CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
East Austin Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1996

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on East Austin 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 East Austin 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

East Austin Creek is a tributary to Big Austin, a tributary of the Russian River, located in Sonoma County, California (see East Austin Creek map, page 2). The legal description at the confluence with Big Austin Creek is T8N, R11W, S27. Its location is 38°30'36" N. latitude and 123°4'0" W. longitude. Seasonal vehicle access to the upper portion exists from East Austin Creek Road (private) via Mill Creek Road, via Westside Road near Healdsburg. Access to the middle portion is only by foot through Armstrong Redwoods Reserve, and the lower section is accessible only with permission through private property.

East Austin Creek and its tributaries drain a basin of approximately 38.9 square miles. East Austin Creek is a third order stream and has approximately 13.1 miles of blue line stream, according to the USGS Cazadero 7.5 minute quadrangle. Major tributaries include Black Rock Creek, Gilliam Creek, Thompson Creek, Gray Creek, Devil Creek, Conshea Creek, and Sulphur Creek. Each of these tributaries were inventoried in 1996 and are described in separate reports. Two unnamed tributaries ("8th XNG" and "Chic’s Creek") were also inventoried and are included in this report. Summer flow was measured as approximately 6.81 cfs on July

21, 1995 below the gravel bridge (dam) on the old Cazadero Road. On June 1, 1996 flow was measured at 22.21 cfs at 58 yards south of the road crossing. On July 23, 1996 the flow was measured as 8.29 cfs at the mouth. Elevations range from about 40 feet at the mouth to 2,050 feet in the headwaters.

East Austin Creek flows in a southwesterly direction through a V-shaped canyon. The mid to upper section lies in a steep, mountainous terrain of loose serpentine rock. The lower section is in a moderately steep, mountainous terrain. The vegetation is mostly redwood forest, but there are zones of oak, grassland, and chaparral. Dominant tree species observed were redwood and oak. Other tree species were madrone, bay, alder, willow, and cypress. Much of the drainage lies within privately owned lands with the lower 1.5 miles of East Austin Creek being populated with summer homes. In addition, the middle section lies within Austin Creek State Recreation Area. Sensitive species listed in DFG's Natural Diversity Database for East Austin Creek Watershed are: the Northern Spotted Owl (*Strix occidentalis cuarina*), Cedars Fairylantern (*Calochortus raichei*), Foothill Yellow-legged Frog (*Rana Boylii*), and Secund Jewelflower (*Streptanthus glandulosus var. hoffmanii*)

METHODS

The habitat inventory conducted in East Austin Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The NEAP crew 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 East Austin 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". East Austin 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 East Austin 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" (NS) 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 East Austin 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, 1994. Canopy density relates to the amount of stream shaded from the sun. In East Austin 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 East Austin 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 by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. 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 East Austin 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:

The Department of Fish and Game conducted surveys of East Austin Creek in July 1947, April/May 1962, July 1962, October 1968, April 1977, and July 1977. The 1947 survey extended from about 0.1 miles above the upper pool to the C.C. Moore log bridge crossing. The

air temperature was recorded as 76°F and the water temperature was 67°F. The substrate consisted of gravel and cobble. The only barrier noted was a seasonal dam used for six weeks in the summer.

The April 1962 survey started 0.25 miles downstream from Gilliam Creek and extended upstream to the headwaters. The flow was estimated to be 45 cfs in April and was measured as 15.3 cfs in May. The average wetted width was 100' and the average depth was 18". The air temperature ranged from 75-80°F and the water temperature ranged from 58-67°F.

The substrate was estimated to be 50% gravel, 30% small cobble, 15% large cobble, and 5% boulders. Spawning habitat was considered to be good throughout the entire section except for the gorge areas, with an estimated 50% being available for spawning. Pool development was considered good and shelter was satisfactory for small salmonids. No diversions, barriers, or pollution were observed during the survey.

The July 1962 survey started at the confluence with Gilliam Creek and extended downstream to the mouth. The flow was estimated at 1.5 cfs. The average wetted width was 35' and the average depth was 6". The water temperature was 76°F and the air temperature was 80°F.

Spawning habitat was poor in the 1.5 miles below Gilliam Creek and good to excellent in the lower 2.5 miles of the survey. Pool development was considered good throughout the entire 4 miles surveyed. The substrate was predominately boulder, cobble, and gravel. No pollution or diversions were observed. Only a few springs were observed and they were contributing very little to the flow. A barrier consisted of a gravel filled bridge located about 2 miles from the mouth. The county placed the culvert to this bridge in June and removed it in October. In addition, numerous private summer dams created seasonal barriers in the lower 1.5 miles of the stream.

The April 1977 survey covered a distance of one mile upstream from the mouth. Flow was estimated to be 1 cfs. The average wetted width was approximately 20' and the average depth was 6". The air temperature ranged from 58-71°F and the water temperature ranged from 56-63°F.

The substrate was mostly gravel except for a 600' section near the Boy Scout Camp with cobble and boulders. Spawning habitat was abundant in the lower .5 miles and 4 steelhead redds were observed

during the survey. The pools averaged 3' in depth and were primarily located near boulders and the stream banks. Shelter was formed primarily by pools and some overhanging vegetation. No diversions, springs, or pollution were observed during the survey. A partial barrier was the remnant of an old bridge opposite the Boy Scout Camp with a falls of about 2'.

The July 1977 survey started one mile above the mouth of East Austin Creek and extended upstream to the headwaters. Flows were continuous throughout the area and were visually estimated as follows: lower 4 miles .5 cfs; middle 3 miles 1.5 cfs; and the upper 4 miles 1.2 cfs. The wetted width of riffles averaged 3' and the wetted width of pools averaged 2'. The depth of riffles averaged 4" and the depth of pools averaged 2'. Water temperatures ranged from 69-81°F and air temperatures ranged from 74-92°F.

The substrate consisted of 5% bedrock, 10% boulder, 30% cobble, 50% gravel, and 5% sand/mud/detritus. Approximately 50% of the area surveyed was considered good spawning habitat with gravel appearing "loose and clean". Pools were created by bedrock, boulders, and some undercut banks. Shelter was provided by boulders and undercut banks. Canopy provided an average of 40% cover. Barriers consisted of two summer dams located approximately 1.4 miles downstream from the confluence with Gilliam Creek and two rock falls in the headwaters. No diversions were observed and five springs were noted in the headwaters. It was suspected that pollution was being introduced through seepage from septic tanks and cattle excrement.

The Department of Fish and Game conducted a partial survey of an unnamed tributary now referred to as "8th crossing". The survey started at the mouth and extended 0.3 miles upstream, to a rock falls and a series of barriers. The flow was estimated to be .75 cfs. The wetted width averaged 4' and the depth averaged 5". The water temperature was 59°F and the air temperature was 60°F.

Spawning habitat was considered to be fair throughout the lower .3 mile stretch. Pool development was generally good, but many pools were small. Shelter was satisfactory for small salmonids and consisted of overhanging vegetation, rocks, and roots. No diversions or pollution were observed and spring development was considered to be very good throughout the entire section.

HABITAT INVENTORY RESULTS FOR EAST AUSTIN CREEK

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

The habitat inventory of July 8 - September 30, 1996 was conducted by Mark Bolin and Mark Kipp (NEAP) and data analyzed by Ken Bunzel (DFG). The survey began at the confluence with Big Austin Creek and extended up East Austin Creek to the end of anadromous fish passage at a 30' waterfall located approximately 2.25 miles upstream of the confluence with Sulphur Creek. The total length of the stream surveyed was 65,671 feet, with an additional 1,806 feet of side channel. On June 1, 1996 flow was measured at 22.21 cfs at 58 yards south of the road crossing. On July 23, 1996, flow was estimated to be 8.29 cfs at the confluence with Big Austin Creek.

East Austin Creek has 7 channel types in 8 separate reaches: from the mouth to 12,381 feet an F4; next 996 feet an F1; next 2,816 feet a B3; next 18,819 feet a B1; next 4,753 feet a G3; next 2,329 feet an F1; next 20,969 feet an F3 and the upper 2,608 feet an F2.

F1 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly bedrock substrate. F2, F3 and F4 channels are similar to F1 channels except with boulder, cobble and gravel substrates, respectively.

B1 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 bedrock substrate. B3 channels are similar to B1 channels except with cobble substrates.

G3 channel types are characterized as entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient and a predominantly cobble substrate.

Water temperatures ranged from 57-78°F. Air temperatures ranged from 53-96°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 45% flatwater units, 35% pool units, and 20% riffle units. Based on total **length** there were 55% flatwater units, 26% pool units, and 19% riffle units (Graph 1).

Four hundred, Eighty-six habitat units were measured and 24% were completely sampled. Twenty Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were runs at 21%, bedrock scour pools 15%, low gradient riffles 15% and glides 13% (Graph 2). By percent total **length**, runs made up 22%, step runs 18%, low gradient riffles

14%, and glides 12%.

170 pools were identified (Table 3). Scour pools were most often encountered at 68%, and comprised 57% 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. One Hundred and twenty of the 170 pools (71%) had a depth of three feet or greater (Graph 4). These deeper pools comprised 21% 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. Riffle types had the highest shelter rating at 97. Flatwater had the lowest rating with 85 and pools rated 86 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 154, main channel pools rated 85, and scour pools rated 84 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 41%, bedrock ledges 17%, white water 9%, and terr. vegetation 8%. Graph 5 describes the pool shelter in East Austin Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel or small cobble were the dominant substrates observed in 5 of the 11 low gradient riffles measured (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 164 pool tail-outs measured, 1 had a value of 1 (1%); 157 had a value of 2 (96%); 6 had a value of 3 (4%); and 0 had a value of 4. On this scale, a value of one is best for fisheries. Graph 7 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 36%. The mean percentages of deciduous and evergreen trees were 53% and 46%, respectively. Graph 8 describes the canopy for the entire survey and graph 9 describes the canopy by reach.

For the entire stream reach surveyed, the mean percent right bank vegetated was 68% and the mean percent left bank vegetated was 65%. For the habitat units measured, the dominant vegetation types for the stream banks were: 46% deciduous trees, 34% evergreen trees, 9% grass, 9% brush and 2% bare soil. The dominant substrate for the stream banks were: 32% bedrock, 28% cobble/gravel, 24% boulder and 15% silt/clay/sand (Graph 10).

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY ("8TH XNG")

The habitat inventory of October 3, 1996 was conducted by Mark Bolin and Mark Kipp (NEAP) and data analyzed by Ken Bunzel (DFG). This tributary flows into East Austin Creek about 4,304 feet upstream of the confluence with Conshea Creek. The survey began at the confluence with East Austin Creek and continued upstream for 1,276 feet. The surveyed section of this creek has an F3 channel type. These channels are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble. Water temperatures ranged from 55-56°F and air temperatures were all at 55°F.

Fourteen habitat units were measured and 36% were completely sampled. Based on total ***length*** *there were 55% flatwater units, 38% riffle units, and 7% pool units. Five Level IV habitat types were identified. By percent total* ***length****, step runs made up 35%, high gradient riffles 22%, runs 21%, and low gradient riffles 17%.*

Four pools were identified and all were scour pools. One of the pools had a maximum depth greater than 2 feet. Pools had a mean shelter rating of 85, riffles rated 210, and flatwater rated 218. By percent area, the dominant pool shelter types were boulders at 45%, bedrock ledges 35%, and white water 18%. None of the low gradient riffles, and only 1 of the other habitat units had gravel or small cobble as the dominant substrate. All pool tail-outs had embeddedness values of 2.

The mean percent canopy density for the stream reach surveyed was 77%, (deciduous and evergreen trees were 7% and 93%, respectively). The dominant vegetation type for the stream banks was evergreen trees. The dominant substrate for the stream banks were: 40% boulder, 30% bedrock, 20% cobble/gravel and 10% silt/clay/sand.

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY ("CHIC'S CREEK")

The habitat inventory of October 2, 1996 was conducted by Mark Bolin and Mark Kipp (NEAP) and data analyzed by Ken Bunzel (DFG). This tributary flows into East Austin Creek about 1,072 feet downstream of the confluence with Sulphur Creek. The survey began at the confluence with East Austin Creek and extended 620 feet past Chic Cazarotti's cabins. The survey ended when it was evident that salmonids were no longer present. The total length of the stream surveyed was 931 feet and this section was an F3 channel type. F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

The water temperature was 60°F and the air temperature was 70°F.

