CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Pechaco Creek

Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Pechaco Creek. 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 Pechaco 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 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

Pechaco Creek is a tributary to Pena Creek which flows into Dry Creek, a tributary of the Russian River, located in Sonoma County, California (see Pechaco Creek map, page 2). The legal description at the confluence with Pena Creek is T9N, R10W, S7. Its location is 38°38'47" N. latitude and 123°0'25" W. longitude. Year round vehicle access exists from Highway 101 near Healdsburg, via a private road.

Pechaco Creek and its tributaries drain a basin of approximately 3.1 square miles. Pechaco Creek is a third order stream and has approximately 2.9 miles of blue line stream, according to the USGS Warm Spring Dam, Geyserville, Guerneville and Cazadero 7.5 minute quadrangles. Elevations range from about 350 feet at the mouth of the creek to 1280 feet in the headwaters. There are several unnamed tributaries to Pechaco Creek, but were not inventoried due to lack of time in the field season. Pechaco Creek consists of grassland and oak-woodland in the lower section of the creek and hardwood forest with some bay trees dominates the upper section of the creek. The watershed is entirely privately owned and is primarily managed for grazing. The red tree vole (*Arborimus pomo*) is listed in the DFG's Natural Diversity Database with a federal status of species of concern as occurring within the Pechaco Creek watershed.

METHODS

The habitat inventory conducted in Pechaco Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The Americorps

Volunteers 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 and was supervised by Bob Coey, Russian River Basin Planner (DFG).

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 Pechaco Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, 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.

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.

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". Pechaco 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 unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the

nearest tenth.

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 Pechaco 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) or "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 Pechaco 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.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Pechaco 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 visually into percentages of evergreen or deciduous trees.

9. Bank Composition:

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 Pechaco 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 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 three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Pechaco Creek include:

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

No historical stream surveys exist for Pechaco Creek.

HABITAT INVENTORY RESULTS

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

The habitat inventory of October 14, 15, 19, 29, and November 11, 1998, was conducted by Simone Watts, Dez Mikkelsen, Marc Miller (AmeriCorps), and Stephanie Carey (CDFG) with supervision and analysis by CDFG. The survey began at the confluence with Pena Creek and extended up Pechaco Creek 10,148 feet. The survey also included an additional 293 feet of side channel.

Flows were not measured on Pechaco Creek.

The surveyed section of Pechaco Creek has five channel types: from the mouth to 2857 feet an F4; next 1151 feet an F2; next 5140 feet an F3; next 525 feet a G3 and the upper 475 feet a G2.

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

F2 and F3 channel types are similar, but have predominately boulder and gravel substrate, respectively.

G3 channel types are characterized as well entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient (2-4%) and a predominantly cobble substrate. G2 channel types are similar but have predominately boulder substrate.

Water temperatures ranged from 50°F to 67°F. Air temperatures ranged from 53°F to 66°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 39% pool units, 29% riffle units, 17% flatwater units, and 15% dry streambed units. Based on total **length** there were 29% dry streambed units, 26% pool units, 26% riffle units, and 19% flatwater units (Graph 1).

One hundred forty-nine habitat units were measured and 33% were completely sampled. Sixteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles at 26%, dry streambed 15%, runs 13% and mid-channel pools 9% (Graph 2). By percent total **length**, dry streambed made up 29%, low gradient riffles 24%, runs 13%, and step pools 6%.

Fifty-eight pools were identified (Table 3). Scour pools were most often encountered at 62%, and comprised 54% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids

increases with depth. Three of the 58 pools (5%) had a depth of three feet or greater (Graph 4). These deeper pools comprised 2% of the total length of stream habitat.

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. Pool types had the highest shelter rating at 26. Riffle had the lowest rating with 5 and flatwater rated 25 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 28. Main channel pools rated 23 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 54%, aquatic vegetation 13%, small woody debris 11%, and root masses 11%. Graph 5 describes the pool shelter in Pechaco Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in two of the nine low gradient riffles measured. Small cobble was dominant in two of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1998 surveys.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 58 pool tail-outs measured, twelve had a value of 1 (21%); sixteen had a value of 2 (28%); six had a value of 3 (10%); and ten had a value of 4 (17%). Fourteen (24%) pool tail-outs rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Cobble was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 63%. The mean percentages of deciduous and evergreen trees were 67% and 33%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 56% and the mean percent left bank vegetated was 60%. For the habitat units measured, the dominant vegetation types for the stream banks were: 32% deciduous trees, 29% grass, 28% evergreen trees, 10% brush and 2% bare soil. The dominant substrate for the stream banks were: 55% silt/clay/sand, 19% boulder, 17% cobble/gravel and 9% bedrock (Graph 10).

