CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Pieta Creek

Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2002

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Pieta Creek, a stream in the Russian River Basin. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in Pieta Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

The objective of this report is to document the current habitat conditions and, after analyzing historical and recent data, 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

Pieta Creek is located in Mendocino and Lake Counties, California and is a tributary of the Russian River (see Pieta Creek map, APPENDIX A). The legal description at the confluence with Russian River is T12N, R11W, S2. Its location is 38°55'27.56"N latitude and 123°03'27.63"W longitude. Access to the mouth of Pieta Creek exists from a dirt road off of Hwy 101 north of Squaw Rock.

Pieta Creek and its tributaries drain a basin of approximately 24204 acres (37.8 square miles). Pieta Creek is a maximum fifth order stream and has approximately 62040.7 feet (11.75 miles) of blue line stream, according to the USGS "Hopland" 7.5 minute quadrangles. Elevations range from about 439 feet at the mouth of the creek to 3645 feet in the headwaters. The vegetation is primarily shrub (46%) and hardwood (42%) with some herbaceous (6%), mixed hardwood/conifer (5%), and conifer (1%). None of the watershed is urban and only 8.18 acres are agricultural. The watershed is 82.3% privately owned and 17.7% federally owned and is managed for recreation, mainly hunting, and livestock graving. Major tributaries are Coleman Creek and Tyler Creek which are discussed in separate reports, Salt Springs Creek was not surveyed. Several minor unnamed tributaries were noted but not surveyed.

Endangered, threatened, or sensitive species include foothill yellow-legged frog (*Rana boylii*), Bell's sage sparrow (*Amphispiza belli belli*), serpentine cryptantha (*Cryptantha clevelandii var dissita*), glandular western flax (*Hesperolinon adenophyllum*), and colusa layia (*Layia septentrionalis*) (*Ndbb source*). Salmonid fish species historically present include chinook salmon, coho salmon, and steelhead trout.

METHODS

The habitat inventory conducted in Pieta 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) field crew that conducted the inventory was trained in standardized habitat inventory methods by DFG. This inventory was conducted by two person teams and was supervised by Derek Acomb, Russian River Planner (DFG).

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.

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 Pieta Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, air and water temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

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

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. 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:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled dry. Pieta 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 were in feet to the nearest tenth. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Pieta Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "not suitable" (value 5) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Pieta Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes which are defined in the California Salmonid Stream Habitat Restoration Manual.

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 Pieta Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the top 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 visually into percentages of evergreen or deciduous 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 Pieta Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured 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.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of four basic methods: 1) stream bank observation, 2) underwater observation, 3) electro fishing, or 4) seine netting. Methods 1-3 are discussed in the California Salmonid Stream Habitat Restoration Manual. Seine netting is a fish capture technique that involves the use of a one meter square net attached to dowels on two parallel sides. The surveyor pushes the seine through the habitat unit to catch aquatic organisms. At the end of the unit the surveyor scoops up the seine and places all captured organisms in a bucket partially filled with stream water for holding. The water is aerated with a bubbler to maintain dissolved oxygen levels and minimize stress on the organisms. All fish, amphibians, and reptiles in the holding bucket are identified to species, counted and returned to the steam. Data is recorded on an electrofishing field form. Seine netting is used to confirm the presence of a species, particularly salmon and steelhead, and is not intended to quantify a population estimate.

IMPACT INVENTORY & ANALYSIS

Problems such as migration barriers, streambed erosion, poor water quality or temperatures are noted in the comments and landmarks section. In some cases measurements are taken, an analysis of what caused the problem is made and restoration potential and alternatives are recommended.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat for data storage and analysis. Habitat is a Visual Basic extension to Microsoft Access, developed by Zebulon Young, University of California, Berkeley. This program processes and summarizes the data, and produces the following tables and appendices:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of shelter by habitat types
- Summary of dominant substrates by habitat types
- Summary of fish habitat elements by stream reach

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Pieta Creek include:

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HISTORICAL STREAM SURVEYS:

DFG field notes for Pieta Creek regarding chemical treatments date back to 1954 and DFG surveys were conducted in 1959 and 1974. More recently, Mendocino County Resource Conservation District (MCRCD) conducted a Geothermal Watershed Assessment in 1985 and Pieta Creek Basin Stream Assessment in 1990-1991. A brief summary of each survey follows. Pieta has also been the focus of several controversial gravel mining permit applications in Ukiah, CA. Previous to the 1990-91 assessment, all surveyors agreed that Pieta Creek was one of the best steelhead spawning and nursery streams in the Russian River drainage.

In September 1954, William Johnson (DFG) recorded observations and estimates of fish killed after the chemical treatment of a section of Pieta Creek between the mouth of Coleman Creek and Hwy 101. Chemical treatments, a steelhead management strategy in the 1950's and 60's, targeted rough fish which may have competed with steelhead.

In 1959, Gerald Holman (DFG) inspected the lower mile of Pieta for possible barriers and found many 2-3' rock falls and one potential boulder barrier. He recommended altering it only when it became a complete fish barrier.

On July 30, 1959 Holman (DFG) surveyed from the headwaters to five miles downstream. The

remainder of the creek, a distance of three miles, was surveyed August 18, 1959 by J. Rowell and D. Lollock. For most of its length, Pieta flowed through a narrow V-shaped canyon except in the headwaters which was open, agricultural terrain and near the mouth which crosses the Russian River flood plain. Riparian canopy consisted fir and oak while vegetation in the surrounding hill was dense brush. The temperature on 8/18/59 was 64ºF water and 58ºF air. Surveyors found most the headwaters section dry with an ocational pool. Below the confluence with Tyler Creek, flows were intermittent 0.5-1.0 cfs. Creek depth ranged from 0'-20' (avg. 6") and width ranged 0'-30' (avg. 3'-4'). Pools with abundant shelter were common througout. Substrate in the headwaters section was mostly gravel, in the lower reach boulders, cobble, and bedrock were also common. The best spawning gravel appreared to be in the headwaters. Caddis and may fly lavae were abundant. No aquatic plants were observed. Four possible barriers were encountered, only one was recommended for removal. A 6' bedrock falls, 0.25 miles below the mouth of Salt Springs Creek, was acting as an effective rough fish barrier, but may have posed a threat for steelhead migration during low water years. One diverstion was noted 0.25 mile from the mouth. No pollution was observed. The stream appeared to be a major contributor to the Russian River steelhead steelhead fisheries.

Another complete DFG survey was conducted September 12-13, 1974 by J. Burns and B. Jackson and found many of the same results as the 1959 survey. Canopy consisted of chapparal, oak, madrone, and annual grasses and was 70% in the headwaters and only 10% below the confluence with Tyler Creek. Temperatures ranged from 58ºF water, 70ºF air at the headwaters to 70ºF water, 76ºF air two miles from the mouth. Surveyors found the headwaters to 1.3 miles downstream to be dry. Below that, maximum pool depth was 1'-10' (avg. 3'), riffles averaged 4". Stream width ranged 1.5'-30' (avg. 6'). Flow ranged 0.5-3.0 cfs. Substrate above the mouth of Tyler Creek was 50% gravel, 20% cobble, 20% boulders, and 10% bedrock. Pool substrate was similar with less gravel and more sand/silt/detritus. Below Tyler Creek, substrate was 30% cobble, 25% boulders, 20% bedrock, 20% gravel and 5% sand/silt/detritus. Surveyors stated that abundant spawning gravel was distributed througout the creek and that above Tyler Creek was approximately 75% potential spawning gravel. Below Tyler creek, approximately 10% was spawning gravel and 50% of habitat was pools. Pool shelter consisted mostly of boulders. Macroinvertebrates were abundant. Surveyors noted many small rock falls, none of which seemed to be acting as barriers. Numerous diversions to hunting clubs were seen. No pollution was observed. Pieta was deemed a valuable spawning and nursery stream for steelhead.

In 1985, Sari Sommarstrom, Ph.D., conducted the Pieta Creek Gerothermal Watershed Assessment for MCRCD. The report sought to establish a baseline of biological and enviromemental factors to facilitate future geothermal energy development with minimal impact. Along with being a valuable steelhead habitat, a portion of the Pieta Creek system lies within the Geysers-Calistoga Known Geothermal Resource Area (KGRA). Geothermal activity was not apparent on the surface and its development had not impacted the stream. The study found the overall water quality to be very good. However, during the winter, turbidity, aluminum, and iron exceeded known water quality critera while in the summer, pH, boron, and specific conductivity exceeded known water quality critera. At some sites during the summer, temperature and dissolved oxygen were at marginal levels for steelhead. Historic water temperatures ranged from 39.2ºF to 82.4ºF and 1984-85 temperatures ranged from 58.2ºF to 79.0ºF. Higher than optimal temperatures in lower Pieta was attributed to lack

of ripirain canopy. The most common vegetative types in the Pieta basin were oak woodland (47.2%), chaparral (40.3%) and some grassland (9.0%). Grasslands have been created from woodland and chaparral to accommodate grazing in the Pieta basin which is estimated to date back 130 years. Channel stability was found to be excellent although above the confluence with Coleman Creek, there were massive landslides on either side of the channel. Dirt roads in the area also contributed sediment. Recommendations for stream quality, fisheries resouces, and resource conservation and mitigation were made.