Five habitat units were measured: 2 high-gradient riffles, 2 scour pools and 1 step run. By percent total ***length****, step runs made up 67%, high gradient riffles 31%, boulder scour pools 1%, and bedrock scour pools 1%.*

Both of the pools were shallow, with maximum depths less than 2 feet, but with good shelter ratings of 60 and 240. By percent area, the dominant pool shelter types were boulders at 68% and aquatic vegetation at 17%. Although there was very little spawning gravel, both of the pool tail-outs measured had embeddedness values of 2, indicating low levels of fine sediment in the stream.

The mean percent canopy density for the stream reach surveyed was 38%, (deciduous and evergreen trees were 6% and 94%, respectively). The dominant vegetation types for the stream banks were: 75% evergreen trees and 25% brush. The dominant substrate for the stream banks were: 63% boulder.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

In the July 1947 survey near the headwaters, steelhead, sculpin (Cottus Sp.), Three-spined Stickleback, Sacramento Suckers, and California Roach were seen. During the April/May 1962 survey numerous young of the year steelhead were observed. These fish were seen primarily in the shallow or riffle areas along the survey. An estimated fifty 1+ steelhead were also observed. One 28" adult steelhead was located approximately 300 yards upstream from the mouth of Thompson Creek. Small numbers of juvenile California Roach, Sacramento Squawfish, and Sacramento Suckers were observed along with 10 adult squawfish and 10 adult suckers. These larger fish were observed in the gorge just upstream from the mouth of Gray Creek. Salamanders and frogs were also found throughout the entire survey.

In the July 1962 survey extending from Gilliam Creek to the mouth, 0+ steelhead were observed at an average of 10-12 fish per pool, with highest abundance in the upper section. Sacramento Suckers and other warm water species averaged 10-15 per pool, due to the sparse cover and higher water temperatures. Frogs and snakes were also observed.

In October 1968, a survey was conducted to check for the presence of juvenile Coho Salmon. Steelhead, California Roach, Sacramento Suckers, and Sacramento Squawfish were observed, but no Coho Salmon were seen.

In the April 1977 survey of the 1 mile section above the mouth, juvenile steelhead and California Roach were numerous throughout the section surveyed. Two adult steelhead were seen approximately 600 feet from the mouth. Three-spine Stickleback and Sacramento Suckers were also observed.

During the July 1977 survey extending from 1 mile upstream of the mouth to the headwaters, 0+ and 1+ steelhead were observed at a rate of 5/100' in the lower 6 miles. Juvenile Sacramento pikeminnow were observed at a rate of 1/100' in the lower 3 miles. Adult Sacramento Suckers were observed at a rate of 20/100' in the lower 2 miles of the stream. Juvenile California Roach and stickleback were both observed at a rate of 150/100' throughout the stream.

In the unnamed tributary (8th XNG"), an estimated 2,000 0+, four 1+ and two 2+ steelhead were observed. Salamanders and frogs were also common.

On July 18, 1996 a biological inventory was conducted in five sites of East Austin Creek to document fish species composition and distribution. Each site was single pass electrofished 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 65-85°F and the water temperature ranged from 65-75°F. The observers were Bolin, Kipp (NEAP), and Fort (DFG).

The inventory of Reach 1 started in habitat unit 26 and ended approximately 1,333 feet upstream in habitat unit 36. In glide, run and pool habitat types 5 0+, 11 1+ and 1 2+ steelhead (<1/100') were observed along with 755 Sacramento Squawfish (57/100'), 21 sculpin, 231 Sacramento Suckers, 6 American Shad and 3 crayfish.

Another inventory of Reach 1 continued in habitat unit 39 and ended approximately 250 feet upstream in habitat unit 41. In run and riffle habitat types 20 0+, 38 1+ and 10 2+ steelhead (27/100') were observed along with 37 Sacramento Squawfish (15/100'), 36 sculpin and 15 crayfish.

Another inventory of Reach 1 continued in habitat unit 117 just above Old Cazadero Rd. and ended approximately 1,041 feet upstream in habitat unit 125. In pool, glide, run, and step run habitat types 16 0+, 20 1+, 16 2+, and 2 3+ steelhead (5/100') were observed along with 995 Sacramento Squawfish (95/100'), 126 Sacramento Suckers, 6 sculpin, 1 unidentified salamander and 1 crayfish.

The inventory of Reach 2 started in habitat unit 141 and ended approximately 902 feet upstream in habitat unit 143. In pocket water and step pool habitat types 38 0+, 35 1+ and 12 2+ steelhead (10/100') were observed along with numerous Sacramento Squawfish, 50 Sacramento Suckers and 7 sculpin.

The inventory of Reach 3 started in habitat unit 145 and ended approximately 555 feet upstream in habitat unit 149. In step run, mid-channel pool and run habitat types 42 0+, and 3 1+ steelhead (8/100') were observed along with 165 Sacramento Squawfish (30/100'), 3 Sacramento Suckers, 7 sculpin and 1 unidentified salamander.

On October 16-17, the biological inventory was continued in 3 more sites of East Austin Creek. The observers were Bolin, Kipp (NEAP), Campo (AmeriCorps) and Coey. The inventory of Reach 4 started in habitat unit 231 and ended approximately 1,333 feet upstream in habitat unit 240. In run, riffle and pool habitat types 155 0+, 28 1+ and 4 2+ steelhead (14/100') were observed along with 2 resident trout, 293 Sacramento Squawfish (22/100'), 6 Sacramento Suckers, and 4 Yellow-legged Frogs. Many pools in this section were too deep to sample.

The inventory of Reach 5 started in habitat unit 270 and ended approximately 1,182 feet upstream in habitat unit 279. In pool and riffle habitat types 380 0+, and 20 1+, and 3 2+ steelhead (34/100') were observed along with 226 Sacramento Squawfish (19/100'), 8 sculpin, 7 frogs, 7 salamanders and 5 newts. The riffles in this section contained numerous fish and the pools were too deep to completely sample.

The inventory of Reach 7 started at Murray's Hunting Camp in habitat unit 397 and ended approximately 855 feet upstream in habitat unit 404. In pool and riffle habitat types 335 0+, 44 1+, and 7 2+ steelhead (45/100') observed along with 169 Sacramento Squawfish (20/100'), 19 sculpin, 10 Rough Skinned Newts and 2 Pacific Giant Salamanders. The following table summarizes 1996 electrofishing results for East Austin Creek. The inventory length is the length of stream covered and the electrofishing seconds is the number of seconds in which the electrofisher was activated.

Summary Of 1996 Electrofishing Results For East Austin Creek								
Reach	1a	1b	1c	2	3	4	5	7
Steelhead 0+/100'	5	20	16	38	42	155	380	335
Steelhead 1+/100'	11	38	20	35	3	28	20	44
Steelhead 2+/100'	1	10	16	12		4	3	7
Res. Trout #			2			2		
Sacramento pikeminnow /100'	755	37	995	1000	165	293	226	169
Sacramento sucker #	231		126	50	3	6		
Sculpin #	21	36	6	7	7		8	19
American shad	6							
Yellow-legged Frog						4		
Unid. Frog							7	
Pac. Giant Salamander								2
Unid. Sal.			2		1		7	
Newt							5	10
Crayfish	3	15						

Biological Inventory: Unnamed Tributaries

On October 7-8, the biological inventory was conducted in the 2 unnamed tributaries of East Austin Creek. The observers were Bolin, Kipp (NEAP), Nossaman, Sanchez (AmeriCorps). The inventory of the tributary referred to as "Chic's Creek" started in habitat unit 2 and ended about 696 feet upstream in habitat unit 5. In run, riffle and pool habitat types 7 0+, and 3 1+ steelhead (1/100') were observed along with 2 sculpin, 4 Yellow-legged Frogs and 4 unidentified frogs. It was noted that this is a small stream with cool water and few salmonids observed.

The inventory of the tributary referred to as "8th XNG" started in habitat unit 1 and ended about 322 feet upstream in habitat unit 5. In run, riffle and pool habitat types 23 0+, 4 1+, and 1 2+ steelhead (9/100') were observed along with 8 Sacramento Squawfish, 10 sculpin, 4 Yellow-legged Frogs, 2 unidentified frogs, and 2 unidentified salamanders. This stream was also noted as being small with cool water and few salmonids observed.

A summary of historical and recent data collected for East Austin Creek appears in the table below. This does not include tributaries of East Austin Creek.

Species Observed in Historical and Recent Surveys of East Austin Creek

YEARS	SPECIES	SOURCE	Native/Introduced
1947, 1962, 1968, 1977, 1996	Steelhead Trout	DFG	N
1947, 1996	Sculpin	DFG	N
1947, 1977, 1996	Three-spined Stickleback	DFG	N
1962, 1968, 1977, 1996	Sacramento pikeminnow	DFG	N
1947, 1962, 1968, 1977, 1996	Sacramento Sucker	DFG	N
1947, 1962, 1968, 1977, 1996	California Roach	DFG	N
1996	American Shad	DFG	I

The only introduced fish species documented during any of the surveys was the American Shad observed in Reach 1 in 1996. Historical records indicate no hatchery stocking, transfers or known rescues have occurred in East Austin Creek.

DISCUSSION FOR EAST AUSTIN CREEK

East Austin Creek has 7 channel types: F1, F2, F3, F4, B1, B3 and G3.

There are 12,381 feet of F4 channel type in Reach 1. 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.

There are 3,325 feet of F1 channel type in Reaches 2 and 6. According to the DFG Salmonid Stream Habitat Restoration Manual, F1 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover.

There are 7,569 feet of B3 channel type in Reach 3. B3 channel types are: excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs.

There are 18,819 feet of B1 channel type in Reach 4. B1 channel types are excellent for bank-placed boulders and bank cover and good for log cover.

There are 4,753 feet of G3 channel type in Reach 5. G3 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing deflectors, and log cover.

There are 20,969 feet of F3 channel type in Reach 7. 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.

There are 2,608 feet of F2 channel type in Reach 8. F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

All channel types of East Austin Creek 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. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks,

and suitable anchoring for high flows.

The water temperatures recorded on the survey days July 8 - September 10, 1996 ranged from 57-78°F. Air temperatures ranged from 53-96°F. Water temperatures above the salmonid threshold stress level (65°F) were recorded in all reaches. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Pools comprised only 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 East Austin Creek, the pools are relatively deep with 71% having a maximum depth of at least 3 feet. These deeper pools comprised 21% of the total length of stream habitat. Landowners indicate many large logs were removed from the system for lumber and firewood. This practice has lead to a decline in pool depth and shelter for young rearing fish, and likely increased stream velocities causing erosion and flooding downstream.

The mean shelter rating for pools was 86. About half of the existing pool shelter is either boulders or bedrock ledges. Log and root wad cover in the pool and flatwater habitats would diversify 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.

Forty-five percent of the low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Ninety-six percent of the pool tail-outs measured had embeddedness ratings of 2. This is considered "fair" Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. Streambank erosion is prevalent along roads upstream of the Gray Creek confluence to the Sulphur Creek confluence.

The mean percent canopy for the survey was only 36%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Cooler water temperatures are desirable in East Austin 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 structure and bank stability.

The headwater area of East Austin Creek is geologically made up of highly erodible materials. This natural instability has been exasperated by historic mining activities and a more recent devastating fires. While much of the mining activity appears to have healed over, the effects of the fire in reducing riparian vegetation are still evident. Several large landslides exist which will be active for some time.

DISCUSSION FOR UNNAMED TRIBUTARY ("8TH XNG")and Chic's Creek

Both tributaries have an F3 channel type. These 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.

Stream shade canopy in 8th XNG was good at 77%. Stream shade canopy was very low (38%) for Chic's creek. Although cool water temperatures were recorded (55-60°F), temperatures need to be recorded during the critical summer months to make any further conclusions.

Although the few existing pools have good shelter for salmonids, there is inadequate pool habitat in this creek. More and deeper pools with log and root wad shelter would improve salmonid rearing habitat. Available spawning habitat is also limited with most of the substrate being boulder or large cobble. Embeddedness levels indicate there is fine sediment erosion in the stream.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. Steelhead were documented consistently during each past survey year. Coho were not found during any of the past surveys of East Austin Creek. They were found in two of the tributaries (Gilliam Creek and Gray Creek) in 1962. This is likely due to physiological and environmental requirements for coho being more stringent than for steelhead, or coho may have been absent or present only in small numbers in some years. The summer 1996 surveys documented many 0+ steelhead in the upper reaches and less in the lower reaches. Steelhead were also more numerous in the upper reaches in the 1962 survey. Few 1+ fish were observed in 1996, indicating poor rearing conditions the year before or poor holding-over

conditions in general.

