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AQUATIC SURVEYS ALONG THE SANTA CLARA RIVER
PART III: WEST OF COMMERCE CENTER BRIDGE TO THE
VENTURA COUNTY LINE, CALIFORNIA

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I. INTRODUCTION

The Santa Clara River is one of the largest rivers in Southern California, and one of the last major rivers in the region that exists in a relatively natural state. The river originates in the northern slopes of the San Gabriel Mountains in Los Angeles County. The headwaters of the Santa Clara River, and some of its major tributaries, originate on National Forest lands. It traverses Ventura County and flows into the Pacific Ocean halfway between the Cities of San Buenaventura and Oxnard. It is approximately 100 miles long, and its watershed covers about 1,600 square miles. The majority of the main river corridor is privately owned.

Runoff generated from winter storms collects in the Santa Clara River, which extends from above the community of Acton to the Pacific Ocean. These flood flows are highly variable. Tertiary-treated effluent from two water reclamation plants also provides perennial flows.

The river provides habitat for a variety of aquatic species, including the federally listed endangered unarmored threespine stickleback. The purpose of this study was to conduct surveys of aquatic habitats existing along the Santa Clara River. All fish, amphibian, and reptile species encountered were identified, their location noted, and habitat features described.

II. PROJECT LOCATION AND FEATURES

The study area is located along the Santa Clara River, starting at a point 2100 feet upstream of Castaic Creek confluence downstream to the Ventura County line (Figure 1). Figure 1 is a geographic map showing the general location of the study area (outlined in red) in relation to other existing landmarks. General features existing within the study area are described below.

A. EXISTING REACHES

This section of Santa Clara River can be divided into several reaches based on gross changes in topography that directly influence functional channel width and indirectly influence vegetation types growing along the stream channel. Large riparian corridors may create a canopy over sections of the river, providing extensive shading. Typical mature riparian vegetation includes Arundo, willows, cottonwoods, mulefat, tamarisk, and nettle. The width of the channel depends upon the time of year and location along the river. During storm flows, the width may be several hundred feet, but during late summer it may be only a few feet. The following is a general description of features found within this reach.

This reach extends from the Castaic Creek confluence to the Ventura County line. This is one of the widest portions of the river. The flat river bottom is primarily sand with a few sections of gravel and rock. Although the low-flow channel is focused, there is little incision present. The riparian zones located along both sides of the river are extensive, but set back from the low-flow channel.

Also included within this reach is the Potrero drainage which enters the Santa Clara River along the south bank down stream of Mayo Crossing. This is a small surface drainage that flows through range



FIGURE
1

land. This drainage has limited riparian vegetation in the upper reaches which becomes more abundant near the Santa Clara River confluence.

B. SEASONAL FLOW PATTERNS

The changing seasonal flow patterns within the Santa Clara River drainage constantly modify the type and available aquatic habitat along the river. Increased winter runoff scours and redeposits stream sediments along the downstream river corridor. At the same time, vegetative debris (trees and other plant materials) that are also washed downstream by elevated flows, become lodged along the banks and in the center of the river. These debris piles create temporary structures that physically assist in removing suspended sediments from the river water. As the velocity of flow reduces, silt and debris are trapped at these locations, causing the formation of large sandbars along the river.

During non-storm periods in the spring months (March through May), base flow within the Santa Clara River is primarily defined by the continuous discharge from the wastewater treatment plants. During the non-storm periods in the summer (June through August) and fall (September through November), the flow patterns that helped to create various aquatic habitats along the river decline considerably, and the river begins to clearly focus a zone of potential aquatic habitat within the central portion of the streambed. During these months, aquatic vegetation clearly defines the low-flow channel within the streambed. There are also notable changes in the lateral location of the low-flow channel over the course of a day resulting from changing water surface elevation throughout the day. These periods coincide with elevated water releases from the two upstream wastewater treatment plants. As water elevation changes, some sandbars are eroded and new ones created. These continuous processes create new pools or ponds along the river course, and at the same time can realign the low-flow channel.

The Potrero drainage is also seasonal in nature, surface flows disappearing during drought years.

C. EXISTING AQUATIC HABITAT TYPES

There are four basic aquatic habitat types along the Santa Clara River within the study area: low-flow channel, riffle, on-channel pool, and isolated pool. The following describes the basic features common to each type and also discusses how each is formed.

Low-flow Channel - The low-flow channel is the portion of the riverbed where water flows continuously. The exact location of this channel along the river may change seasonally as well as throughout the day. Erosion and accretion of existing alluvium constantly remove and redeposit sediments along the length of the river. Depth of water within the low-flow channel varies with season and surface water flow. During the winter, water depth can be several feet, but during the drier summer months, only a few inches. Aquatic plants growing along the edge of the river during the spring months may trap and hold sediments, causing creation of a new sandbar that redirects surface flows, creating a new low-flow channel. Established plants tend to clearly define the low-flow channel through the summer and fall months. Typically, the wider section of the low-flow channel is lined with a variety of vegetation including water speedwell (*Veronica anagallis*), water cress (*Nasturtium sp.*), grasses (*Distichlis*), umbrella sedge (*Cyperus difformis*), mugwort (*Artemisia*

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douglasiana), stinging nettle (*Urtica sp.*), smartweed (*Polygonum lapathifolium*), and sometimes filamentous algae.