The 1990-91 Pieta Creek Basin Stream Assesment was conducted by A. A. Rich and Associates for MCRCD. The two year monitering project was also conducted to obtain baseline data for various stream habitat parameters. Surveyors concluded that Pieta Creek did not provide particularly good salmonid spawning or rearing habitat although they did observe healthy salmonids. Four of the five survey points were characterized by poor pool shelter, lack of riparian shade, high water temperatures, and highly silted substrate. One sight sampled, about 6 miles from the mouth, had better habitat and 25% spawnable gravel. Pieta creek had numerous erosion problems including steep slopes (>60%), mass wasting, landslides, potential debris jams and sediment traps, bank cutting, and channel scour and depostion. These serious erosions problems had "silted in" large portions of the creek. This sharp contrast to the 1985 survey was accounted for by "personal interpretation" rather than rapid decline of bank stability. Water quality was excellent albiet alkaline. Suspended solids, boron, aluminum, and electical conductivity were the only water quality criteria above safe levels for aquatic organisms. Both study years were characterized by low rainfall and the limiting factor for salmonid rearing appeared to be low water flows.

HABITAT INVENTORY RESULTS FOR PIETA CREEK

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

The habitat inventory of Pieta Creek, 6/19/2002 - 7/18/2002, was conducted by Mike Shugars, Derek Acomb,and Justin Smith (DFG) with supervision and analysis by California Department of Fish and Game (DFG). The survey began at the confluence with the Russian River and extended up Pieta Creek to the end of survey. The total length of stream surveyed was 61067 feet, with an additional 1109 feet of side channel.

A flow of 0.09 cfs was measured on 9/30/02 in Reach 2 above survey start with a Marsh-McBirney Model 2000 flowmeter. Surveyors averaged two measurements.

This section of Pieta Creek has seven reaches with six distinct channel types: from the mouth to 2349 feet a F4, 26153 feet a F2, 5429 feet a B2, 9357 feet a F3, 3984 feet a C3, 10936 feet a F4 and 2859 feet a A3.

F channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio. F4 channel types have a predominantly gravel substrate, F2 channel types have a predominantly boulder substrate, and F3 channel types have a predominantly cobble substrate.

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

C3 channel types are low gradient (<2%), meandering, point-bar, riffle/pool, alluvial channels with a broad, well defined floodplain and a predominantly cobble substrate.

A3 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly cobble substrate.

Water temperatures ranged from 52ºF to 74ºF. Air temperatures ranged from 57ºF to 90ºF. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs at end of report). A recorder in Reach 4, approximately 41720' from the mouth, logged temperatures every half hour from 7/15/02 to 8/23/02. The highest temperature recorded was 71.3°F on 7/27/02 and the lowest was 54.4°F on 8/22/02 and 8/23/02. The mean of the daily highs was 70.1°F for the month of July, and 67.7°F for August.

Another recorder in an upper reach that was not surveyed logged temperatures from 7/16/02 to 10/18/02. The highest temperature recorded was 75.6°F 7/26/02 and 7/27/02 and the lowest was 46.8°F on 10/1/02. The mean of the daily highs was 72.6°F for the month of July, 66.5°F for August, 59.3°F for September, and 55.9°F for October.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 50% flatwater units, 9% riffle units, 40% pool units, 1% dry units, (Graph 1). Based on total **length** of Level II habitat types there were 57% flatwater units, 4% riffle units, 21% pool units, 19% dry units, (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were 4% Glide units, 5% Low Gradient Riffle units, 1% High Gradient Riffle units, 32% Mid-Channel Pool units, 20% Run units, 26% Step Run units, 3% Lateral Scour Pool - Boulder Formed units, 4% Step Pool units, 2% Cascade units, 1% Lateral Scour Pool - Bedrock Formed units, 1% Plunge Pool units, 1% Dry units, (Graph 3). Based on percent total **length**, 3% Glide units, 3% Low Gradient Riffle units, 16% Mid-Channel Pool units, 24% Run units, 29% Step Run units, 1% Lateral Scour Pool - Boulder Formed units, 3% Step Pool units, 1% Cascade units, 19% Dry units.

A total of 237 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 89%, and comprised 93% 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. Ninety-five of the 234 pools (41%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 225 pool tail-outs measured, 57 had a value of 1 (25.3%); 78 had a value of 2 (34.7%); 14 had a value of 3 (6.2%); 76 had a value of 5 (33.8%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

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 7 , flatwater habitat types had a mean shelter rating of 5 , and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 11, Scour pools had a mean shelter rating of 16, Backwater pools had a mean shelter rating of 22, (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Pieta Creek. Graph 7 describes the pool cover in Pieta Creek. Boulders are the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel observed in 24% of pool tail-outs, small cobble observed in 23% of pool tail-outs, large cobble observed in 18% of pool tail-outs, boulders observed in 31% of pool tail-outs, bedrock observed in 3% of pool tail-outs.

The mean percent canopy density for the surveyed length of Pieta Creek was 34%. The mean percentages of hardwood and coniferous trees were 56% and 44%, respectively. Sixty-six percent of the canopy was open. Graph 9 describes the mean percent canopy in Pieta Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 40%. The mean percent left bank vegetated was 40%. The dominant elements composing the structure of the stream banks consisted of 23% bedrock, 38% boulder, 31% cobble/gravel, 8% sand/silt/clay, (Graph 10). Grass was the dominant vegetation type observed in 25% of the units surveyed. Additionally, 47% of the units surveyed had hardwood trees as the dominant vegetation type, and 18% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

During the 1950's and 1960's, DFG rescued juvenile steelhead from pools in portions of Pieta that were drying up during the summer months. Steelhead fingerlings rescued averaged 19,053 per year over the 14 years rescues were conducted. Fish were usually released elsewhere in Pieta Creek but sometimes into Tyler Creek or the Russian River. There is only one recorded stocking of steelhead in Pieta Creek. In 1983, 14,300 fingerlings from Warm Springs Hatchery were planted.

Summary of transfers, rescues, and hatchery stocking						
YEAR	SPECIES	TYPE	LOCATION	SOURCE	NUMBER	SIZE
1951	SH	RESCUE	UNKNOWN	PIETA CREEK	2216	FING
1952	SH	RESCUE	UNKNOWN	PIETA CREEK	7280	FING
1953	SH	RESCUE	UNKNOWN	PIETA CREEK	6246	FING
1955	SH	TRNSFR	RUSSIAN RIVER	PIETA CREEK	8910	FING
1958	SH	TRNSFR	PIETA CREEK	PIETA CREEK	15550	FING
1959	SH	TRNSFR	PIETA CREEK	PIETA CREEK	9260	FING
1960	SH	TRNSFR	PIETA CREEK	PIETA CREEK	21648	FING
1961	SH	TRNSFR	PIETA CREEK	PIETA CREEK	48610	FING
1961	SH	TRNSFR	TYLER CREEK	PIETA CREEK	2496	FING
1962	SH	TRNSFR	PIETA CREEK	PIETA CREEK	22496	FING
1963	SH	TRNSFR	PIETA CREEK	PIETA CREEK	5620	FING
1964	SH	TRNSFR	RUSSIAN RIVER	PIETA CREEK	2348	FING
1966	SH	TRNSFR	TYLER CREEK	PIETA CREEK	76872	FING
1967	SH	TRNSFR	PIETA CREEK	PIETA CREEK	5134	FING
1968	SH	TRNSFR	PIETA CREEK	PIETA CREEK	51110	FING
1983	SH	PLANT	PIETA CREEK	WARM SPRINGS HATCHERY	14300	FING

SH = Steelhead Trout *(Oncorhynchus mykiss)*

From the 1954 chemical treatment, Johnson concluded that juvenile steelhead averaged 42 per 100'. He concluded that the fish population for the area chemically treated September 2 and 3, 1954 was 40% roach, 37.5% steelhead trout, 20% suckers, 12% squawfish and 0.5% cottoids.

A creel census in May 1959, opening day of fishing season, reported a fishing effort of 1.7 trout per angler-day and 1.1 trout per angler hour.