Stream shade canopy is very low and water temperatures are high. High water temperatures were also recorded in all historical surveys and a mean shade canopy of 40% was recorded in 1977. Steelhead numbers varied by reach and are most likely affected by changes in canopy density. The high presence of species such as Sacramento Squawfish and Sacramento Suckers indicate temperature levels have been and continue to be marginal for salmonids. The high numbers of these predatory warm water fish may be limiting steelhead numbers.

Ample spawning habitat exists and sedimentation levels are moderate. There is adequate shelter in the existing pools, although there is a general lack of large woody debris. Many deep pools exist although the number and length of pools is less than desirable. The addition of woody debris would increase scour, pool depth and length and improve upon shelter values.

GENERAL RECOMMENDATIONS

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

Recent 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. Signs of recent and historic tree and log removal were evident in the active channel during our survey. 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.

SPECIFIC FISHERIES ENHANCEMENT RECOMMENDATIONS

1) Identified sites from the road survey should be treated to reduce the amount of fine sediments entering the stream. Opportunities to decrease considerable quantities of sediment to the stream are numerous with changes in road management strategy. These cost effective alternatives should be explored with landowners.

2) There are ten sites in East Austin Creek with major bank erosion problems. These sites should be treated with bank

stabilization structures and/or restoration techniques to reduce the amount of fine sediment entering the stream.

3) Monitor fish populations for steelhead index.

RESTORATION IMPLEMENTED

4) There are numerous points where the toe of the fill slope of the road is within the floodplain. High flows erode this fill slope causing bank erosion and road failure. These sources of erosion related to the road system have been inventoried and prioritized by NEAP and Pacific Watershed Associates according to present and potential sediment yield.

2) Increase the canopy on East Austin Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels in Reach 1, 2, 3, 4, 5, 6, 7, 8, and 9. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

PROBLEM SITES AND LANDMARKS - EAST AUSTIN 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 LEN (FT.)	COMMENTS
1.00	87	ROAD LF BANK W/ 6" CULVERT, SEE FORM WATER TEMP 66°F
4.00	424	JUV. SQUAWFISH, LARGE DOUG-FIR ROOT WAD, POSS. STREAM ENHANCEMENT CRAYFISH, RIP RAP LF BANK
5.00	498	PIKEMINNOW
7.10	666	SIDE CHANNEL LF BANK
8.00	737	MAIN CHANNEL RT BANK
13.00	1306	MID-CHANNEL POOL CAUSED BY ROOT WAD AT TOP OF GRAVEL BAR
18.00	2246	AUSTIN CK RD LF BANK
21.00	2528	LARGE SQUAWFISH
23.00	2821	TOP OF UNIT A FRAME W/ CHIMNEY IN MIDDLE ON LF BANK
25.00	3089	POWER & PHONE LINES IN MIDDLE OF UNIT
26.00	3386	SQUAWFISH, WIDE OPEN
28.00	3843	2 FT ROCK DAM 110 FT UP UNIT
31.00	4113	RIP RAP RETAINING WALL, RED HOUSE ON LF BANK

36.00	4422	CLASS 3 STREAM LF BANK W/CULVERT
42.00	4925	BEDROCK OUTCROPPING BOTH SIDES, GOOD EF "ROMAN PLUNGE" TURTLE BEDROCK OUTCROP
44.00	5059	LF BANK BLOWOUT, SEE FORM
45.00	5178	CONCRETE BRIDGE FOOTING AT TOP OF UNIT
49.00	5765	BOYSCOUT CAMP PUMP HOUSE RT BANK 10 FT, REDWOOD LF BANK
52.00	6126	ALTAMORI PROPERTY BOUNDARY, SKIP 50 UNITS.
100.00	6214	ALTAMORI END OF PROPERTY BOUNDARY
101.00	6420	DRY TRIB LF BANK MID UNIT.
103.00	6829	POSS SALMONID EF HOLE, W/O PIKEMINNOW
109.00	7889	CLASS 3 TRIB RT BANK, SCOURED TO BEDROCK
112.00	8400	0+ SALMONIDS
114.00	8524	BLOW OUT LF BANK-SEE FORM
115.00	8845	OLD CAZADERO RD. EARTH BRIDGE TOP OF UNIT. SEE CULVERT FORM
117.00	9174	ABOVE DAM AT ST MICHAELS-OLD CAZADERO RD.
121.00	9680	POSS SALMONIDS
126.00	10185	COWS IN CRK, HEREFORD XING. CLASS 3 STREAM LF BANK W/ RUNNING WATER.
128.00	10754	SEE BLOWOUT FORM
129.00	11074	2 BLOWOUTS, 3 FT FIR ACROSS STREAM
130.00	11274	1+ SALMONIDS, LOWER END OF UNIT
131.00	11420	SMALL DRY TRIB RT BANK
135.00	11795	GOOD HABITAT,
137.00	12155	SALAMANDERS
142.00	13022	END OF UNIT, RATTLESNAKE LF BANK
143.00	13377	4 MAJOR POOLS
144.00	13631	L/B FEEDER STREAM(WET)
145.00	13700	LARGE 12 IN. FISH "SUDS" POOL
147.00	13983	WELL INCISED DRY CHANNEL RT BANK
149.00	14186	DISTINCTIVE 15 FT TALL BOULDER MID CHANNEL
150.00	14263	BLACK ROCK CRK CONFLUENCE WATER TEMP IN BLACK ROCK CRK 67°F
151.00	14333	BLACK ROCK CRK CONFLUENCE BISECTS THIS POOL
152.00	14447	FEEDER STREAM WELL INCISED CHANNEL LF BANK
153.00	14506	ABANDONED R.R. BED ALONG LF BANK THIS BANK
164.00	15862	FEEDER STREAM DRY LF BANK

167.00	16417	SMALL CLASS 3 STREAM (DRY) LF BANK SOME BEDROCK IN CHANNEL
168.00	16615	WELL INCISED RAVINE ABOVE OLD RR BED RT BANK, POSS CLASS 3 STREAM
172.10	17048	CLASS 3 STREAM-62 DEGREES LF BANK
174.00	17396	9 MERGANSERS
178.00	17733	2+ SHD TOP POOL SPRING FED RAVINE TOP OF UNIT, 3 POOL IN UNIT
180.00	18224	FLAG RT BANK ON BIG DOUBLE REDWOOD LF BANK
182.00	18673	BLOW OUT RT BANK
185.00	19284	WELL INCISED EPHEMERAL CHANNEL LF BANK
188.00	19649	END OF PARK RD RT BANK(UNPAVED) GOOD CONDITION
189.00	19820	RT BANK CULVERT ON RD
190.00	19972	FLAG RT BANK
194.00	20443	STEP RAVINE W/FEEDER STREAM(WET) LF BANK
195.00	20507	2+ SALMONIDS IN RIFFLES
196.00	20644	SALMONIDS 0+, 1+, 2+
198.00	20795	SALMONIDS 0+, 1+, 2+
201.00	21122	CONFLUENCE GILLIAM CK 66°F LF BK
204.00	21481	BRAIDED GRAVEL BAR
208.00	21933	CLASS 3 STREAM AT BOTTOM OF UNIT 66°F RT BANK
214.00	22875	CLASS 3 STREAM RT BANK 61°F
223.00	24540	RAVINE LF BANK
227.00	25053	DRY RAVINE LF BANK OAK XING UNIT 3-1 FT RESIDENT TROUT
231.00	26281	3 POOLS CONFL. THOMPSON CK-69°F
232.00	26373	RD 10-12 FT LF BANK, 12-14 IN RESIDENT SALMONIDS
242.00	27797	DRY TRIB LF BANK RD TO FOX MTN FORDS STREAM MID UNIT
243.00	27885	5 FT UNDERCUT BANK
246.00	28198	LARGE TROUT RESIDENT?
249.00	28569	FEEDER TRIB LF BNK WET W/ CULVERT RD.
253.00	30045	LONG RUN RD TO MANNINGS FLAT LF BANK STEP RUN SALMONID CITY
254.00	30226	EF HERE TO IDENTIFY PALE SALMONID
260.00	32133	RT BNK FORD TO MANNINGS FLAT CAMPGRND
262.00	32400	CLASS 3 STREAM RT BANK DRY CONFLUENCE
266.00	33712	LONG GLIDE MANNING FLAT RD RT BANK, DRY TRIB LF BANK TOP OF UNIT, NICE SPAWNING AREA
271.00	34757	RT BANK CULVERT UNDER MANNING FLAT

273.00	35012	LF BANK RAVINE DRY SALMONID 0+,1+,2+, LARGE RESIDENTS
275.00	35296	BIG REDWOOD RT BANK CHAIN ON OAK ABOVE CRK
282.00	35951	FORD TO GRAY CK RD, 0+ PALE SALMONIDS
285.00	36387	CONFL. GRAY CK TOP OF UNIT 66°F
286.00	36489	BOTTOM OF UNIT AT CONFLUENCE WITH GRAY CREEK. PIKEMINNOW PRESENT
287.00	36601	PIKEMINNOW,SALMONIDS,TURTLES PRESENT
294.00	37192	BOTTOM OF "DUMP", RIGHT BANK RAVINE
601.30	38251	RAVINE LF BANK
604.00	38815	3 POOLS
605.00	38924	NICE DEEP POOL. BEDROCK GORGE LF BANK. BOULDER JUMBLE TOP OF UNIT
608.00	39177	CABIN RT BANK; SALMONIDS
610.00	39395	SALMONIDS
611.00	39765	CABIN LF BANK; AUSTIN CREEK RD. FORD
300.00	39823	HAB UNITS OUT OF SEQUENCE DUE TO DELAY IN ACCESS. #300 IS FIRST RIFFLE ABOVE FORD
303.00	40138	ROAD LF BANK FILL SLOPE @ CREEK
304.10	40363	SM. SIDE CHANNEL PARALLEL STREAM SEPARATED BY SM. COBBLE BAR AND BED-ROCK OUT CROPPING
304.20	40363	SALMONIDS
304.30	40363	SALMONIDS 0+,1+,2+
305.00	40410	6 IN. SALMONIDS
308.00	40829	DRY TRIB. R/B TOP OF PROPERTY
321.00	42332	GLIDE ENDS JUST PAST BIG STUMPS ON RT BANK
322.00	42418	SEVERAL TROUT 12"
323.00	42561	ROAD LF BANK DEEP SEATED LANDSLIDE RT BANK SALMONID AND SQUAWFISH
324.00	42922	DEEP SEATED LANDSLIDE RT BANK
326.00	43211	BIG OLD TROUT. CONFLUENCE OF DEVIL CK
341.00	45479	DRIVEWAY TO CAMP LF BANK
341.00	45592	DRIVEWAY TO CAMP LF BANK
342.00	45723	SPIKER HUNTING CAMP CANVAS TENT W/ JEEP LF BANK SORENSON'S PROPERTY
344.00	45859	AT CONFLUENCE OF CONSHEA CREEK LONG CURVING POOL
346.00	46306	ELECTRIC CORRAL OVER STREAM AT TOP OF UNIT
348.00	46479	FORD AT BOTTOM OF UNIT
353.00	47112	TEMPORARY PLASTIC SUMMER DAM
356.00	47416	DRY TRIB RT BANK
357.00	47543	6 IN. TROUT 0+,1+,2+
358.00	47627	DRY TRIB R/B TOP OF UNIT CLASS III