A general survey of Pechaco Creek was conducted on November 11, 1998, starting upstream of habitat unit #142. The channel continues as a G channel and switches between boulder and cobble substrates. Below a cascade section, two 2+ steelhead (possible residents) were observed, however, no other fish were observed upstream of the cascade section. Hill slopes are sluffing off soil in several locations and there are several areas of high siltation in the stream. Canopy is good with most of the vegetation consisting of a hardwood forest with some bay trees. The topography is gentle on both slopes and the stream is intermittent with many debris jams.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On October 28, 1998, a biological inventory was conducted in two sites of Pechaco Creek to document the fish species composition and distribution at several locations. Each site was single pass electrofished in using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream. The air temperature ranged from 62°F to 67°F and the water temperature ranged from 51°F to 57°F. The observers were Marc Miller (AmeriCorps) and Stephanie Carey (DFG).

The inventory of Reach 2 started at habitat unit #028 and ended a habitat unit #038, approximately 600 feet upstream. In pool and riffle habitat types, 73 0+ and two 1+ steelhead were observed along with 16 sculpin, 11 roach, and 2 yellow-legged frogs.

The inventory of Reach 3 started at habitat unit #048 and ended at habitat unit #062, approximately 457 feet upstream. In pool, run, and riffle habitat types, 265 0+ steelhead were observed along with 8 yellow-legged frogs.

A summary of recent data collected appears in the table below.

Table 1. Species Observed in Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1998	Steelhead	DFG	N
1998	Sculpin	DFG	N
1998	Roach	DFG	N
1998	Pacific Giant Salamander	DFG	N
1998	Yellow-legged Frog	DFG	N

No introduced fish species were observed during the survey. Historical records reflect that no hatchery stocking, transfers, or rescues have occurred in Pechaco Creek. However, transfers and rescues have occurred in Pena Creek.

ADULT SURVEYS:

No carcass/spawning survey was conducted in 1998/1999.

DISCUSSION

Pechaco Creek has five channel types: F4, F2, F3, G3 and G2.

There are 2857 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover.

There are 1151 feet of F2 channel type in Reach 2. F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

There are 5140 feet of F3 channel type in Reach 3. 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.

For F channel types, any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 525 feet of G3 channel type in Reach 4. G3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

There are 475 feet of G2 channel type in Reach 5. G2 channel types are fair for log cover.

The water temperatures recorded on the survey days October 14 to November 11, 1998 ranged from 50°F to 67°F. Air temperatures ranged from 53°F to 66°F. The warmer water temperatures were recorded in Reach 1.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the upper, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and\or more extensive biological sampling conducted.

Pools comprised 26% 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 Pechaco Creek, the pools are relatively shallow with 5% having a maximum depth of at least 3 feet. These pools comprised 2% 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 26. However, a pool shelter rating of approximately 80 is desirable. The relatively small/moderate/large amount of pool shelter that now exists is being provided primarily by boulders (54%), aquatic vegetation (13%), small woody debris (11%), and root masses (11%).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 nine low gradient riffles measured (44%) had either gravel or small cobble as the dominant substrate. This is generally considered good/poor/fair for spawning salmonids.

Twenty-eight percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 21% 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 and 4 had the best ratings and Reaches 2 and 3 had the poorest ratings. Reach 5 pool tail-outs were determined to be unsuitable for spawning due to the natural geomorphology of the substrate.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel and/or because of fine sediment capping the redd and preventing fry emergence. In Pechaco Creek Reaches 2 and 3, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 63%.

This is a slightly low percentage of canopy, since 80 percent is generally considered desirable. Cooler water temperatures are desirable in Pechaco Creek. Elevated water temperatures could be reduced by increasing stream canopy. 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.