The 1959 DFG survey found an abundance of juvenile steelhead and some roach above the 6' rock falls. Roach and suckers were numerous below the rock falls. No population estimates were made. Fishing pressure was estimated to be heavy in spring and early summer. May and caddis flies were also common. Other vertebrates observed were frogs and salamanders.

In 1963, R. Hansen estimated steelhead 63 per 100', 48% relative abundance shortly after the lower 1.0 mile of Pieta Creek was chemically treated as part of the study evaluating the use of Rotenone as a means for managing salmonid resources in the Russian River.

The following year a visual steelhead population estimate was made by E. Gibbs 9 per 100'and a relative abundance of 9% (reported in 1967).

The 1974 Burns and Jackson DFG survey estimated that juvenile steelhead numbered 35 per 100' in the lower section. Other fish present from the mouth to 3.6 miles upstream were roach, suckers, and squawfish. Above this to the headwaters only steelhead were observed. Juveniles 1"-10" in length, the majority less than 3", were observed 150-200 per 100'. Total fishing pressure was unknown but was reported to be high in the vicinity of Tyler Creek. Copious aquatic insects were observed including mayfly, caddisfly, stonefly, diptera, dragonfly, damselfly, and hemiptera larvae and nymphs.

In 1975, the KGRA Fisheries Investigations report was released by D. Price. This cooperative study by PG&E and DFG electroshocked 100' sections of Pieta Creek to sample steelhead populations in 1974. They estimated steelhead numbered 108 per 100' and 40% relative abundance.

Another cooperative effort produced a thorough fisheries resource inventory, The Geysers KGRA Fisheries Investigation, released in 1980 by Price and R. Geary. The study, conducted in August and September 1976, estimated juvenile steelhead had a relative abundance of 42%, numbered 52 per 100', and had a mean fork length of 2.5". Other species observed were California Roach, 49% relative abundance, and Pacific Lampreys, 9% relative abundance. Average fish density was 4,808 fish per hectare (a range of 1,387 to 8,970 fish per hectare).

The 1985 MCRCD study estimated juvenile salmonids had a relative abundance of 78%, numbered 108 per 100' and had a mean fork length of 2.2". Other species observed were California Roach, 19% relative abundance, and Pacific Lamprey, 3% relative abundance. Average fish density was 12,513 fish per hectare (a range of 3,169 to 23,333 fish per hectare). Steelhead and Pacific Lamprey were found throughout Pieta Creek while California Roach were found only in the lower portion (mouth to 5.5 miles upstream). These distributions were noted to be identical to those found in 1976. The study also noted fish populations vary naturally from year to year and that 1974, 1976, and 1985 were all quite different, hydrologically, from each other.

The 1991 MCRCD survey, which conducted a biological inventory in 1990 and 1991, found steelhead averaged 0.1 to 0.8 fish per square meter and California Roach 0.2 to 0.7 fish per square meter. Steelhead had a relative abundance of 71% in 1990 and 59% in 1991. In 1990, one large mouth bass was found (relative abundance 1%), presumably escaped from a farm pond upstream. Total fish estimates for each species in 1990 were not significantly different from 1991. Hydrologically, both years were similar; drought conditions prevailed. Compared to historical data, the survey suggested that steelhead and California Roach populations had not changed since 1976 but suspected past methods were not rigorous enough.

Species Observed in Historical and Recent Surveys			
YEARS	**SPECIES**	**SOURCE**	**NATIVE/ INTRODUCED**
1954, 1959, 1963-64, 1974, 1976, 1985, 1990-91, 2002	STEELHEAD TROUT *(Oncorhynchus mykiss)*	DFG, PG&E, MCRCD	N
1954, 1976, 1985, 1990-91, 2002	PACIFIC LAMPREY (*Lampetra tridentatus)*	DFG, PG&E, MCRCD	N
1954, 2002	SCULPIN OR COTTOIDS *(Cottus sp.)*	DFG	N
1954, 1959, 1963, 1974, 1976, 1985, 1991, 2002	CALIFORNIA OR VENUS ROACH *(Hesperoleucus symmetricus)*	DFG, PG&E, MCRCD	N
1954, 1959, 1963, 1974, 2002	SACRAMENTO OR WESTERN SUCKER *(Catostomus occidentalis)*	DFG, MCRCD	N
1954, 1963, 1974, 2002	SACRAMENTO PIKE MINNOW OR SQUAWFISH *(Ptychocheilus grandis)*	DFG, MCRCD	N
1990 or 1991	GREEN SUNFISH *(Lepomis cynellus)*	MCRCD	I
1990	LARGE MOUTH BASS *(Micropterus salmoides)*	MCRCD	I

On 8/12/02 and 9/30/02 a biological inventory was conducted at two sites on Pieta Creek to document fish species presence at the sites sampled. Site 1 was single pass electro-fished using a Smith Root Model 12 electro-fisher and site 2 was seine netted. Fish from the sites were counted by

species, and returned to the stream. At site 1, the air temperature ranged from 89-92ºF and the water temperature ranged from 70-71ºF. The observers were A. Livingston (Americorps) and J. Smith (DFG). At site 2, the air temperature ranged from 72-73ºF and the water temperature ranged from 63-66ºF. The observers were Douglas Mitchel, Derek Acomb and Sarah Green (DFG).

The site 1 inventory began at 1320 hours near the mouth in Reach 1 and ended at 1510 hours upstream. The distance sampled was approximately 829'. Habitat types surveyed were glides, mid-channel pools, and runs. No steelhead were observed. The site 2 inventory in Reach 1 began at 1455 hours and ended upstream at 1605 hours. Habitat types sampled were glides, mid-channel pools, and runs. Steelhead were observed. The following table displays the total fish yielded from these sites.

Species Observed	Numbers recorded at Site 1	Numbers recorded at Site 2
STEELHEAD 0+	0	97
STEELHEAD 1+	0	8
STEELHEAD 2+	0	7
CALIFORNIA ROACH	14	42
SACRAMENTO PIKE MINNOW	55	0
SACRAMENTO SUCKER	64	0
PACIFIC LAMPEY	2	1
SCULPIN	1	0

Other species noted were crayfish and frogs.

DISCUSSION FOR PIETA CREEK

Pieta Creek has six channel types: F4, F3, F2, B2, C3, and A3. Many site specific projects can be designed within B and F channel types, especially to increase pool frequency, volume and shelter.

According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover. F2 channel types are fair for low-stage weirs, single and

opposing wing-deflectors and log cover. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover. B channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

C3 channel types are excellent for bank-placed boulders and good for low-stage weirs, boulder clusters, single and opposing wing deflectors and log cover. They are fair for medium-stage weirs.

A3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days 6/19/2002 - 7/18/2002 ranged from 52ºF to 74ºF. Air temperatures ranged from 57ºF to 90ºF. The warmest water temperatures were recorded in Reach 2. Water temperatures above 65°F, if sustained, are above the threshold stress level for salmonids.

Summer temperatures measured using remote temperature recorders ranged from 54.4°F to 71.3°F for Reach 4 and 46.8°F to 75.6°F for Reach _4. The Temperature Summary graph shows that for much of the summer (July through August) the lower and upper watershed exhibited water temperatures above the optimal for salmonids. It is unknown if this thermal regime is typical. To make any further conclusions, temperatures need to be monitored for a longer period of time in more locations through the critical summer months, and extensive biological sampling should be conducted.

Pools comprised 21% of the total length of this survey. In third and fourth order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In Pieta Creek, the pools are relatively deep with 41% having a maximum depth of at least three feet. These pools comprised 14% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 12. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders at 59%, bedrock at 23%, small wood at 3%, large wood at 1%, white water at 2%, root mass at 2%, undercut banks at 1%, and terrestrial vegetation at 1%. Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Four of the eleven low gradient riffles measured (36%) had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

Six percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 26% had a rating of 1. Cobble embeddedness measured to be 25% or less (a rating of 1) is considered best for the needs of salmon and steelhead. In a reach comparison, Reaches 1, 3 and 5 had the best embeddedness ratings and Reaches 3 and 7 had the poorest ratings.

The mean percent canopy for the survey was 34%. This is a very low percentage of canopy, since 80% is generally considered desirable. Riparian removal and intensive grazing within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures. Cooler water temperatures are desirable in Pieta Creek. Elevated water temperatures could be reduced by increasing stream canopy. Reaches 1-5 had very low percent canopy and numerous bank erosion problems. These reaches as well as other areas with bank erosion could benefit from bio-technical re-vegetation techniques using native species. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

GENERAL MANAGEMENT RECOMMENDATIONS

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

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

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Increase the canopy on Pieta Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (all of reaches one through five, and portions of reaches six and seven). In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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

3) There are sections of Pieta Creek 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.

4) Pieta Creek would benefit from the utilization of bio-technical vegetative techniques to discourage lateral migration of the base flow channel and decrease bank erosion.

5) Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.

6) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing >shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches.

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.

0'	Mouth of Pieta damned up because of bridge construction upstream.
319'	Roach observed throughout the creek from 319’ to 35320'. Steelhead 0+, 1+, 2+ observed in abundance, often >100 at a time, throughout the creek from 319’ to 59599'.
805'	Out of influence of main river, start protocol.
893'	Suckers observed from 893' to 2645'.
976'	BRIDGE- Hwy 101: 16'H x 105'W x 95'L, no downcutting, no sill, not retaining gravel. Temporary pillars will be removed when bridge is completed.
1130'	Crayfish observed from 1130' to 14857'. BRIDGE- Hwy 101: 20'H x 80'W x 43.8'L, no downcutting, no sill, not retaining gravel.
2124'	Barbed wire dividing property through stream
2349'	Dry tributary (trib) on right bank (RB), large slide on left bank (LB), 100'W x 30'H.
2469'	Spring on LB where at slide
2614'	Alternative pool tail crest that drains into side channel.
2730'	Many large boulders on bank
2932'	Erosion on RB- 60'W x 60'H
3015'	Dry trib LB
3304'	Algae continues to cover rocks.
3362'	Dry trib RB
3400'	Boulders more abundant in stream

3687' Huge slow slide on LB: 300'W x 120'H
4246' Minor slides along RB
4406' Canyon is starting to narrow up
4440' Wet trib RB at end of unit, water temp: 69°F
4686' Narrow bedrock canyon
6327' Small springs RB
6705' Springs on RB
6813' Still in narrow bedrock canyon
7642' Canyon opening up
8077' RB spring
8713' Narrow canyon continued without bedrock
9065' Gravel slide on RB at end of unit
9509' Dry trib LB at end of unit
10055' Mild erosion on LB, erosion is healing
10618' Huge 10' diameter boulders in stream
10698' Some kind of elemental deposition LB, white colored
11174' Gravel slide RB: 80'W x 70'H
11439' Element deposition on LB
11606' Wet spring RB, trickling into Pieta Creek.
11722' Canyon opens up and spreads out
11748' Trees are starting to grow in channel
12088' Small slide LB: 30'W x 60'H
12343' Large boulders in channel
12739' Wet road crossing at start of unit. Evidence of cattle in stream
13107' Sediment slide on RB
13296' Large boulders in channel
13453' Slide on LB: 20'W x 45'H
13748' Large slide on LB: 180'W x 120'H
13819' Major silt deposition on bottom
14401' Erosion spot on LB
14467' At end of unit there is a 9' jump, but there is an alternative route.
14675' Dry trib LB
15171' Slide on LB: 25'W x 40'H
15721' Newts periodically observed in the creek from 15721' to 56957'.
16380' Sediment slide on LB
16453' Large oak fallen on RB
16676' Sediment slide on LB: 200'W x 160'H
16830' Dry trib RB
17719' Spring LB
18034' Evidence of cattle in creek
18195' Spring LB, flood plain returning
18631' Wet trib LB water temp: 61°F, main stem water temp: 71°F
20107' LB slide. Evidence of cattle in creek
20498' Wet trib LB, water temp: 59°F; Oak woodland with pines

20523' Channel widens with large boulders, trees begin growing in channel.
20580' Truck size boulder in pool
20755' Wet trib RB, very steep and spring-like
21200' Stream cuts through gravels backed up by LWD and SWD hung on boulders.
21345' RB spring, very well shaded pool
21410' Spring-like trib RB
21507' Cobble slide RB
21862' Oak woodland with pine, RB slide
21954' RB blue goo slide, with very small spring
22130' Surface water temp: 76°F
22183' Road crossing at top of unit, buried AT&T cable crossing
22228' Spring LB middle of unit, unit started at road crossing
22757' Canyon widens
22875' Channel thick with sedges
23251' Sand and gravel covering pool bottom, nice canopy, canyon narrows
23321' Spring LB
23500' Large slide RB, so far slides have been natural and not realistically manageable
23791' Gradient increases
23885' Dry trib RB
24046' Small blue goo slide for length of unit
24305' Spring flow under blue goo RB
24544' Gradient decreases, canopy hangs down to channel
24681' Bedrock wall LB, good canopy
24735' Many sedges in unit
24900' Stable banks and canyon walls
25075' Many sedges in the channel. GULLY- LB active: 20'D x 150'L x 20'W, not upslope, not high flow influenced, debris influenced, possibly caused by large tree up-rooting, not a significant sediment source.
25231' Wet trib LB, very steep
25368' Many springs LB
25550' Slide RB
25615' LB dry trib
25741' Small slides LB
25787' Boulders constricting channel
26126' Road LB
26780' Large oak fallen in the middle of unit
27219' Canyon narrows
27875' Old culvert in bank, not active, washed down from above
28406' Spring RB, coarse sediment aggraded at bank
28662' Large sediment slide: 240'W x 170'H
29479' Sediment slide R: 170'W x 150'H
29725' Spring on LB
29748' Piece of culvert 11" long in pool
30604' Canyon narrows

30724' Small gill net in water
31487' Wet road crossing
31837' Wet road crossing goes up LB at end of unit
33013' Road access LB
33747' Channel narrows
33931' Channel change to F3
34078' Canopy is getting closer to channel
34791' Fallen trees in channel
35534' Small grassy shrubs growing near stream
35783' Spring LB
36005' Wet trib LB - too steep to survey
36578' Dry trib on RB
37011' Alders are abundant along creek side
38250' Wet trib LB at 60' into unit, too steep to be surveyed, water temp of trib: 59°F, temp of Pieta: 63°F
40493' Channel is widening
41431' Wet trib LB
41485' Spring on RB, start of new access
41720' Hobo temp recorder in this unit
41930' Pool is stagnant, dry trib RB
41975' Wet road crossing
42600' Dry trib LB, dry trib RB
43288' Channel change to C3
43308' Dry trib on LB half way through unit
47272' Channel change to an F4. Dry trib on RB, dry trib on LB
55975' Channel is becoming narrow
56049' Wire fencing and barrels used to hold RB together 250' into unit: 20'L x 15'H
56457' Road runs along unit on RB, dry trib on RB
56967' Banks are eroding from road, hunting cabin on RB 750' into unit, dry trib with immediate 6' jump RB, channel becomes very narrow
58061' 6.5' jump, RB is eroding due to springs
58138' Fish above 6' jump. BRIDGE: 6.3'H x 19'W x 9.5'L, no downcutting, no sill, not retaining gravel.
58208' Dry trib on LB, channel changes to an A3, wet road crossing, second wet road crossing, BRIDGE.
58801' Road on LB
58884' Very steep
59898' Road on RB
60511' Spring LB
60546' Road on RB
60584' 6' diameter PVC pipe lying in creek bed
60667' 2" diameter rubber tube in stream 400' long, wet trib on LB- too steep to survey. END OF SURVEY - channel is steep.