		ON TOPO MAP
362.00	48386	RED BEDROCK
366.00	48805	DRY TRIB L/B TOP OF UNIT COMES FROM CULVERT AT ROAD
374.00	49643	OLD SKID ROAD L/B TO R/B
376.00	49828	RD. L/B FILLSLOPE NEAR CREEK
378.00	50163	RED SLIDE CREEK R/B DRIVEWAY FORDS E. AUSTIN 62°F
379.00	50275	NICE GRAVEL
384.00	50729	SPRING R/B
385.00	50749	RD L/B
390.00	51330	10 POOLS - 2 WATERFALLS FISH OLD NARROW GAUGE RAIL WRAPPED ROUND BOULDERS
393.00	51509	HUGE LANDSLIDE R/B 200'L,400'H,20'D
396.00	51737	MURRAY'S CAMP L/B SM. CABIN FENCED GARDEN
399.00	52043	WHERE MURRAY'S PUT IN SUMMER DAM. DRY TRIB (CLASS III ON TOPO L/B)
404.00	52592	DRY RAVINE R/B
407.00	52990	L/B FEEDER STREAM 56°F
411.00	53665	NICE SPAWNING GRAVEL THIS UNIT
414.00	54094	SPAWNING R/B FEEDER STREAM BOTTOM OF UNIT 57°F MIDDLE OF UNIT
417.00	54490	DAM HOUSE L/B, DAM 4'H X 35'W W/ SPILLWAY, METAL SECTIONS, PIPE BRACES AND PLASTIC LINER
422.00	54941	CLASS III R/B 60°F WHITE HOUSE L/B "CHICS CREEK"
426.00	55234	LITTLE WATERFALLS
428.00	55436	CONCRETE BIB AT FORD
433.00	55962	CONFLUENCE SULPHUR CREEK
437.00	56693	RD L/B, BLOW OUT R/B
450.00	58207	SPRING L/B BOTTOM OF UNIT
452.00	58415	BLOW OUT R/B 60'W, 80'H, 7'D 3' TREE ACROSS CREEK
455.00	60322	BLOWOUT R/B 160'W, 85'L, 7'D.
462.00	61162	SALMONIDS FEEDER STREAM STEEP RAVINE 57°F
464.00	61514	SALMONIDS SOME GRAVEL
465.00	62124	R/B BOTTOM OF UNIT 58°F
478.00	63656	RAVINE R&L BANK TOP OF UNIT FEEDER TRIB L/B 63°F
479.00	63724	NICE GRAVEL CONFLUENCE 61°F CLASS III R/B 15' WATERFALL
481.00	63883	4 POOLS DRY RAVINE L/B TOP OF UNIT

482.00	63919	FEEDER STREAM L/B 65°F
486.00	64243	ON BEDROCK W/ TINY CASCADES
488.00	64318	MINERAL SPRINGS IN STRM. NEXT 4 UNITS
493.00	64789	RAVINE L/B
497.00	65241	6 POOLS, FEEDER R/B W/ WATERFALL L/B 69°F
498.00	65264	MINERAL DEPOSITS IN POOL, RESIDENT SALMONIDS 0+,1+
499.00	65464	NO FISH OBSERVED ABOVE PLUNGE POOL
501.00	65570	NEWT
503.00	65671	FISH BARRIER

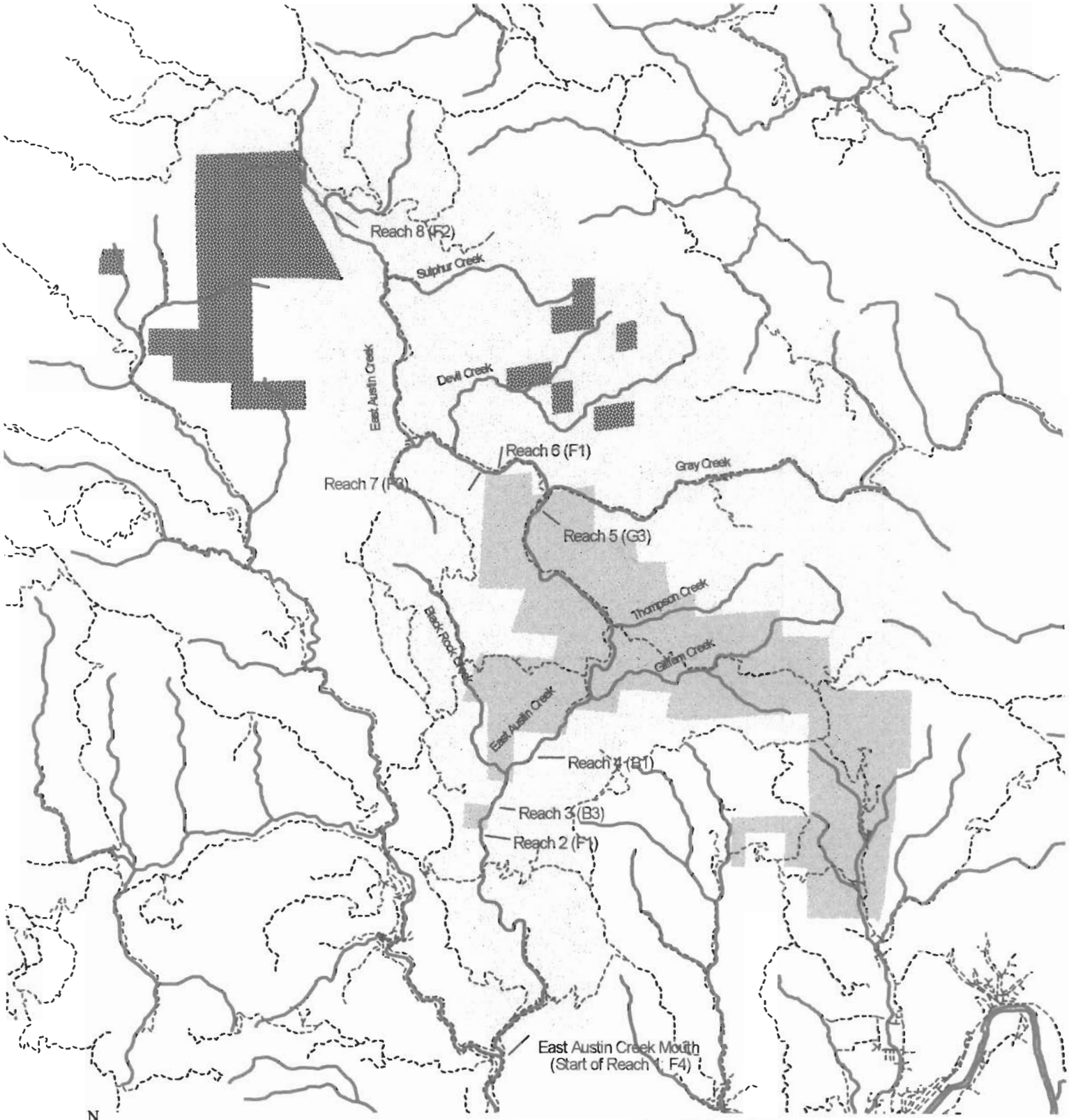
PROBLEM SITES AND LANDMARKS - UNNAMED TRIB. "8TH XNG" COMMENTS

HABITAT UNIT #	*STREAM LEN (FT.)*	*COMMENTS*
2.00	*259*	*WALK WAY OVER CREEK BOTTOM OF UNIT CABIN RIGHT BANK*
5.00	*322*	*JEEP RD LEFT BANK*
6.00	*459*	*3.5' DIAMETER TREE ACROSS STREAM*
8.00	*528*	*LG BLACK PLASTIC WATER LINE RT BANK*
12.00	*817*	*MINERAL SPRINGS*
13.00	*1013*	*MINERAL SPRINGS DRY RAVINE R/B TOP OF UNIT*
14.00	*1276*	*200' UP UNIT WASHED OUT ROAD; CABIN RT. BANK; CONFLUENCE TOP OF UNIT*

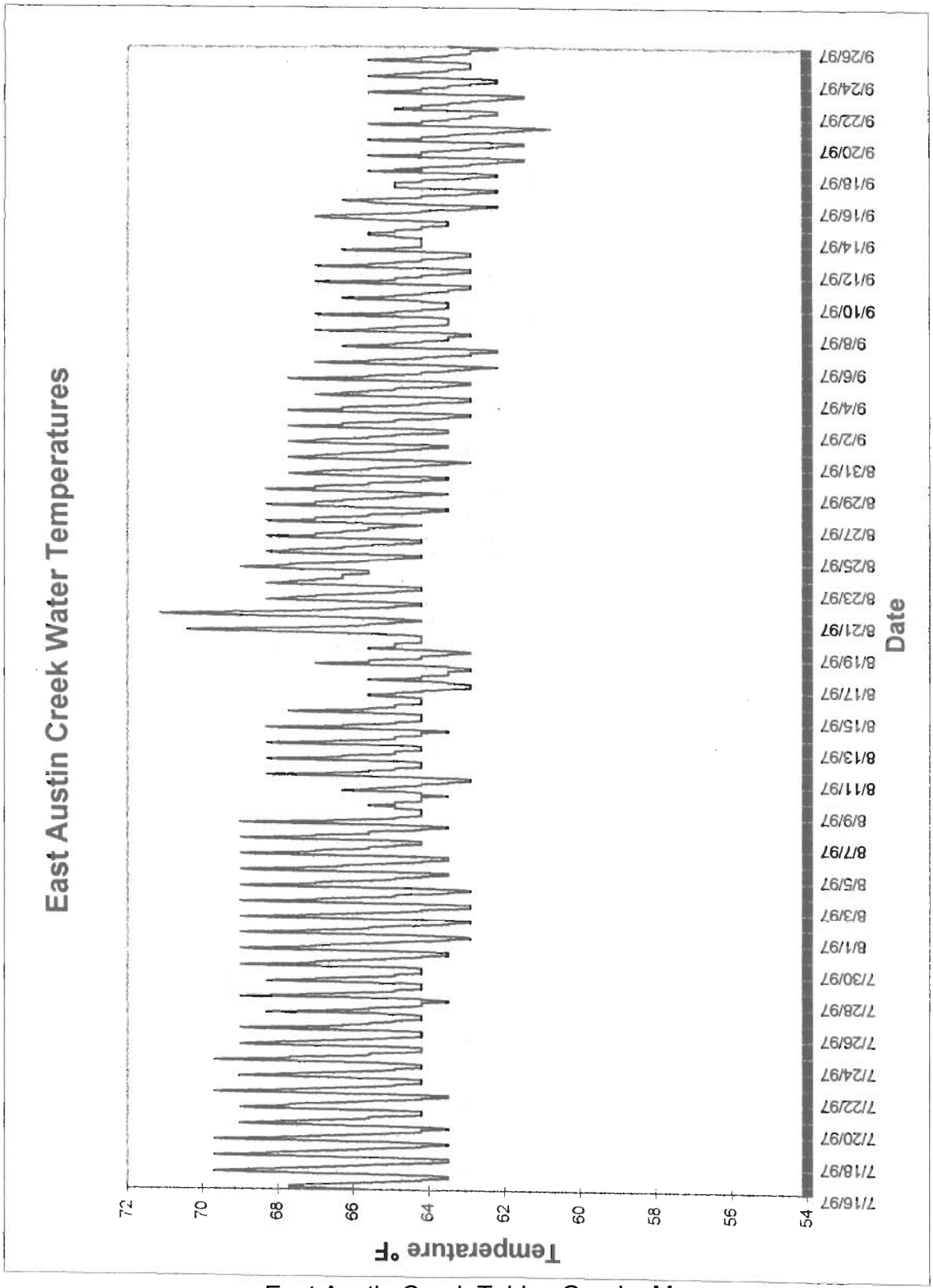
PROBLEM SITES AND LANDMARKS - UNNAMED TRIB. "CHIC'S CREEK" COMMENTS

HABITAT UNIT #	*STREAM LEN (FT.)*	*COMMENTS*
3.00	*298*	*WATER PIPE OVER CREEK, BOTTOM OF UNIT; SPRING RT. BANK*
4.00	*311*	*CHIC CAZAROTTI'S CABIN- RT & LF BANKS WITH WALKWAY BETWEEN*
5.00	*931*	*NO FISH OBSERVED; EAGLE SIGHTING*

East Austin Creek Watershed



Dept. of Fish and Game
Inland Fisheries Division
June 13, 1997


East Austin Creek Water Temperatures
Temperature °F
72
70
68
66
64
62
60
58
56
54
Date
7/16/97
7/18/97
7/20/97
7/22/97
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9/10/97
9/12/97
9/14/97
9/16/97
9/18/97
9/20/97
9/22/97
9/24/97
9/26/97

East Austin Creek | Drainage: Big Austin Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES | Survey Dates: 07/08/96 to 10/09/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T8NR11WS27 LATITUDE: 38°30'36" LONGITUDE: 123°4'0"

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
95	15	RIFFLE	20	135	12855	19	17.7	0.7	2230	211872	2307	219199	0	97
221	53	FLATWATER	45	167	36834	55	21.5	0.9	3180	702832	3345	739139	0	85
170	51	POOL	35	105	17788	26	20.0	1.9	2095	356094	4225	718230	3162	86