The riparian buffer is thin or nearly absent in areas with livestock. Intensive grazing within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures. Re-vegetation with native species may be most beneficial in Reach 1 which had canopy of 32%.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. Overall, good numbers of steelhead were observed during the survey. The 1998 fall surveys documented many 0+ fish indicating successful spawning in the lower and middle reaches of Pechaco Creek. However, few 1+ fish were observed indicating poor rearing conditions the year before or poor holding-over conditions in general. Habitat conditions upstream of our survey reach are most likely unsuitable due to high siltation. Overall, habitat conditions for steelhead have declined over time.

In Reach 1 (upstream of the confluence of Pena Creek) spawning and rearing habitat quality diminishes due to the effects of eroding stream banks, lack of riparian habitat, and increased

temperatures and nutrient runoff from agriculture and livestock. Sediment transported downstream in the winter also impacts fair quality spawning gravel downstream.

In Reach 1 bank protection, riparian planting and exclusionary fencing for livestock is recommended.

Upstream of Reach 3 conditions are better. In Reach 4 spawning and rearing habitat exists and canopy shading is higher, although instream shelter is still lacking and stream bank erosion is prevalent. However, many opportunities and alternatives exist for habitat improvement, as all the reaches in Pechaco Creek are candidates for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this stream, especially to increase pool frequency, volume and shelter.

GENERAL MANAGEMENT RECOMMENDATIONS

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

Recent winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. 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) There are at least two sections (Reach 1 and Reach 2) 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.

2) Increase the canopy on Pechaco Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (portions of Reaches 1, 2 and 3). The reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

3) 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. Highly silted areas of Pechaco Creek above Reach 5 should also be mapped.

4) 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. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.