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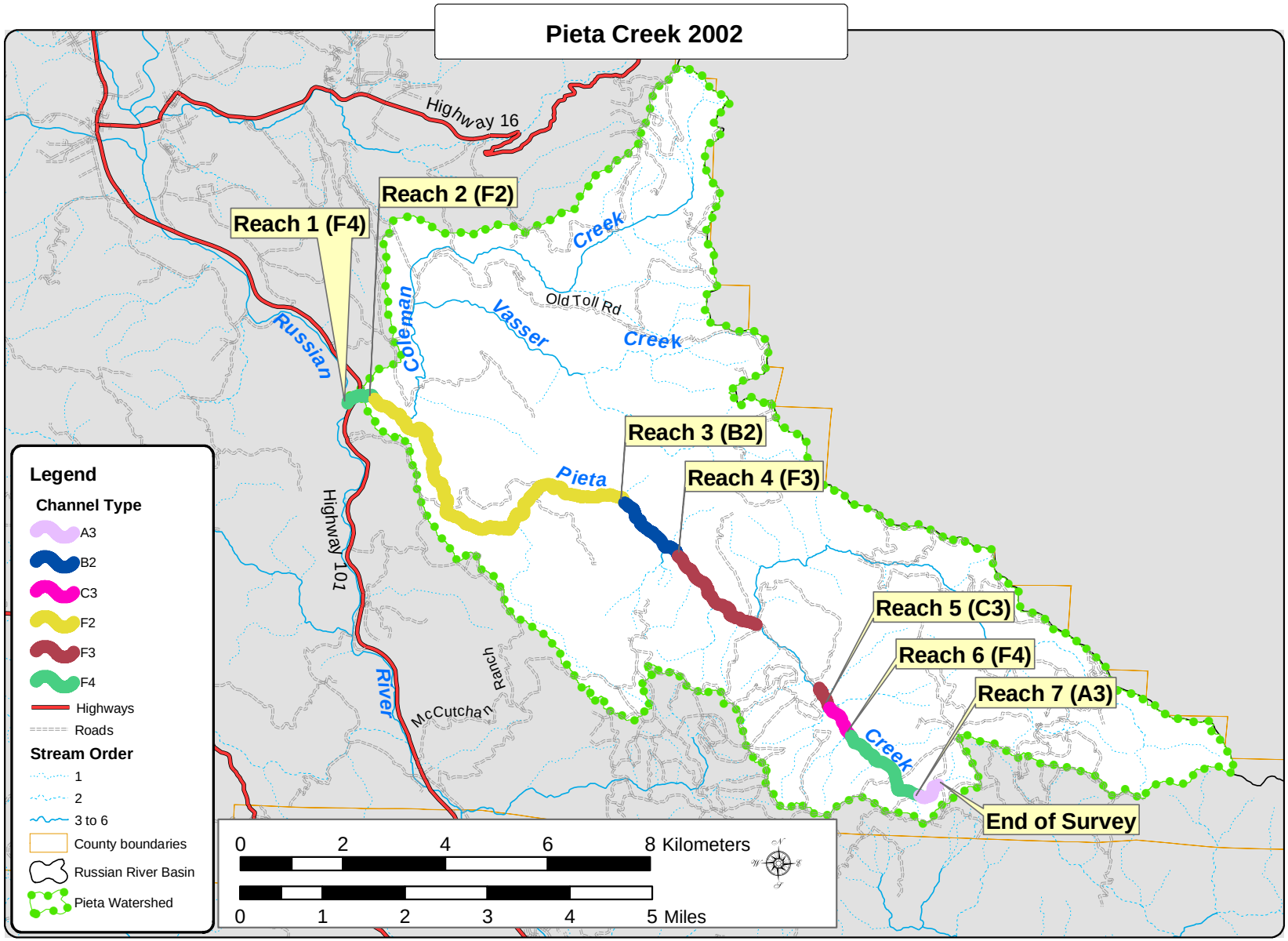

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Prepared by: Ann-Marie Osterback, May 16, 2003

Pieta Creek Tales Graphs Map
Assessment Completed 2002

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

Stream Name: Pieta Creek

LLID: 1230571389236

Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
8	0	DRY	1.4	1479	11833	19.0									
291	35	FLATWATER	49.7	121	35189	56.6	11.7	0.7	1.4	841	244830	539	156822		5
237	233	POOL	40.4	54	12854.2	20.7	15.0	1.2	2.9	845	200244	1394	327448	1080	12
50	19	RIFFLE	8.5	46	2300	3.7	8.7	0.4	0.9	260	13007	94	4694		7

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
586	287	62176.2	458081	488964

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Pieta Creek

LLID: 1230571389236

Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
32	11	LGR	5.5	52	1649	2.7	11	0.4	1.5	365	11687	124	3981		0	32
6	3	HGR	1.0	48	291	0.5	9	0.4	1.2	199	1196	93	560		7	37
11	4	CAS	1.9	31	343	0.6	3	0.7	1.2	78	853	33	358		26	47
1	1	BRS	0.2	17	17	0.0	1	0.3	1	17	17	5	5		0	80
24	9	GLD	4.1	81	1938	3.1	14	0.7	1.9	1089	26133	655	15713		2	30
117	8	RUN	20.0	129	15150	24.4	9	0.6	2	653	76397	372	43561		2	33
150	18	SRN	25.6	121	18101	29.1	12	0.7	2.5	801	120193	555	83258		8	32
185	181	MCP	31.6	54	10040	16.1	15	1.3	7.8	883	163377	1537	281150	1206	11	38
25	25	STP	4.3	74	1860	3.0	14	0.8	3.7	957	23936	1182	29538	822	10	29
1	1	LSR	0.2	22	22	0.0	4	0.5	1.9	88	88	62	62	44	45	95
5	5	LSBk	0.9	45	225	0.4	16	0.8	3.7	669	3344	799	3994	598	4	31
16	16	LSBo	2.7	38	603	1.0	13	1.1	3.6	513	8204	690	11035	500	9	30
3	3	PLP	0.5	22	67	0.1	17	1.1	3.3	367	1100	489	1467	361	60	27
2	2	BPB	0.3	18	37	0.1	9	1.7	3.4	174	347	378	755	357	23	35
8	0	DRY	1.4	1479	11833	19.0										8

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
586	287	62176.2	436873	475437

Table 3 - Summary of Pool Types

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
210	206	MAIN	89	57	11900	93	15.2	1.2	892	187350	1161	239034	11
25	25	SCOUR	11	37	917	7	13.7	1.0	509	12736	485	12116	16
2	2	BACKWATER	1	19	37	0	9.0	1.7	174	347	357	713	23

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
237	233	12854.2	200433	251863

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

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
182	MCP	78	0	0	21	12	80	44	50	27	31	17
25	STP	11	0	0	7	28	15	60	3	12	0	0
1	LSR	0	0	0	1	100	0	0	0	0	0	0
5	LSBk	2	0	0	0	0	2	40	3	60	0	0
16	LSBo	7	0	0	3	19	8	50	5	31	0	0
3	PLP	1	0	0	0	0	1	33	2	67	0	0
2	BPB	1	0	0	0	0	1	50	1	50	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
234	0	0	33	14	100	46	64	27	31	13

Mean Maximum Residual Pool Depth (ft.): 2.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002 Dry Units: 8

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
32	11	LGR	0	0	0	0	0	0	0	0	0
6	3	HGR	0	0	0	0	0	0	7	60	0
11	4	CAS	0	0	0	0	0	0	25	25	0
1	1	BRS	0	0	0	0	0	0	0	0	0
50	19	TOTAL RIFFLE	0	0	0	0	0	0	6	15	0
24	9	GLD	8	6	0	0	8	0	0	11	0
117	8	RUN	0	0	0	0	13	0	0	25	0
150	17	SRN	0	1	0	1	7	0	1	64	3
291	34	TOTAL FLAT	2	2	0	1	9	0	0	41	1
185	179	MCP	2	4	1	2	1	0	1	59	23
25	25	STP	0	2	0	1	0	0	4	71	22
1	1	LSR	70	0	0	30	0	0	0	0	0
5	5	LSBk	3	0	0	3	0	0	0	26	28
16	16	LSBo	1	3	2	0	1	0	1	63	22
3	3	PLP	0	0	0	10	0	0	17	47	27
2	2	BPB	0	0	0	0	0	0	0	0	100
237	231	TOTAL POOL	2	3	1	2	1	0	2	59	23
586	284	TOTAL	2	3	1	2	2	0	2	54	19

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002 Dry Units: 8

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
32	11	LGR	0	0	0	36	45	18	0
6	3	HGR	0	0	0	0	33	67	0
11	4	CAS	0	0	25	0	0	50	25
1	1	BRS	0	0	0	0	0	0	100
24	9	GLD	0	11	56	33	0	0	0
117	8	RUN	0	13	38	25	13	13	0
150	18	SRN	0	0	6	17	33	44	0
185	29	MCP	10	7	45	14	10	14	0
25	8	STP	0	0	13	13	0	75	0
1	1	LSR	100	0	0	0	0	0	0
5	3	LSBk	33	33	33	0	0	0	0
16	4	LSBo	0	0	75	0	25	0	0
3	2	PLP	0	0	50	0	0	50	0
2	2	BPB	50	0	50	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
34	44	56	0	40	40

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	24	23	23.0
Boulder	37	40	37.7
Cobble / Gravel	32	32	31.4
Sand / Silt / Clay	9	7	7.8

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	30	22	25.5
Brush	2	2	2.0
Hardwood Trees	49	47	47.1
Coniferous Trees	16	21	18.1
No Vegetation	4	10	6.9

Total Stream Cobble Embeddedness Values: 3

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

StreamName: Pieta Creek LLID: 1230571389236 Drainage: Russian River - Upper

Survey Dates: 6/19/2002 to 7/18/2002

Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	2	2
SMALL WOODY DEBRIS (%)	0	2	3
LARGE WOODY DEBRIS (%)	0	0	1
ROOT MASS (%)	0	1	2
TERRESTRIAL VEGETATION (%)	0	9	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	6	0	2
BOULDERS (%)	15	41	59
BEDROCK LEDGES (%)	0	1	23

Appendix C - Fish Habitat Inventory Data Summary

Stream Name: Pieta Creek LLID: 1230571389236 Drainage: Russian River -
Survey Dates: 6/19/2002 to 7/18/2002 Survey Length (ft.): 62176. Main Channel (ft.): 61067. Side Channel (ft.): 1109
Confluence Location: Quad: HOPLAND Legal Description: T12NR11WS02 Latitude: 38:55:25.0N Longitude: 123:03:26.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 2349.2
Riffle/Flatwater Mean Width (ft.): 13.6
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 62 - 69 Air (F): 68 - 80
Dry Channel (ft.): 0