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
486	119	67477	1270799	1676569

East Austin Creek

Drainage: Big Austin Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/08/96 to 10/09/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T8NR11WS27 LATITUDE: 38°30'36" LONGITUDE: 123°4'0"

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 %
71	9	LGR	15	138	9780	14	19	0.5	2.2	2214	157205	1186	84223	0	85	40
18	5	HGR	4	106	1903	3	18	0.7	1.7	1227	22083	882	15871	0	99	31
5	1	CAS	1	194	968	1	16	1.6	6.6	4422	22111	9298	46488	0	180	23
1	0	BRS	0	204	204	0	12	0.6	1.9	1836	1836	1102	1102	0	60	0
6	6	POW	1	203	1215	2	25	1.3	4.0	3095	18568	4956	29738	0	181	43
61	15	GLD	13	136	8289	12	30	0.9	3.9	5282	322215	6539	398894	0	11	31
101	19	RUN	21	148	14898	22	17	0.7	2.8	1996	201640	1377	139094	0	64	35
53	13	SRN	11	235	12432	18	17	0.9	5.2	2475	131194	1851	98110	0	161	28
31	9	MCP	6	108	3337	5	28	2.0	8.4	2581	80014	5237	162340	3594	64	34
4	4	CCP	1	85	340	1	19	1.8	4.9	1571	6284	2581	10325	1526	60	44
14	5	STP	3	234	3282	5	18	1.6	7.6	3879	54310	7154	100151	5419	141	42
5	3	CRP	1	141	703	1	23	1.6	4.6	3780	18901	6421	32107	5092	39	35
1	0	LSL	0	90	90	0	28	1.7	2.7	2394	2394	4070	4070	3112	0	30
10	5	LSR	2	78	782	1	18	1.5	3.4	1360	13603	2150	21504	1503	53	59
72	14	LSBk	15	90	6487	10	18	2.0	23.0	1728	124427	3872	278790	3004	83	41
25	8	LSBo	5	80	1994	3	17	1.5	4.2	1469	36735	2252	56307	1615	99	26
3	0	PLP	1	30	89	0	15	3.5	8.3	455	1365	1606	4819	1515	135	0
2	1	SCP	0	82	163	0	10	1.7	3.9	768	1536	1248	2495	959	120	75
1	1	BPB	0	23	23	0	26	2.0	5.2	598	598	1196	1196	718	30	15
2	1	DPL	0	249	498	1	32	2.8	6.2	7840	15680	21532	43064	18228	233	45

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
486	119	67477	1232696	1530688

East Austin Creek Tables Graphs Map
Assessment Completed 1996
Page 4 of 21

East Austin Creek

Drainage: Big Austin Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/08/96 to 10/09/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T8NR11WS27 LATITUDE: 38°30'36" LONGITUDE: 123°4'0"

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
49	18	MAIN	29	142	6959	39	24.3	1.9	2876	140902	5575	273154	3930	85
116	30	SCOUR	68	87	10145	57	18.2	1.8	1705	197769	3439	398885	2643	84
5	3	BACKWATER	3	137	684	4	21.8	2.2	3563	17814	9351	46755	7818	154

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
170	51	17788	356485	718794

East Austin Creek Tables Graphs Map
Assessment Completed 1996
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East Austin Creek

Drainage: Big Austin Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 07/08/96 to 10/09/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T8NR11WS27 LATITUDE: 38°30'36" LONGITUDE: 123°4'0"

UNITS 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
31	MCP	18	0	0	0	0	4	13	14	45	13	42
4	CCP	2	0	0	0	0	1	25	2	50	1	25
14	STP	8	0	0	1	7	1	7	2	14	10	71
5	CRP	3	0	0	0	0	2	40	2	40	1	20
1	LSL	1	0	0	0	0	1	100	0	0	0	0
10	LSR	6	1	10	1	10	4	40	4	40	0	0
72	LSBk	42	0	0	2	3	19	26	24	33	27	38
25	LSBo	15	0	0	1	4	12	48	11	44	1	4
3	PLP	2	0	0	0	0	0	0	0	0	3	100
2	SCP	1	0	0	0	0	0	0	2	100	0	0
1	BPB	1	0	0	0	0	0	0	0	0	1	100
2	DPL	1	0	0	0	0	0	0	0	0	2	100

TOTAL UNITS 170

East Austin Creek | Drainage: Big Austin Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type | Survey Dates: 07/08/96 to 10/09/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T8NR11WS27 LATITUDE: 38°30'36" LONGITUDE: 123°4'0"

	UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	SQ. FT. UNDERCUT BANKS	SQ. FT. SWD	SQ. FT. LWD	SQ. FT. ROOT MASS	SQ. FT. TERR. VEGETATION	SQ. FT. AQUATIC VEGETATION	SQ. FT. WHITE WATER	SQ. FT. BOULDERS	SQ. FT. BEDROCK LEDGES
	71	11	LGR	0	136	0	77	341	215	1470	4945	0
	18	6	HGR	0	506	0	0	281	0	602	1296	0
	5	2	CAS	0	399	558	27	956	0	1010	1038	0
	1	1	BRS	0	0	0	0	0	24	171	294	0
	6	6	POW	0	164	0	164	908	581	3825	13489	2028
	61	19	GLD	2593	1590	393	387	2121	39	0	1553	104
	101	23	RUN	5	58	0	33	331	742	1731	5934	31
	53	15	SRN	351	771	0	116	2014	747	4333	13915	535
	31	31	MCP	420	1827	1459	654	3577	94	2898	8159	5220
	4	4	CCP	0	30	55	20	70	14	34	509	316
	14	13	STP	186	2002	993	1166	1111	1395	4816	8753	3645
	5	5	CRP	571	817	173	301	1363	0	0	59	36
	1	1	LSL	0	0	0	0	0	0	0	0	0
	10	9	LSR	167	6	484	702	226	0	123	472	0
	72	71	LSBk	2482	1165	449	1695	2175	661	2064	15220	7785
	25	25	LSBo	749	598	66	577	494	199	350	8289	587
	3	3	PLP	0	15	0	15	0	0	39	391	156
	2	2	SCP	0	0	0	0	0	0	0	397	170
	1	1	BPB	0	13	22	0	0	0	0	54	0
	2	2	DPL	0	0	0	0	610	5750	0	4785	1050
TOTAL	486	250		7524	10097	4652	5934	16578	10461	23466	89552	21663
				4%	5%	2%	3%	9%	6%	12%	47%	11%
TOTAL FOR POOLS	170	167		4575	6473	3701	5130	9626	8113	10324	47088	18965
				4%	6%	3%	5%	8%	7%	9%	41%	17%

East Austin Creek | Drainage: Big Austin Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE | Survey Dates: 07/08/96 to 10/09/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T8NR11WS27 LATITUDE: 38°30'36" LONGITUDE: 123°4'0"

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
11	11	LGR	0	0	9	36	36	18	0
8	5	HGR	0	0	0	0	40	40	20
2	2	CAS	0	0	0	0	0	50	50
1	1	BRS	0	0	0	0	0	0	100
6	6	POW	0	0	17	0	0	67	17
21	19	GLD	0	16	68	11	5	0	0
21	22	RUN	0	0	50	9	18	18	5
13	16	SRN	0	0	6	6	56	31	0
31	11	MCP	0	36	36	0	0	18	9
4	4	CCP	0	0	100	0	0	0	0
4	5	STP	0	0	20	0	20	60	0
5	3	CRP	0	33	67	0	0	0	0
0	0	LSL	0	0	0	0	0	0	0
0	5	LSR	20	20	60	0	0	0	0
2	14	LSBk	0	14	43	0	21	7	14
5	8	LSBo	0	13	63	13	13	0	0
1	1	PLP	0	0	0	0	0	0	100
2	1	SCP	0	0	100	0	0	0	0
1	1	BPB	0	100	0	0	0	0	0
2	1	DPL	0	0	0	0	0	0	100

East Austin Creek

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

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Decidous	Mean Right bank % Cover	Mean Left Bank % Cover
35.77	46.12	53.47	67.52	64.56

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	38	51	32.48
Boulder	34	32	24.09
Cobble/Gravel	42	36	28.47
Silt/clay	23	18	14.96

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	15	10	9.12
Brush	9	15	8.76
Deciduous Trees	52	73	45.62
Evergreen Trees	58	36	34.31
No Vegetation	3	3	2.19

H

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: East Austin Creek
SAMPLE DATES: 07/08/96 to 10/09/96
STREAM LENGTH: 65671 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: CAZADERO — Latitude: 38°30'36"
Legal Description: T8NR11WS27 — Longitude: 123°4'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-139)

Channel Type: F4	Mean Canopy Density: 36%
Channel Length: 12381 ft.	Evergreen Component: 62%
Riffle/Flatwater Mean Width: 27 ft.	Deciduous Component: 38%
Total Pool Mean Depth: 1.7 ft.	Pools by Stream Length: 23%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 69%
Water: 64-76°F Air: 63-85°F	Mean Pool Shelter Rtn: 36
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 69%	Occurrence of LOD: 39%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

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

STREAM REACH 2 (Units 140-143)

Channel Type: F1	Mean Canopy Density: 33%
Channel Length: 996 ft.	Evergreen Component: 69%
Riffle/Flatwater Mean Width: 29 ft.	Deciduous Component: 31%
Total Pool Mean Depth: 2.0 ft.	Pools by Stream Length: 40%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 100%
Water: 73-73°F Air: 64-64°F	Mean Pool Shelter Rtn: 100
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 48%	Occurrence of LOD: 10%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

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

STREAM REACH 3 (Units 144-165)

Channel Type: B3	Mean Canopy Density: 27%
Channel Length: 2816 ft.	Evergreen Component: 37%
Riffle/Flatwater Mean Width: 26 ft.	Deciduous Component: 63%
Total Pool Mean Depth: 2.0 ft.	Pools by Stream Length: 23%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 67%
Water: 68-73°F Air: 64-85°F	Mean Pool Shelter Rtn: 60
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 58%	Occurrence of LOD: 18%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

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

STREAM REACH 4 (Units 166-273)

Channel Type: B1	Mean Canopy Density: 36%
Channel Length: 18819 ft.	Evergreen Component: 36%
Riffle/Flatwater Mean Width: 25 ft.	Deciduous Component: 64%
Total Pool Mean Depth: 1.9 ft.	Pools by Stream Length: 30%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 88%
Water: 65-78°F Air: 64-96°F	Mean Pool Shelter Rtn: 70
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 69%	Occurrence of LOD: 13%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

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

STREAM REACH 5 (Units 274-611)

Channel Type: B3	Mean Canopy Density: 40%
Channel Length: 4753 ft.	Evergreen Component: 30%
Riffle/Flatwater Mean Width: 15 ft.	Deciduous Component: 64%
Total Pool Mean Depth: 2.2 ft.	Pools by Stream Length: 34%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 71%
Water: 60-78°F Air: 72-96°F	Mean Pool Shelter Rtn: 117
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 57%	Occurrence of LOD: 10%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

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

STREAM REACH 6 (Units 300-319)

Channel Type: F1	Mean Canopy Density: 30%
Channel Length: 2329 ft.	Evergreen Component: 32%
Riffle/Flatwater Mean Width: 10 ft.	Deciduous Component: 68%
Total Pool Mean Depth: 1.9 ft.	Pools by Stream Length: 42%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 78%
Water: 59-67°F Air: 70-78°F	Mean Pool Shelter Rtn: 56
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 71%	Occurrence of LOD: 40%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 44% 3. 56% 4. 0%

STREAM REACH 7 (Units 320-476)

Channel Type: F3	Mean Canopy Density: 30%
Channel Length: 20969 ft.	Evergreen Component: 50%
Riffle/Flatwater Mean Width: 18 ft.	Deciduous Component: 50%
Total Pool Mean Depth: 1.7 ft.	Pools by Stream Length: 21%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 55%
Water: 57-68°F Air: 53-78°F	Mean Pool Shelter Rtn: 113
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 71%	Occurrence of LOD: 7%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