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

PROBLEM SITES AND LANDMARKS - PECHACO CREEK SURVEY COMMENTS

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

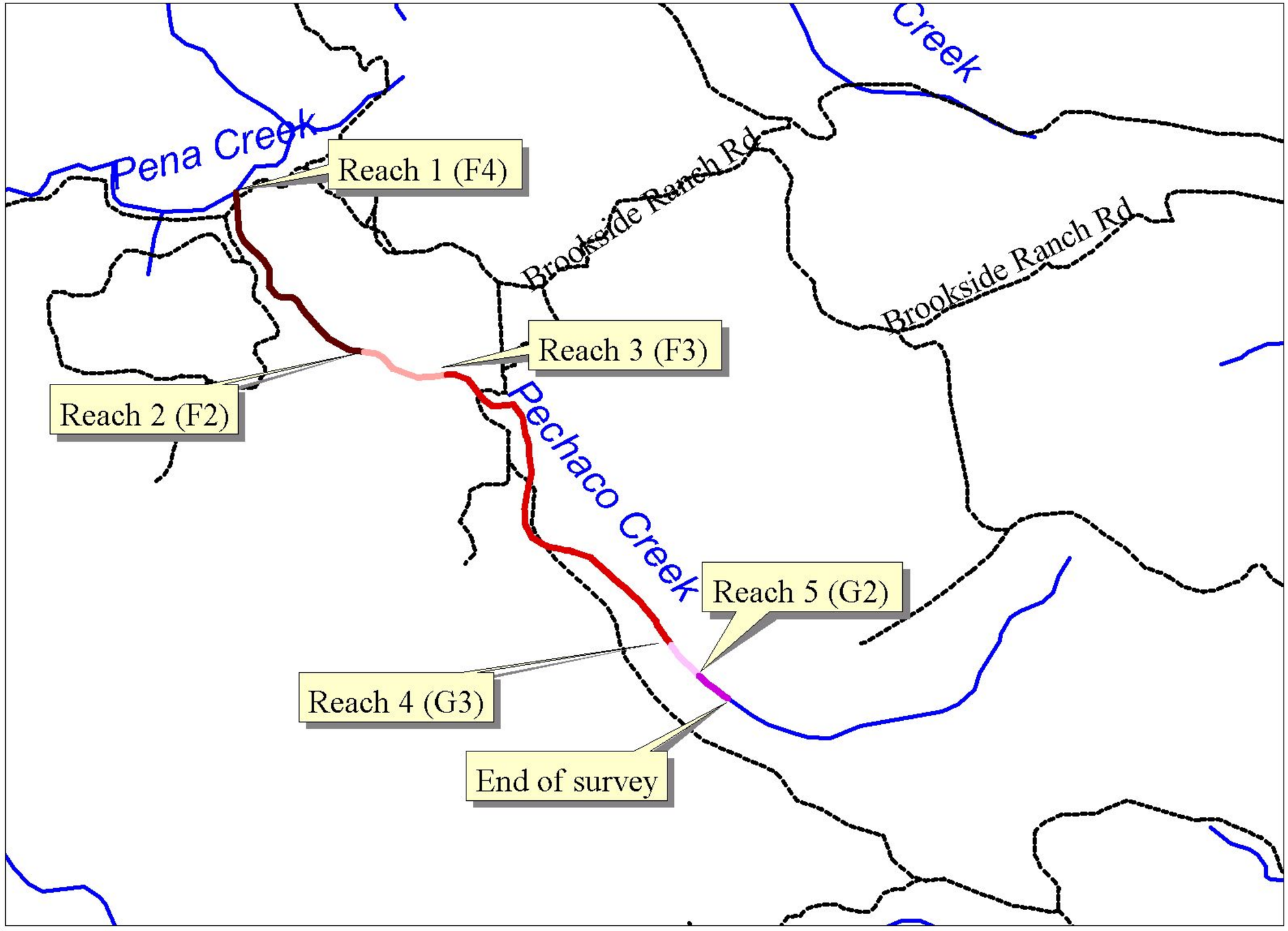
Habitat Unit #	Stream Length(ft)	Comments
Reach 1		
1.00	333	Road crosses stream 130 Ft up from confluence with Pena. Road Along L/B. Cattle grazing in creek.
10.00	1032	Steep dry trib at r/b-no habitat
10.00	1100	Fence crossing stream; cow corral LB
12.00	1507	Dry trib at LB-no habitat. Fence crossing stream.
15.00	1899	Yellow legged frogs and western toads in abundance.
18.00	2132	Dry trib at LB-possibly habitat. Dead sculpin observed in creek.
19.00	2155	0 + steelhead observed.
25.00	2762	Manure in creek. signs of cattle everywhere.
26.00	2822	LB slumping-sediment input from small gully at LB. possibly caused or exacerbated by cattle.
Reach 2		
27.00	2857	Channel change to an F2.
31.00	2980	LB sliding-slumping into stream.
35.00	3321	Fence crosses stream. steep dry trib at RB. no habitat.
38.00	3464	Small gully at RB. dry side channel at LB.
39.00	3626	Dry trib at LB good e-fishing spot. Many 0 plus steelhead.
Reach 3		
47.00	4159	Dry trib at RB- 2 feet wide by 3 feet high. 0 plus Steelhead
49.00	4277	Dry side channel
56.00	5000	Dry trib at RB 100feet of downcut bank at LB approximately 10feet

		high. gully at LB at 300 feet deep seated slide at r/b. approx. 200'h by 300' wide.
59.00	5246	Gully at LB 1'w by 1'h downcutting in creek 10 feet high by 70 feet long.
62.00	5520	dry trib at RB- not hab. Typeable
70.00	5998	dry steep trib at RB. No habitat
76.00	6362	dry trib at LB. No habitat
84.00	6943	erosion at LB.
85.00	6981	0+ steelhead observed.
89.00	7226	dry trib at LB-no habitat. 1+ steelhead observed.
94.00	7612	dry fork at LB. 180feet into unit.
96.00	7689	old wet crossing. Jeep trail at RB.
97.00	7743	2+ steelhead observed. Wet trib at LB. Trib temp =49°f; main temp=51°f. 0 plus steelhead seen in tributary.
98.00	7870	old wooden crossing- bridge- in creek. Possibly needs removing-it is starting to build up gravel.
102.00	8078	spring at LB.
105.00	8171	erosion at RB.
108.00	8375	slide at RB-100feet high by 40feet long. 7 feet deep.
109.00	8406	wet fork at RB. Fork temp=49°F main temp =50°F. 2 + residents seen in fork.
116.00	8745	boulder section-not its own channel type
Reach 4		
123.00	9159	channel change to G3
130.00	9414	highly siltated pool-LB is slumping.
Reach 5		
134.00	9727	channel change: G3 to G2.
135.00	9773	cluster of remnant redwood forest at r/b.
140.00	9960	dry trib at RB. Have not seen fish for several units. Creek begins to steepen
141.00	10089	creek begins to steepen; steep dry trib LB
142.00	10148	LB eroding steeply (20'lx20'hx5'd);pacific giant salamander
		*** End of Survey ***