Canopy Density (%): 17.9
Coniferous Component (%): 68.2
Hardwood Component (%): 31.8
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 33.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 17.5
Pool Frequency (%): 20.8
Residual Pool Depth (%):
< 2 Feet Deep: 20.0
2 to 2.9 Feet Deep: 40.0
3 to 3.9 Feet Deep: 40.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 2.48
Mean Pool Shelter Rating: 8

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

STREAM REACH: 2

Channel Type: F2
Reach Length (ft.): 26153
Riffle/Flatwater Mean Width (ft.): 11.6
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 60 - 74 Air (F): 67 - 89
Dry Channel (ft.): 0

Canopy Density (%): 29.9
Coniferous Component (%): 47.3
Hardwood Component (%): 52.7
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 36.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0.5
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 33.7
Pool Frequency (%): 46.4
Residual Pool Depth (%):
< 2 Feet Deep: 13.9
2 to 2.9 Feet Deep: 47.9
3 to 3.9 Feet Deep: 25.5
>= 4 Feet Deep: 12.7
Mean Max Residual Pool Depth (ft.): 2.89
Mean Pool Shelter Rating: 12

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.6 Gravel: 22.6 Sm Cobble: 19.5 Lg Cobble: 18.9 Boulder: 34.8 Bedrock: 3.7
Embeddedness Values (%): 1. 27.7 2. 29.5 3. 4.2 4. 0.0 5. 38.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B2
Reach Length (ft.): 5429
Riffle/Flatwater Mean Width (ft.): 11.0
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 53 - 65 Air (F): 57 - 90
Dry Channel (ft.): 0

Canopy Density (%): 38.8
Coniferous Component (%): 32.9
Hardwood Component (%): 67.1
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 44.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 3.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 25.0
Pool Frequency (%): 42.3
Residual Pool Depth (%):
< 2 Feet Deep: 4.5
2 to 2.9 Feet Deep: 36.4
3 to 3.9 Feet Deep: 45.5
>= 4 Feet Deep: 13.6
Mean Max Residual Pool Depth (ft.): 3.28
Mean Pool Shelter Rating: 15

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 4.5 Sm Cobble: 31.8 Lg Cobble: 18.2 Boulder: 40.9 Bedrock: 4.5
Embeddedness Values (%): 1. 18.2 2. 27.3 3. 9.1 4. 0.0 5. 45.5

STREAM REACH: 4

Channel Type: F3
Reach Length (ft.): 9357
Riffle/Flatwater Mean Width (ft.): 8.6
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 58 - 66 Air (F): 66 - 86
Dry Channel (ft.): 794

Canopy Density (%): 44.0
Coniferous Component (%): 19.8
Hardwood Component (%): 80.2
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 58.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0.7
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 19.7
Pool Frequency (%): 29.8
Residual Pool Depth (%):
< 2 Feet Deep: 10.7
2 to 2.9 Feet Deep: 39.3
3 to 3.9 Feet Deep: 28.6
>= 4 Feet Deep: 21.4
Mean Max Residual Pool Depth (ft.): 3.125
Mean Pool Shelter Rating: 8

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 32.1 Sm Cobble: 39.3 Lg Cobble: 21.4 Boulder: 7.1 Bedrock: 0.0
Embeddedness Values (%): 1. 21.4 2. 57.1 3. 14.3 4. 0.0 5. 7.1

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: C3
Reach Length (ft.): 3984
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs):
Water (F): 0 - 59 Air (F): 72 - 77
Dry Channel (ft.): 3964

Canopy Density (%): 10.0
Coniferous Component (%): 15.0
Hardwood Component (%): 85.0
Dominant Bank Vegetation:
Vegetative Cover (%): 0.0
Dominant Shelter:
Dominant Bank Substrate Type:
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 0.5
Pool Frequency (%): 50.0
Residual Pool Depth (%):
< 2 Feet Deep: 0.0
2 to 2.9 Feet Deep: 100.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 2.2
Mean Pool Shelter Rating: 0

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

STREAM REACH: 6

Channel Type: F4
Reach Length (ft.): 10936
Riffle/Flatwater Mean Width (ft.): 4.0
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 52 - 59 Air (F): 62 - 77
Dry Channel (ft.): 7075

Canopy Density (%): 76.4
Coniferous Component (%): 57.9
Hardwood Component (%): 42.1
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 67.5
Dominant Shelter: Small Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 3.3
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 0.3
Pool Frequency (%): 14.3
Residual Pool Depth (%):
< 2 Feet Deep: 50.0
2 to 2.9 Feet Deep: 50.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 2.05
Mean Pool Shelter Rating: 35

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 100. Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 50.0 3. 50.0 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 7

Channel Type: A3
Reach Length (ft.): 2859
Riffle/Flatwater Mean Width (ft.): 3.3
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 55 - 56 Air (F): 68 - 68
Dry Channel (ft.): 0

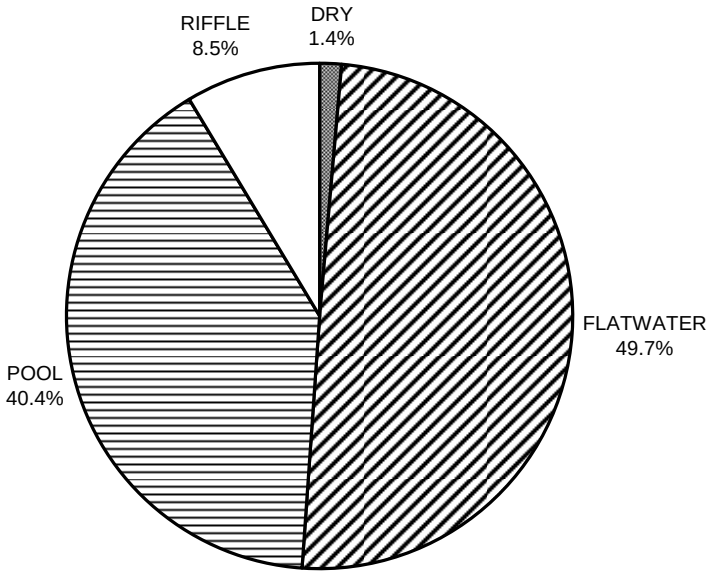
Canopy Density (%): 73.0
Coniferous Component (%): 57.0
Hardwood Component (%): 43.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 46.5
Dominant Shelter: Undercut Banks
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 1.1
Pool Frequency (%): 10.5
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.): 1.3
Mean Pool Shelter Rating: 3