Embeddness Value: 1. 2% 2. 96% 3. 2% 4. 0%

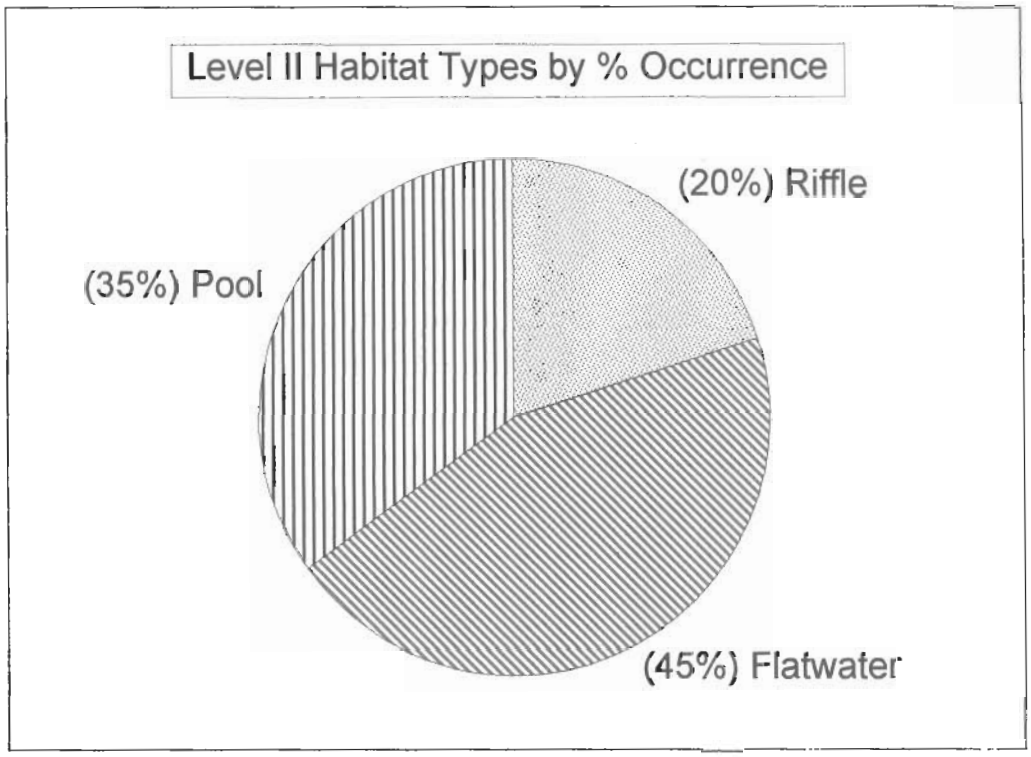
STREAM REACH 8 (Units 477-503)

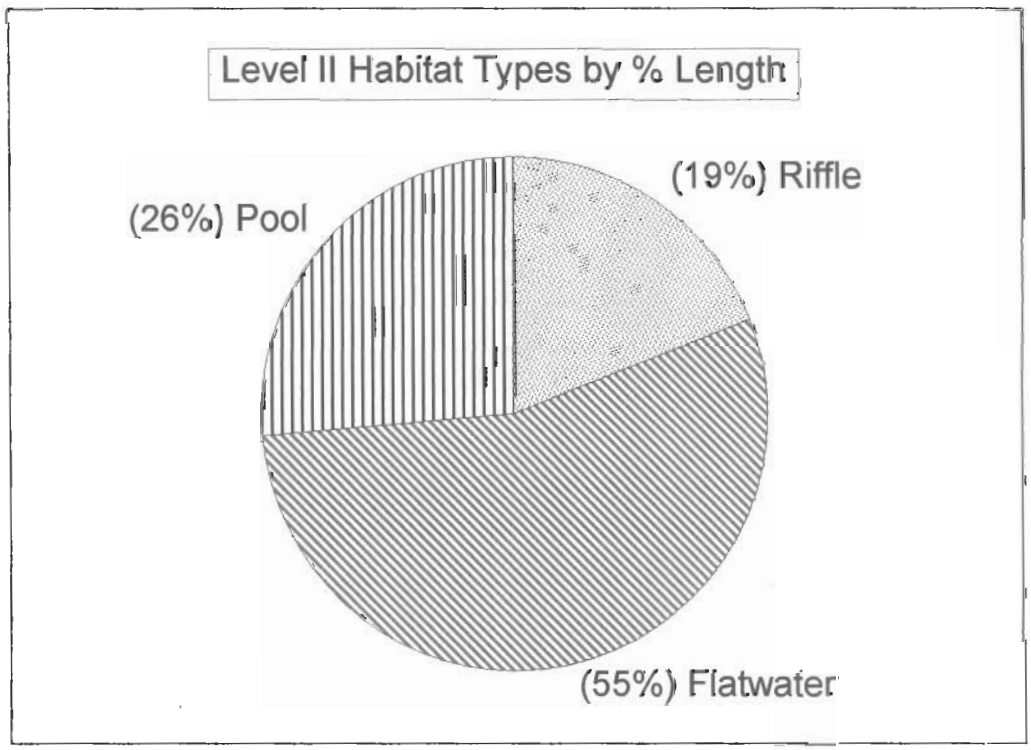
Channel Type: F2	Mean Canopy Density: 71%
Channel Length: 2608 ft.	Evergreen Component: 33%
Riffle/Flatwater Mean Width: 7 ft.	Deciduous Component: 67%
Total Pool Mean Depth: 2.0 ft.	Pools by Stream Length: 41%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 67%
Water: 57-68°F Air: 72-78°F	Mean Pool Shelter Rtn: 134
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 61%	Occurrence of LOD: 5%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