The survey ended at the boulder cascade at habitat unit number 142.

A general survey of the creek above habitat unit number 142 was conducted on November 11, 1998. The channel resembles a type G channel and switches between boulder and cobble substrates. Two 2+ steelhead were observed below a section of cascade. Maybe residents. No fish seen after the cascade. Slopes are sluffing off soil in several spots. There are areas of high siltation in-stream. Canopy is good, consisting of mostly hardwood forest with some bay. Topography is gentle on both slopes. Stream is intermittent and there are many debris jams. Water temperature: 57°F, air temperature: 55°F.

Pechaco Creek



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Map by C.Brooks, 4-5-2001
L:/mondo3/data/stream-projects/pechaco.apr

Channel Types
- F2
- F3
- F4
- G2
- G3
- Roads, Sonoma Co. (sonords98-alb)
- Waterbodies (nhd-alb region.wb)
- Streams, Reach File 3 (russ11)
- City boundaries

0.5 0 0.5 Miles

0.5 0 0.5 1 1.5 Kilometers

Scale = 1:24,000

Central Coast Region
Department of Fish and Game

PECHACO CREEK — Drainage: Pena Creek, Dry Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 10/14/98 to 11/11/98

Confluence Location: QUAD: WrmSprgsDam LEGAL DESCRIPTION: T9NR10WS7 LATITUDE: 38°38'47" LONGITUDE: 123°0'25"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN 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
43	11	RIFFLE	29	62	2673	26	5.3	0.3	208	8924	72	3114	333	5
26	12	FLATWATER	17	77	2014	19	7.3	0.5	511	13296	265	6878	0	25
58	26	POOL	39	47	2748	26	8.0	0.8	377	21893	326	18904	230	26
22	0	DRY	15	137	3006	29	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
149	49	10441	44113	28896

PECHACO CREEK — Drainage: Pena Creek, Dry Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 10/14/98 to 11/11/98

Confluence Location: QUAD: WrmSprgsDam LEGAL DESCRIPTION: T9NR10WS7 LATITUDE: 38°38'47" LONGITUDE: 123°0'25"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
39	8	LGR	26	64	2499	24	5	0.2	0.6	210	8182	44	1700	0	1	62
2	1	HGR	1	25	49	0	6	0.3	0.5	43	87	11	22	0	0	65
2	2	CAS	1	63	125	1	9	0.7	2.2	362	723	263	527	333	20	85
1	1	GLD	1	95	95	1	10	0.4	0.8	950	950	380	380	0	5	90
20	7	RUN	13	66	1313	13	6	0.4	1.2	366	7324	157	3130	0	19	62
5	4	SRN	3	121	606	6	9	0.6	1.3	656	3279	425	2124	0	43	81
14	6	MCP	9	37	525	5	8	1.0	3.1	329	4604	332	4646	285	19	60
2	1	CCP	1	43	85	1	9	1.1	2.0	394	788	392	784	324	15	85
6	4	STP	4	108	645	6	8	0.7	2.2	667	4000	447	2680	383	33	84
1	1	CRP	1	77	77	1	8	1.0	1.9	616	616	616	616	493	0	25
1	1	LSL	1	18	18	0	6	0.6	1.4	108	108	65	65	43	10	70
13	4	LSR	9	34	442	4	8	0.8	2.1	279	3630	221	2878	157	39	71
11	3	LSBk	7	47	517	5	8	0.9	3.1	390	4285	397	4362	94	18	47
8	4	LSBo	5	51	410	4	9	0.9	2.4	437	3500	321	2569	225	30	70
2	2	PLP	1	15	29	0	8	1.0	2.2	107	215	103	206	79	20	93
22	0	DRY	15	137	3006	29	0	0.0	0.0	0	0	0	0	0	0	38