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

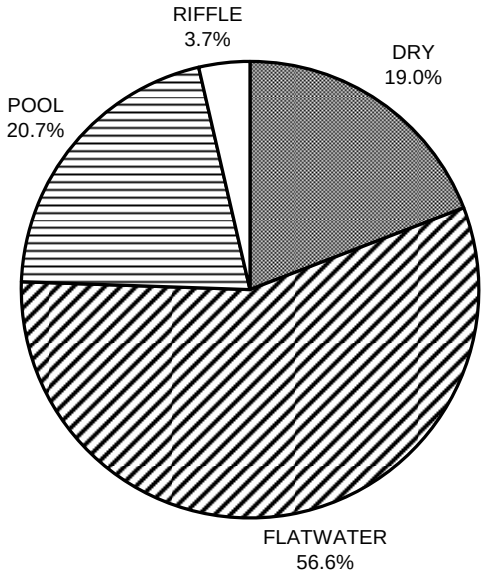
APPENDIX D: GRAPHS

PIETA CREEK 2002
HABITAT TYPES BY PERCENT OCCURRENCE



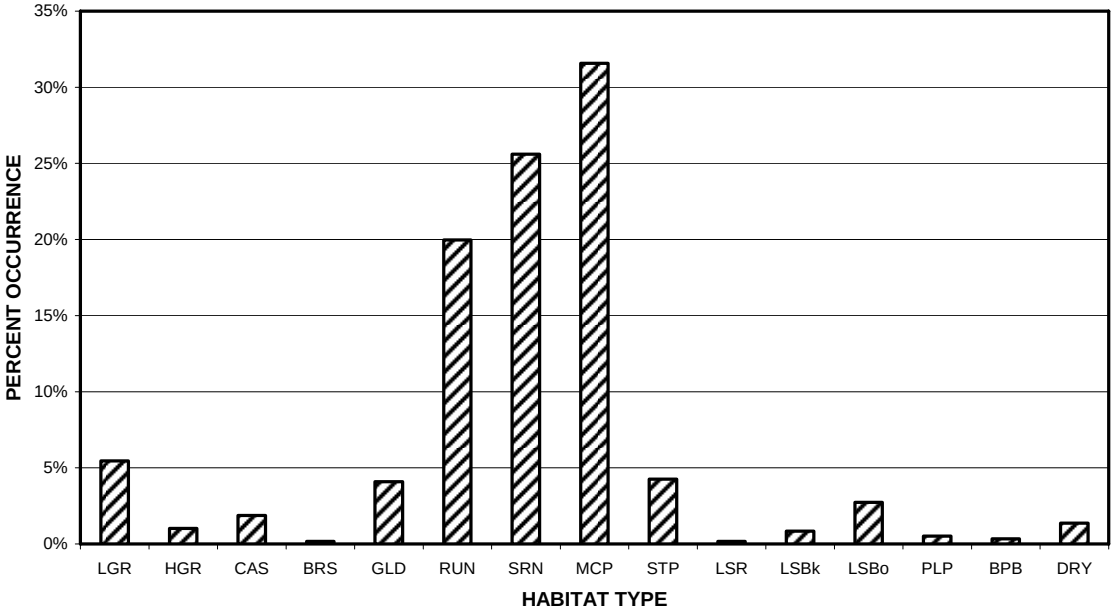
GRAPH 1: Level II habitat types by percent occurrence

PIETA CREEK 2002
HABITAT TYPES BY PERCENT TOTAL LENGTH



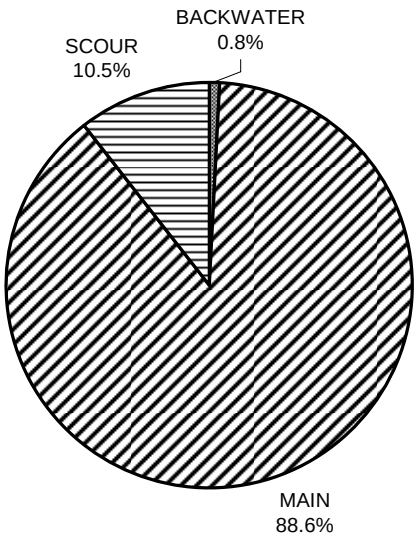
GRAPH 2: Level II habitat types by percent occurrence

PIETA CREEK 2002
HABITAT TYPES BY PERCENT OCCURRENCE



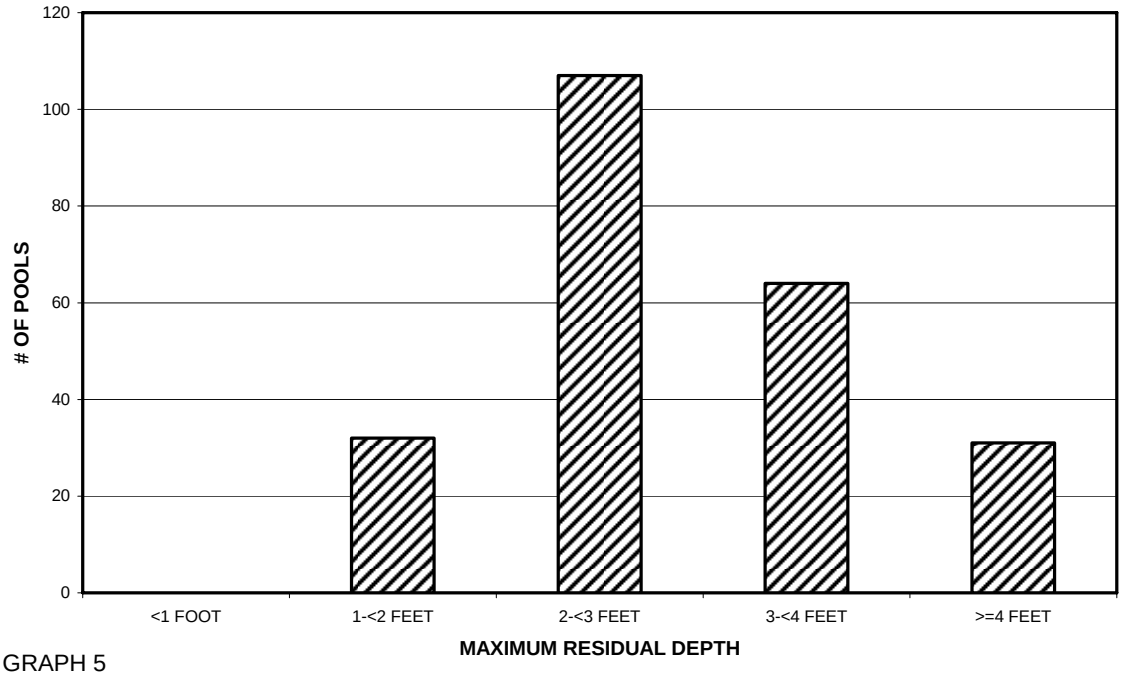
GRAPH 3: Level IV habitat types by percent occurrence

PIETA CREEK 2002
POOL TYPES BY PERCENT OCCURRENCE



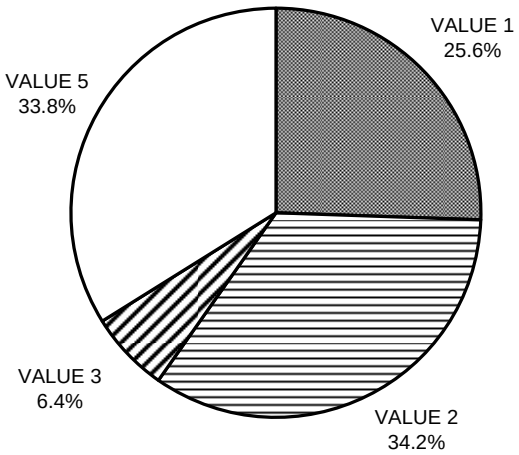
GRAPH 4: Level I pool types by percent occurrence