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

East Austin Creek

Level II Habitat Types

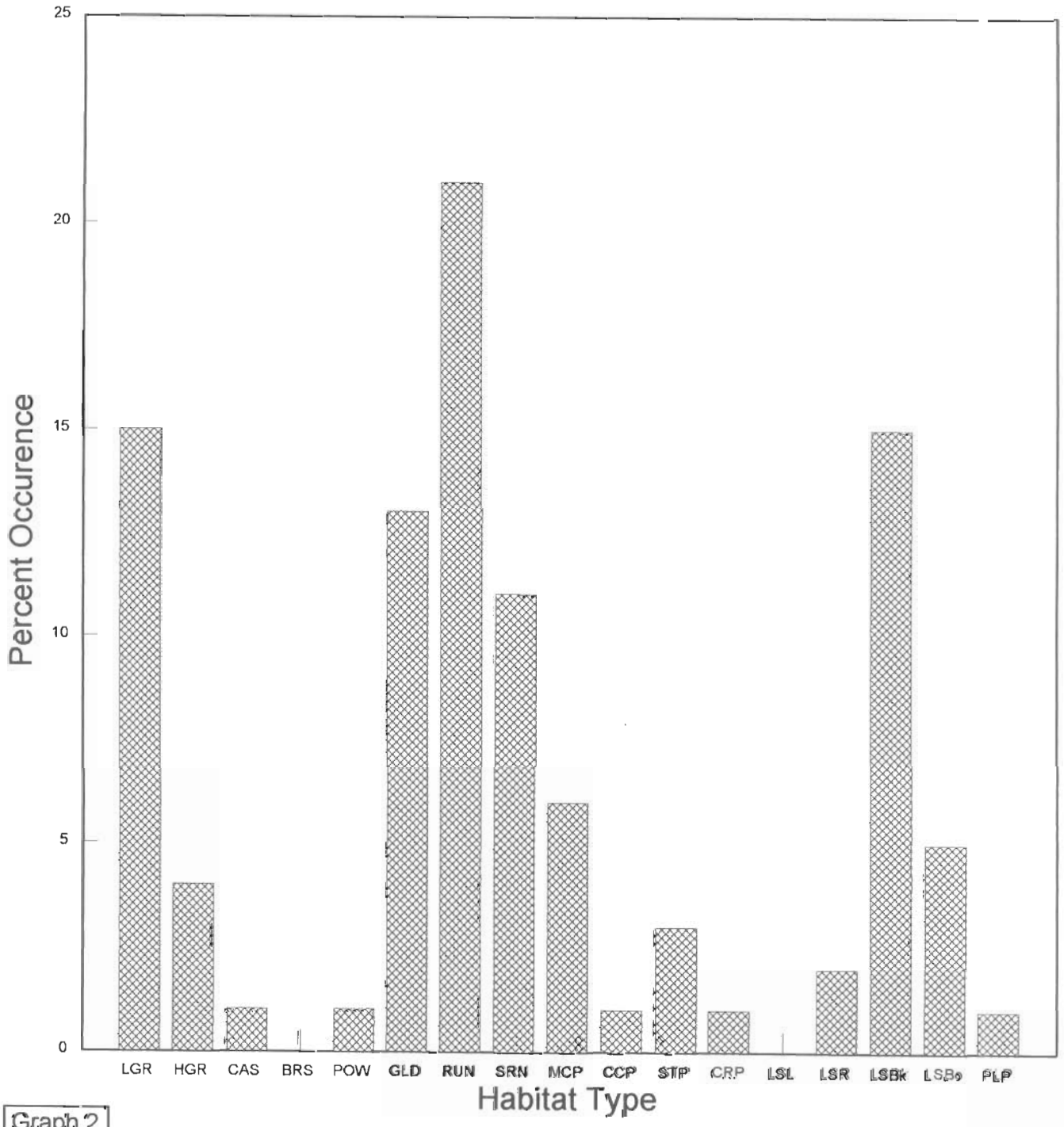




Graph 1

East Austin Creek

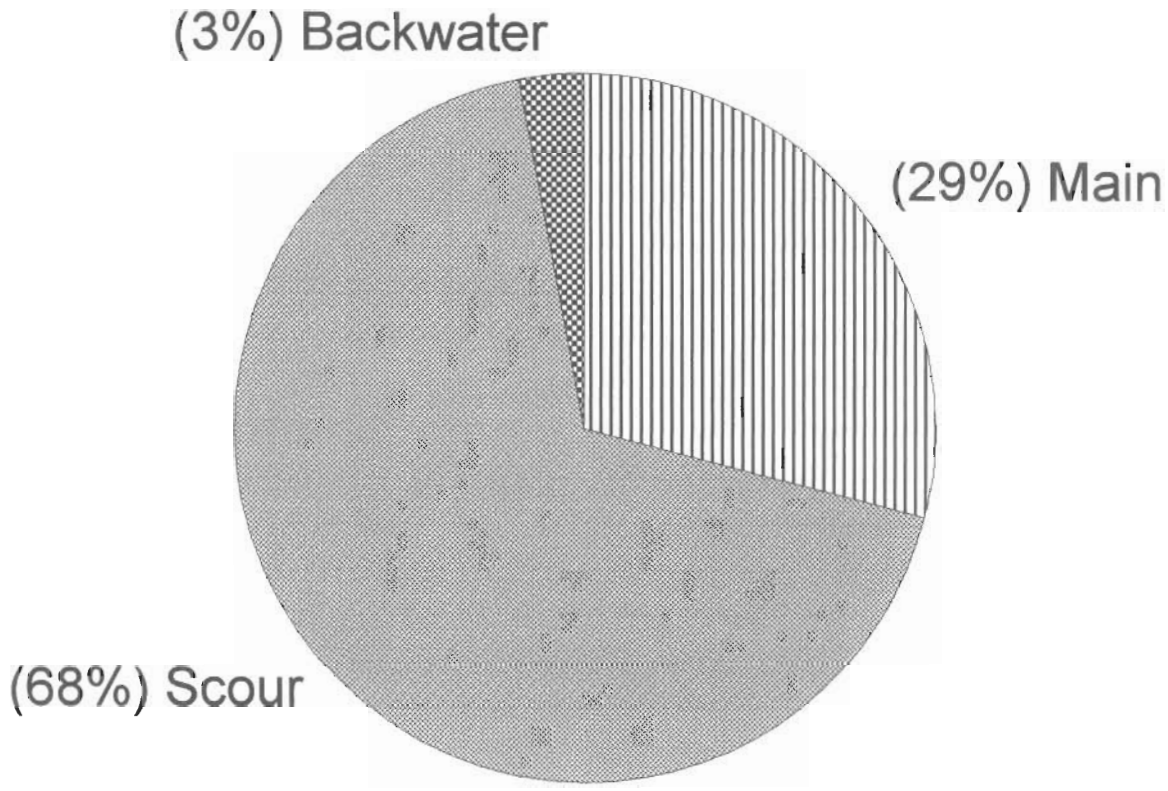
Level IV Habitat Types by % Occurrence



Graph 2

East Austin Creek

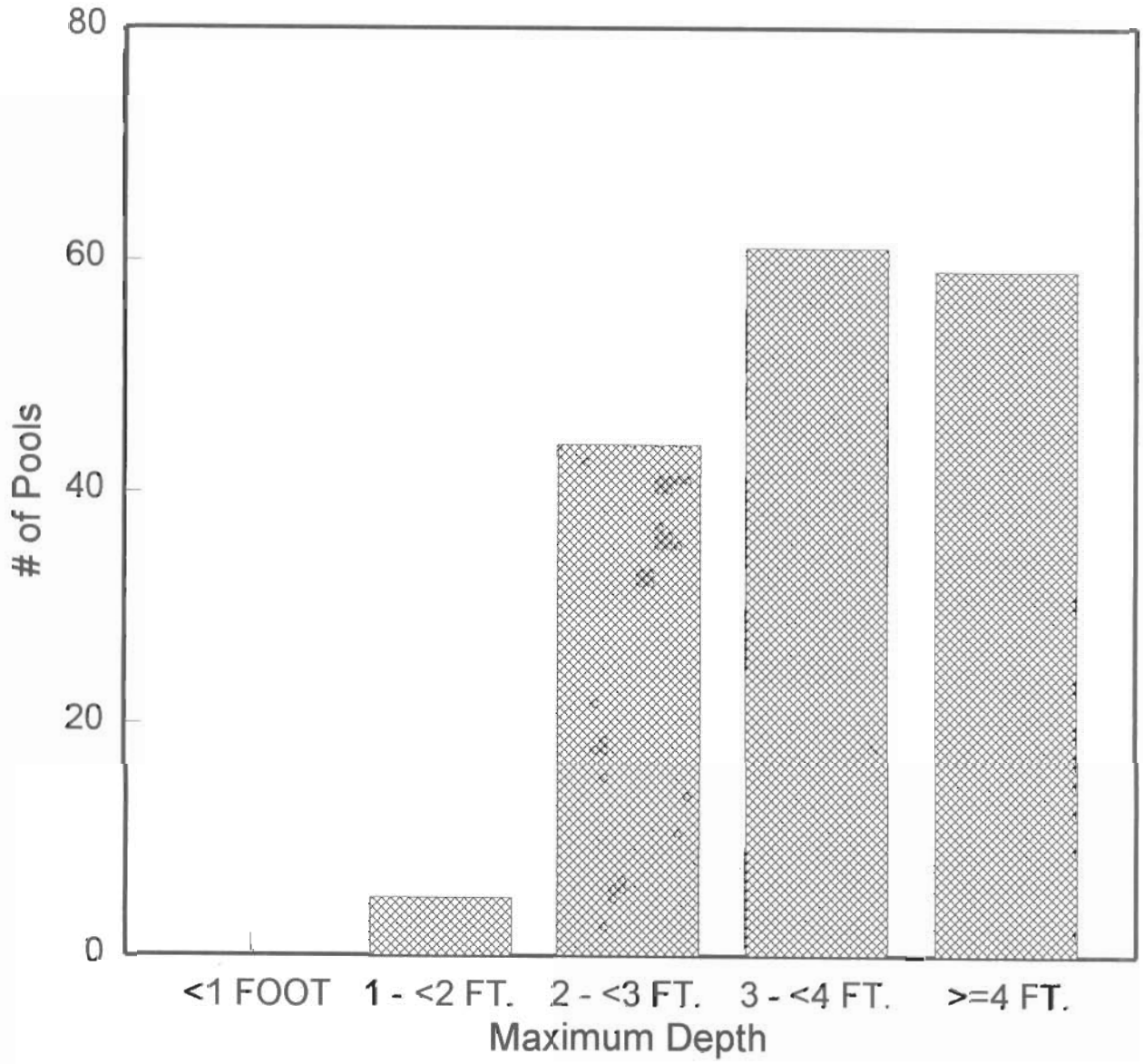
Pool Habitat Types by % Occurrence



Graph 3

East Austin Creek

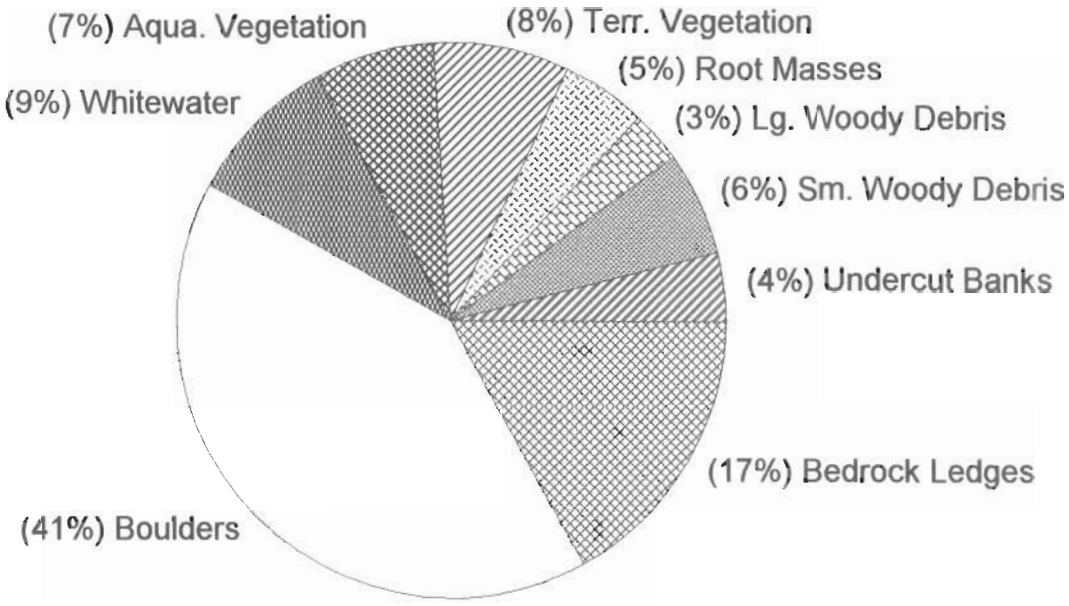
Maximum Depth in Pools



Graph 4

East Austin Creek

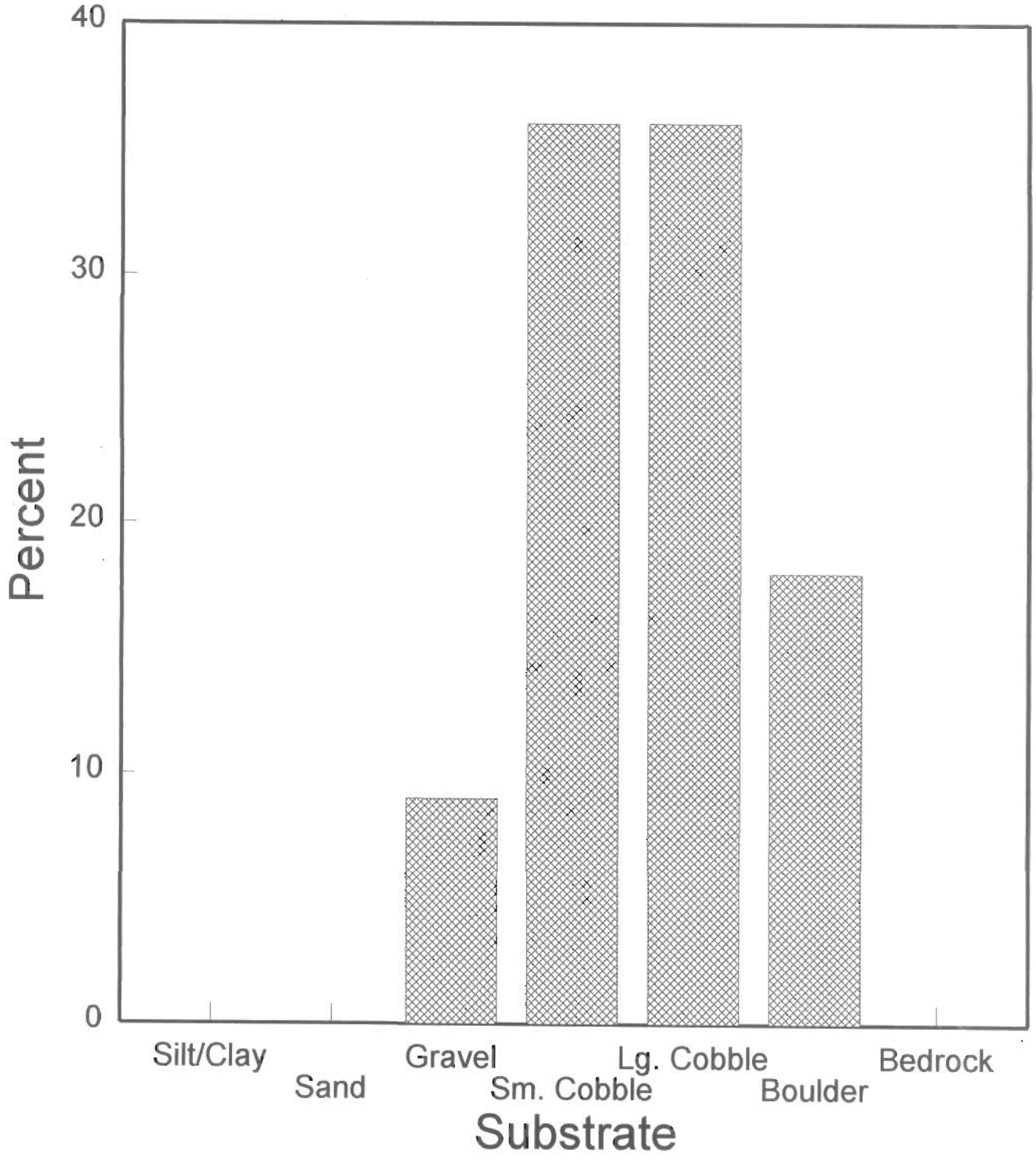
Pool Shelter Types by % Area



Graph 5

East Austin Creek

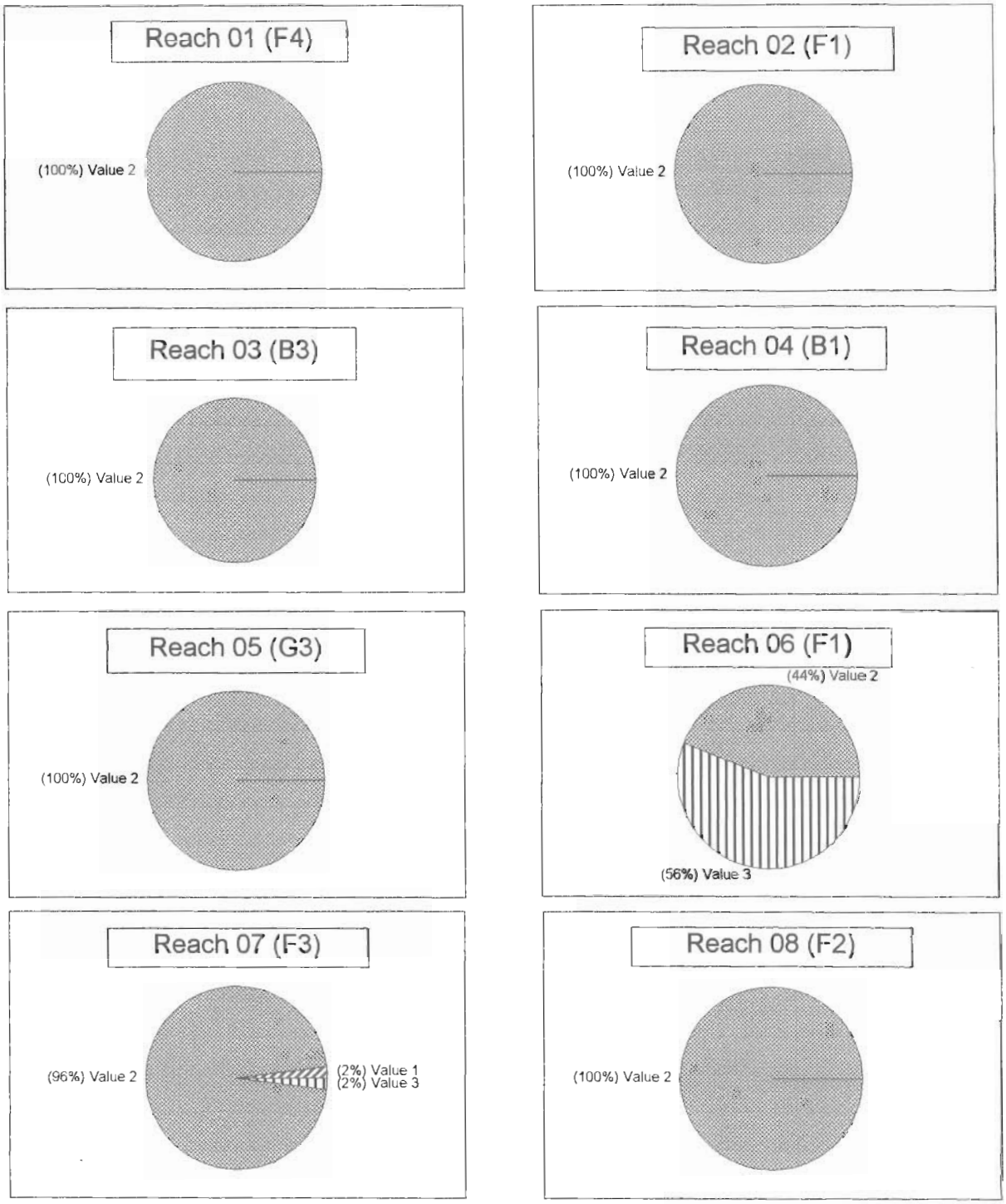
Substrate Composition in Low Gradient Riffles