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
149	49	10441	42291	26688

PECHACO CREEK

Drainage: Pena Creek, Dry Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 10/14/98 to 11/11/98

Confluence Location: QUAD: WrmSprgsDam LEGAL DESCRIPTION: T9NR10WS7 LATITUDE: 38°38'47" LONGITUDE: 123°0'25"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
22	11	MAIN	38	57	1255	46	8.2	0.9	432	9495	370	8148	316	23
36	15	SCOUR	62	41	1493	54	7.8	0.8	345	12419	299	10774	169	28

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
58	26	2748	21914	18922

PECHACO CREEK — Drainage: Pena Creek, Dry Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 10/14/98 to 11/11/98

Confluence Location: QUAD: WrmSprgsDam LEGAL DESCRIPTION: T9NR10WS7 LATITUDE: 38°38'47" LONGITUDE: 123°0'25"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
14	MCP	24	1	7	8	57	4	29	1	7	0	0
2	CCP	3	0	0	1	50	1	50	0	0	0	0
6	STP	10	0	0	4	67	2	33	0	0	0	0
1	CRP	2	0	0	1	100	0	0	0	0	0	0
1	LSL	2	0	0	1	100	0	0	0	0	0	0
12	LSR	21	0	0	8	67	4	33	0	0	0	0
11	LSBk	19	1	9	4	36	4	36	2	18	0	0
8	LSBo	14	0	0	6	75	2	25	0	0	0	0
2	PLP	3	0	0	1	50	1	50	0	0	0	0

TOTAL UNITS
57

PECHACO CREEK

Drainage: Pena Creek, Dry Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 10/14/98 to 11/11/98

Confluence Location: QUAD: WrmSprgsDam LEGAL DESCRIPTION: T9NR10WS7 LATITUDE: 38°38'47" LONGITUDE: 123°0'25"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
39	9	LGR	0	0	0	47	0	0	0	53	0
2	0	HGR	0	0	0	0	0	0	0	0	0
2	2	CAS	0	22	0	0	0	0	0	78	0
1	1	GLD	0	0	0	0	0	0	0	100	0
20	7	RUN	0	0	9	0	1	86	0	5	0
5	4	SRN	1	6	4	0	4	0	0	76	8
14	12	MCP	5	6	0	13	1	2	0	73	0
2	2	CCP	0	5	0	34	31	0	0	31	0
6	6	STP	0	11	2	0	3	0	0	81	3
1	1	CRP	0	0	0	0	0	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0	0	0
13	11	LSR	3	14	0	31	0	49	0	2	0
11	9	LSBk	2	10	0	4	0	11	0	47	25
8	8	LSBo	0	14	5	5	5	0	0	65	5
2	1	PLP	0	5	0	75	0	0	0	20	0
22	0	DRY	0	0	0	0	0	0	0	0	0
ALL HABITAT TYPES 149	74		1	9	3	7	3	17	0	55	5
POOLS ONLY 58	51		2	11	2	11	3	13	0	54	5

PECHACO CREEK

Drainage: Pena Creek, Dry Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 10/14/98 to 11/11/98

Confluence Location: QUAD: WrmSprgsDam LEGAL DESCRIPTION: T9NR10WS7 LATITUDE: 38°38'47" LONGITUDE: 123°0'25"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
39	9	LGR	0	0	22	22	22	22	11
2	2	HGR	0	0	0	0	50	50	0
2	2	CAS	0	0	0	0	0	50	50
1	1	GLD	0	0	100	0	0	0	0
20	7	RUN	0	29	14	29	14	14	0
5	4	SRN	0	0	0	0	0	75	25
14	7	MCP	0	57	0	0	14	29	0
2	1	CCP	0	0	100	0	0	0	0
6	4	STP	0	0	0	0	0	75	25
1	1	CRP	0	100	0	0	0	0	0
1	1	LSL	0	100	0	0	0	0	0
13	4	LSR	0	100	0	0	0	0	0
11	3	LSBk	0	67	0	0	0	0	33
8	5	LSBo	0	60	0	0	0	40	0
2	2	PLP	0	50	0	0	0	50	0
22	[illegible]	DRY	[illegible]	[illegible]	50	[illegible]	50	0	[illegible]

