

Chileno 2008
MEAN PERCENT CANOPY



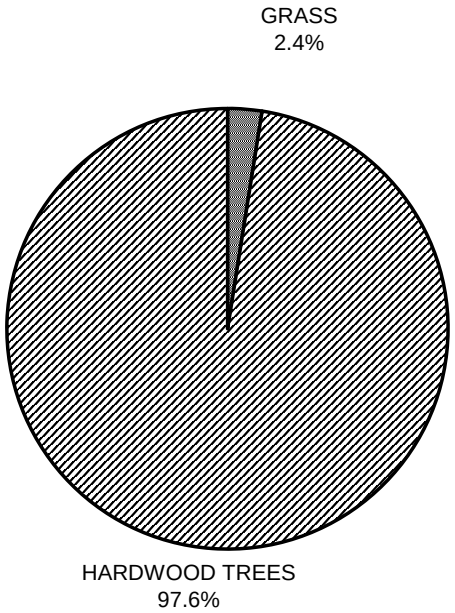
GRAPH 9

Chileno Creek 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

Chileno Creek 2008
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11