Graph 6

East Austin Creek

Percent Cobble Embeddedness by Reach

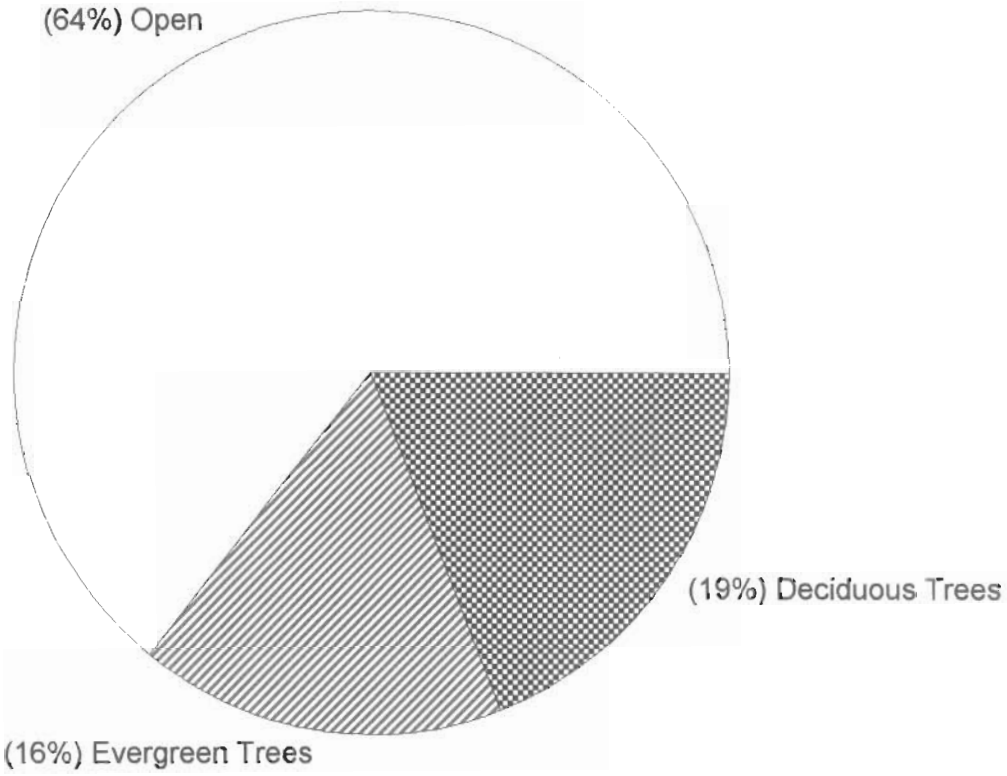


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

East Austin Creek

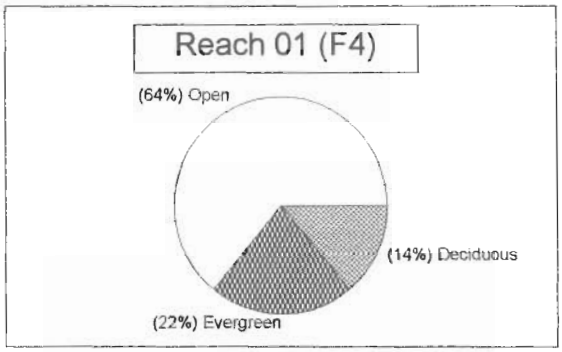
Mean Percent Canopy

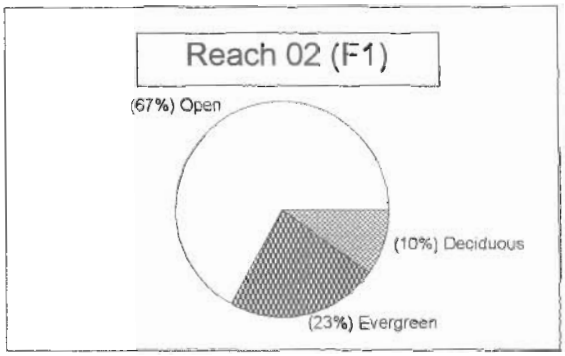


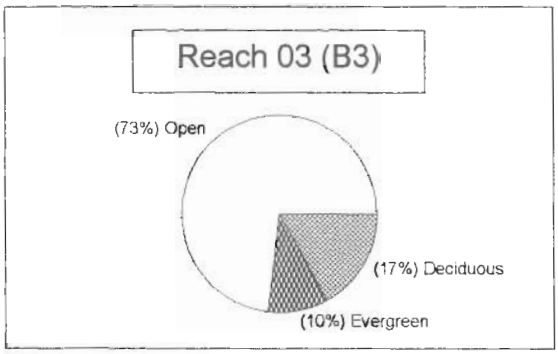
Graph 8

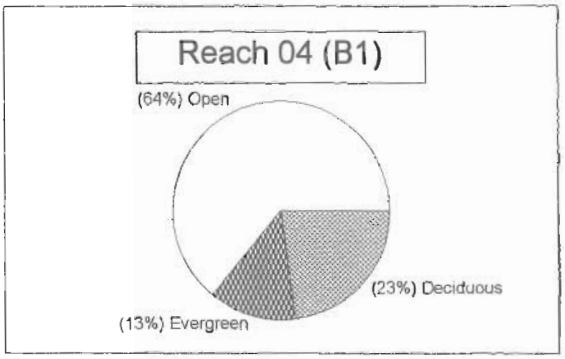
East Austin Creek

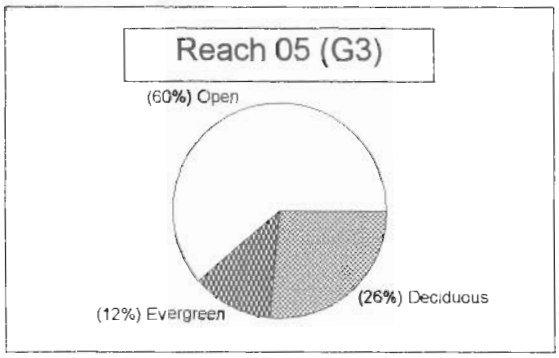
Percent Canopy By Reach

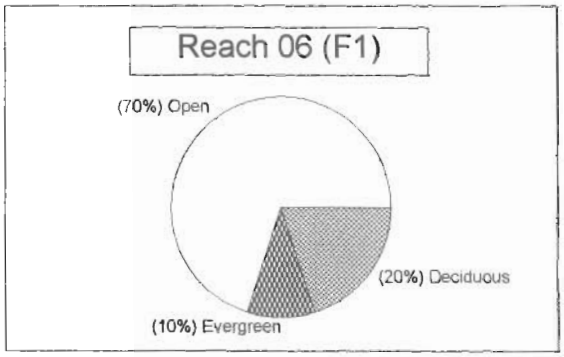


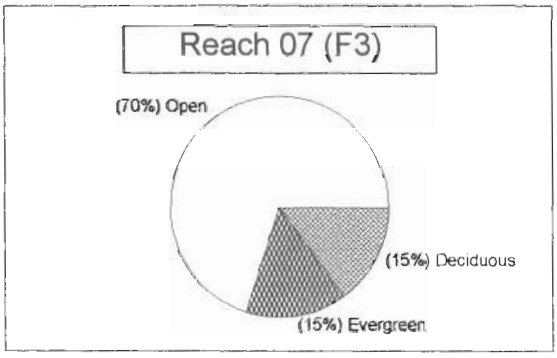


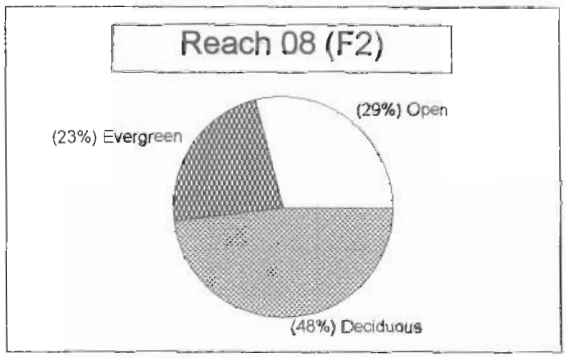








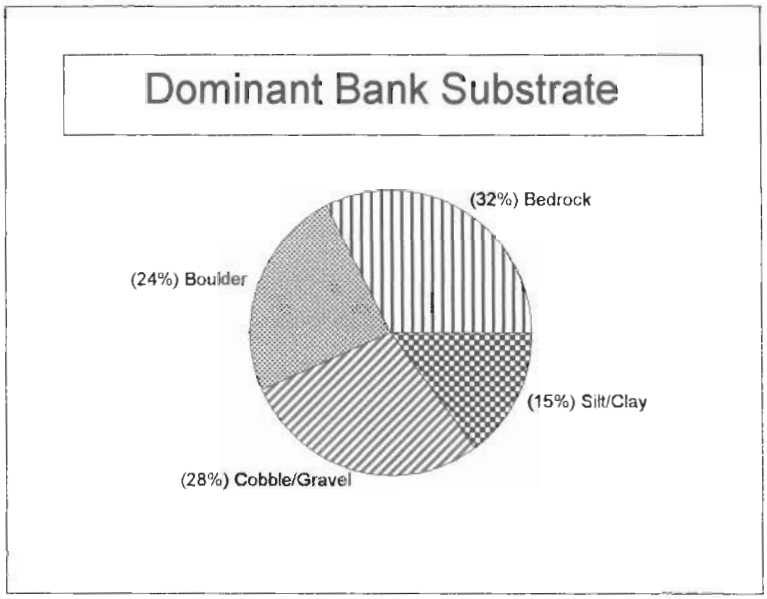


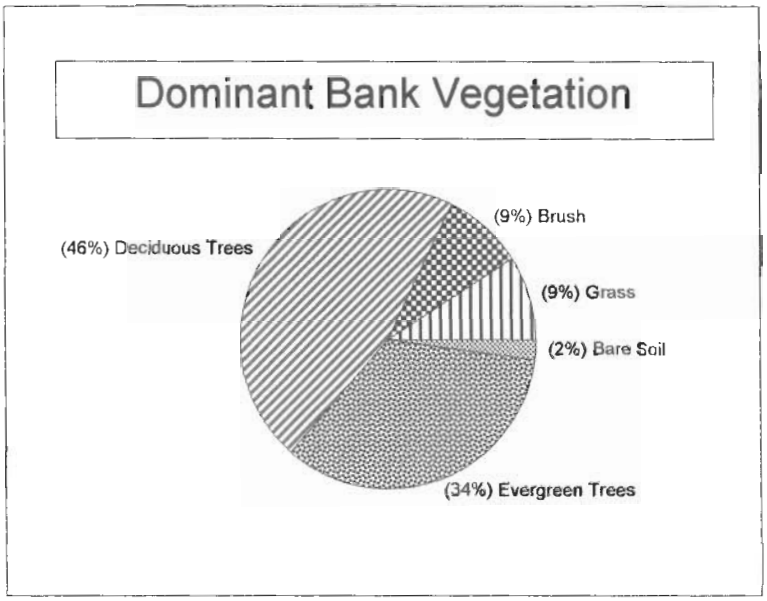


Graph 9

East Austin

Percent Bank Composition





Graph 10