PECHACO CREEK

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
62.64	33.21	66.79	55.87	60.19

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	6	3	8.65
Boulder	10	10	19.23
Cobble/Gravel	8	10	17.31
Silt/clay	28	29	54.81

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	16	14	28.85
Brush	8	2	9.62
Deciduous Trees	14	19	31.73
Evergreen Trees	13	16	27.88
No Vegetation	1	1	1.92

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: PECHACO CREEK
SAMPLE DATES: 10/14/98 to 11/11/98
SURVEY LENGTH:
MAIN CHANNEL: 10148 ft. SIDE CHANNEL: 293 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: WrmSprgsDam Latitude: 38°38'47"
Legal Description: T9NR10WS7 Longitude: 123°0'25"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-27)

Channel Type: F4	Mean Canopy Density: 32%
Main Channel Length: 2857 ft.	Evergreen Component: 24%
Side Channel Length: 0 ft.	Deciduous Component: 76%
Riffle/Flatwater Mean Width: 5.4 ft.	Pools by Stream Length: 14%
Pool Mean Depth: 0.9 ft.	Pools >=2 ft. Deep: 63%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 13%
Water: 53-67°F Air: 61-66°F	Mean Pool Shelter Rtn: 44
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Aquatic Vegetation
Bank Vegetative Cover: 66%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 1950 ft.

Embeddness Value: 1. 50% 2. 13% 3. 0% 4. 38% 5. 0%

STREAM REACH 2 (Units 28-45)

Channel Type: F2	Mean Canopy Density: 70%
Main Channel Length: 1151 ft.	Evergreen Component: 13%
Side Channel Length: 146 ft.	Deciduous Component: 87%
Riffle/Flatwater Mean Width: 9.5 ft.	Pools by Stream Length: 31%
Pool Mean Depth: 1.0 ft.	Pools >=2 ft. Deep: 43%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 14%
Water: 67-67°F Air: 61-61°F	Mean Pool Shelter Rtn: 56
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 65%	Occurrence of LOD: 10%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 38 ft.

Embeddness Value: 1. 11% 2. 33% 3. 11% 4. 11% 5. 33%

STREAM REACH 3 (Units 46-122)

Channel Type: F3	Mean Canopy Density: 63%
Main Channel Length: 5140 ft.	Evergreen Component: 31%
Side Channel Length: 147 ft.	Deciduous Component: 69%
Riffle/Flatwater Mean Width: 6.0 ft.	Pools by Stream Length: 32%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 27%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 3%
Water: 50-67°F Air: 53-61°F	Mean Pool Shelter Rtn: 14
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 69%	Occurrence of LOD: 40%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 871 ft.

Embeddness Value: 1. 18% 2. 30% 3. 15% 4. 15% 5. 21%

STREAM REACH 4 (Units 123-133)

Channel Type: G3	Mean Canopy Density: 91%
Main Channel Length: 525 ft.	Evergreen Component: 80%
Side Channel Length: 0 ft.	Deciduous Component: 20%
Riffle/Flatwater Mean Width: 7.0 ft.	Pools by Stream Length: 18%
Pool Mean Depth: 0.7 ft.	Pools >=2 ft. Deep: 25%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 50-51°F Air: 53-55°F	Mean Pool Shelter Rtn: 25
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Root masses
Bank Vegetative Cover: 10%	Occurrence of LOD: 35%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 25% 2. 50% 3. 0% 4. 25% 5. 0%

STREAM REACH 5 (Units 134-142)

Channel Type: G2	Mean Canopy Density: 90%
Main Channel Length: 475 ft.	Evergreen Component: 73%
Side Channel Length: 0 ft.	Deciduous Component: 28%
Riffle/Flatwater Mean Width: 5.4 ft.	Pools by Stream Length: 45%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 75%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 50-51°F Air: 53-55°F	Mean Pool Shelter Rtn: 35
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 14%	Occurrence of LOD: 30%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 0% 3. 0% 4. 0% 5. 100%