PIETA CREEK 2002
MAXIMUM DEPTH IN POOLS



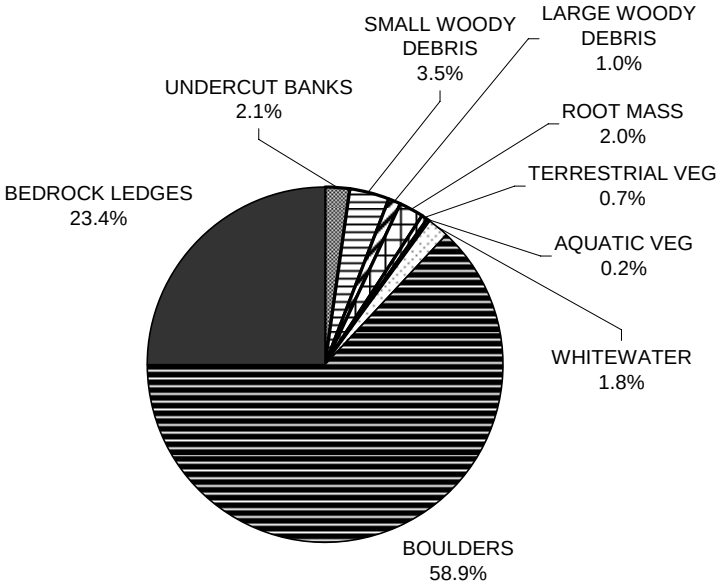
GRAPH 5

PIETA CREEK 2002
PERCENT EMBEDDEDNESS



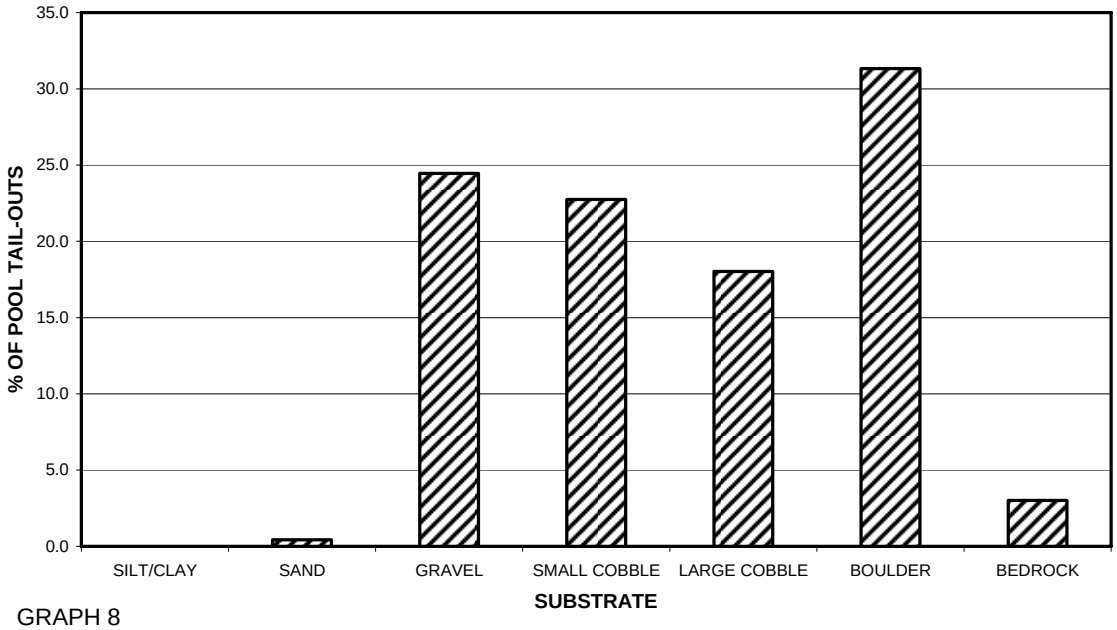
GRAPH 6

PIETA CREEK 2002
MEAN PERCENT COVER TYPES IN POOLS



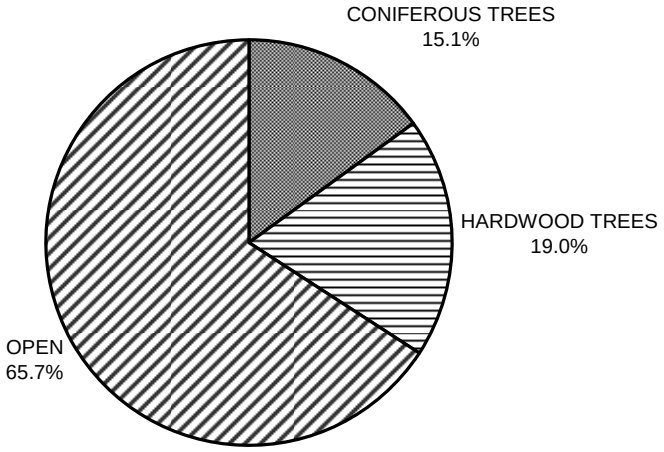
GRAPH 7

PIETA CREEK 2002
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



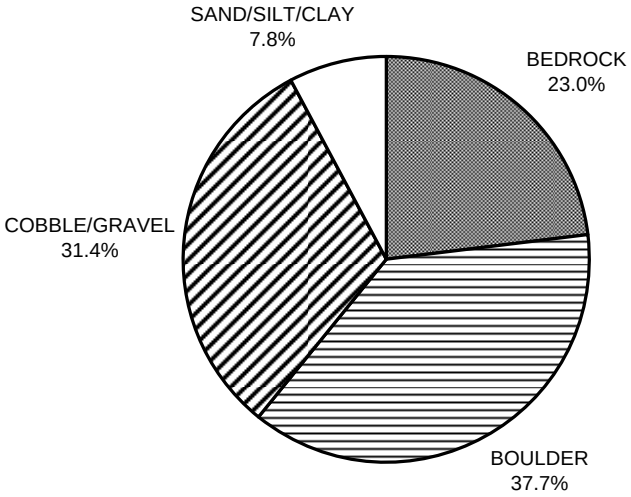
GRAPH 8

PIETA CREEK 2002
MEAN PERCENT CANOPY



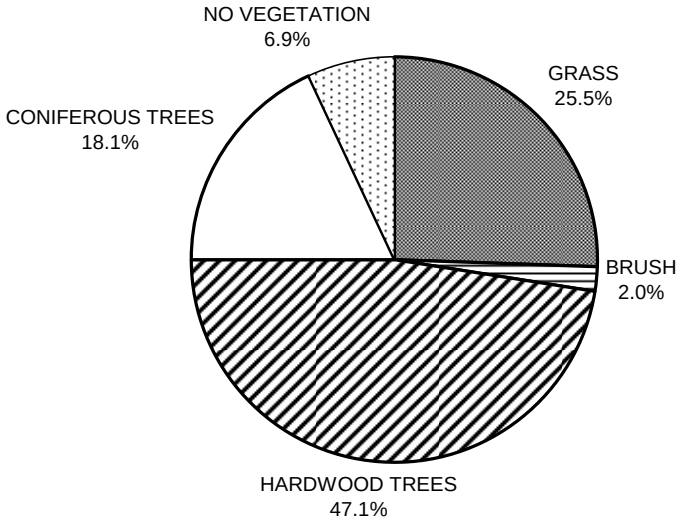
GRAPH 9

PIETA CREEK 2002
DOMINANT BANK COMPOSITION IN SURVEY REACH



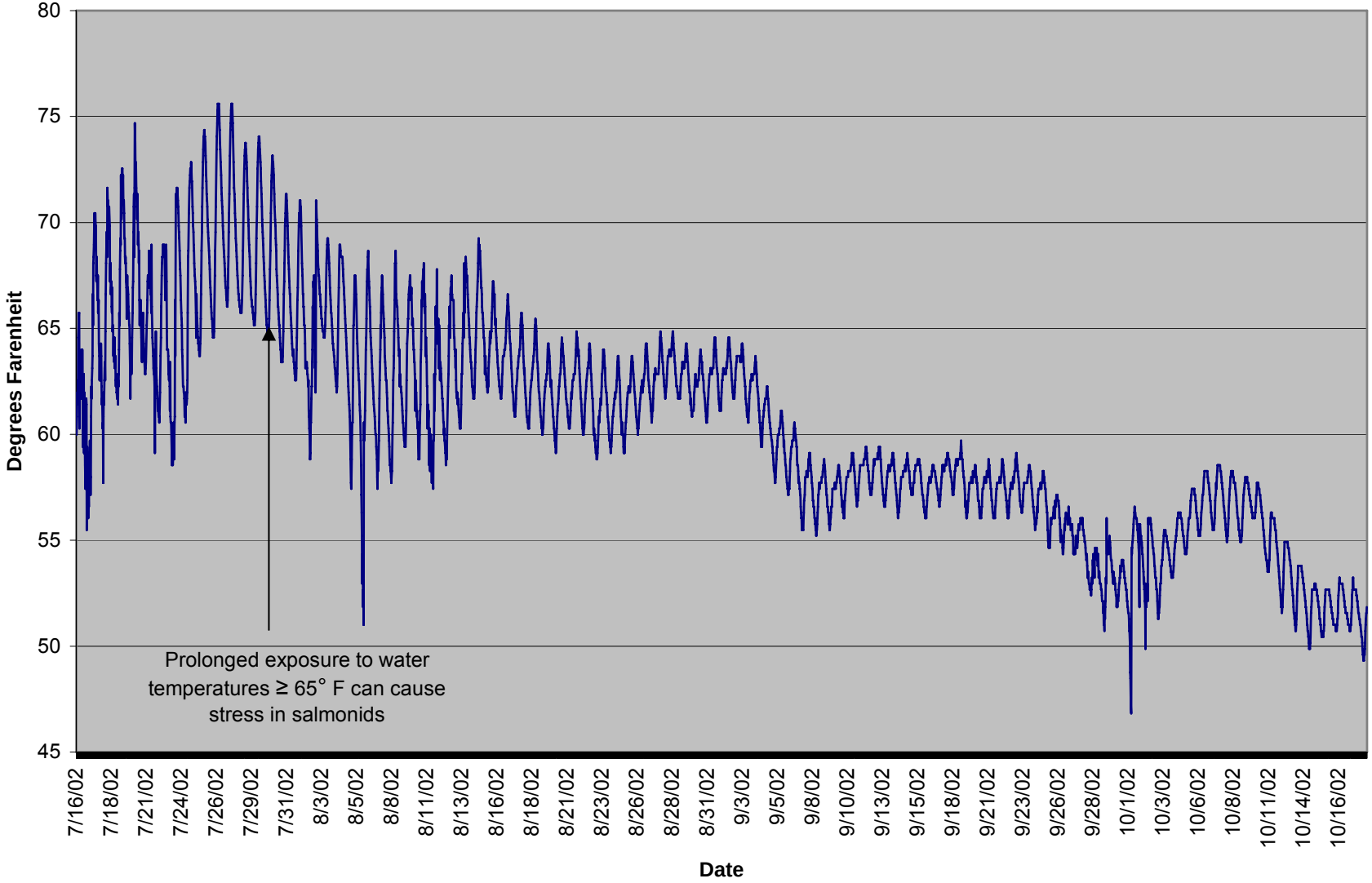
GRAPH 10

PIETA CREEK 2002
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Pieta Creek Water Temperature 2002
(Lower - Reach 4)



Pieta Creek Water Temperature 2002
(Upper - Reach 8)