Rifle - The riffle consists of coarse gravel, rock outcroppings, and debris piles occurring along some portions of the river. These naturally-armored areas are less prone to erosion throughout the day, and provide almost permanent sections of channel habitat or pool areas. During storm events, these areas may be altered by elevated surface flows, floating debris, or other flow-related factors. Like the low-flow channel, water depth within these areas is dictated by the seasonal surface flow patterns. During the summer and fall, depths are generally a few inches. Vegetation typically growing along riffles consists of willow (*Salix sp.*), cottonwood (*Populus fremontii*), Arundo (*Arundo donax*), and mulefat (*Baccharis salicifolia*).

On-channel Pool - There are several areas along sandbars located within the center of the river or along the lateral banks which contain either debris or large established vegetation at the upstream end, which create small backwater areas. Surface flows within these on-channel pools are obvious. These on-channel pools are generally small in size, typically a few feet wide and up to twenty feet long, although some pools are narrower and longer. Water depth is similar to that of the low-flow channel. These pools generally contain some vegetation along the edge and upstream areas. Vegetation growing within or surrounding these pools consists of a variety of plants including water speedwell, smartweed, sedges, cattails (*Typha sp.*), grasses, nettle, and watercress. Most on-channel pools contain filamentous algae along the bottom and edges. Some on-channel pools may also have a riparian canopy (willows, cottonwoods, mulefat, *Arundo*) providing shade to the pool during a portion of the day, while others lack riparian cover altogether.

Isolated Pool - The isolated pool is similar to the on-channel pool except it does not have a direct surface connection to the low-flow channel. In most cases there is no observable surface water flow. Water depth within these pools can range from a few inches to three or four feet. These pool areas may be devoid of typical vegetation, but all seem to have filamentous algae growing along the bottom and edges. Other typical plant species periodically observed within isolated pools include watercress, sedges, reeds, water speedwell, smartweed, and nettle. Some isolated pools may also have a riparian canopy providing shade to the pool during a portion of the day, while others lack riparian cover altogether.

Potrero Drainage - This drainage has a very narrow channel ranging in size from a few inches to a few feet. Water depth is typically less than one inch except for some "pool-like" areas in the upper drainage. These "pool-like" areas may be two feet wide but typically less than two to three inches deep. All areas have a silt/mud bottom.

III. AQUATIC SPECIES

Aquatic species that have the potential to occur along the Santa Clara River drainage consist of several species of fish, amphibians, and reptiles. Commonly found fishes include the unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), the arroyo chub (*Gila orcutti*), the Santa Ana sucker (*Catostomus santanae*), and the mosquitofish (*Gambusia affinis*). Other species rarely

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encountered include large-mouth bass (*Micropterus salmoides*), rainbow trout (*Oncorhynchus mykiss*), prickly sculpin (*Cottus asper*), and goldfish (*Carassius auratus*). The steelhead trout (*O. mykiss irideus*) has been reported within the lower reaches of the Santa Clara River, but has not been reported upstream of Piru Creek. Commonly found amphibians along the Santa Clara River include the California treefrog (*Hyla cadaverina*), Pacific treefrog (*Hyla regilla*), African clawed frog (*Xenopus laevis*), and western toad (*Bufo boreas*). Less common amphibians include the Western spadefoot toad (*Scaphiopus hammondi*), California red-legged frog (*Rana aurora draytonii*), and the arroyo southwestern toad (*Bufo microscaphus californicus*). Reptiles occurring along the Santa Clara River aquatic zone include the Western pond turtle (*Clemmys marmorata pallida*) and two-striped gartersnake (*Thamnophis couchi hammondi*).

A. FISH SPECIES

There are several fish species that may occur within the Santa Clara River drainage.

Unarmored Threespine Stickleback (*Gasterosteus aculeatus williamsoni*) - The stickleback population is limited to on-channel and isolated habitats, secondary inflow channels, plunge pools, and ponds. Water velocity appears to be the limiting factor that keeps the stickleback out of low-flow channels except during late summer when surface water levels are reduced. Stickleback will tend to move along protected areas of the streambank where water velocities are limited. Sticklebacks use the on-channel and isolated pools, secondary inflow channels, and ponds for reproduction and nursery areas. The stickleback is fully protected as a State and Federally listed endangered species. This is not an abundant species within the Santa Clara River drainage.

According to Moyle (1976), stickleback are quiet-water fish, which live in weedy ponds and shallow backwaters, or among emergent plants at stream edges, over bottoms consisting of sand and mud. They feed primarily on bottom organisms or organisms living on aquatic plants. They require cool water (23 - 24° C) for survival. Clear water is a primary requirement for continued survival since they are visual feeders. Stickleback typically complete their life cycle in one year, although older fish may also survive and reproduce for a second season if not washed downstream to the ocean. During winter storms, some adult stickleback are washed downstream from existing ponds located within the headwaters of the Santa Clara River and San Francisquito Creek. Since stickleback are not strong swimmers and cannot leap over the lowest barriers, their continued survival depends on their ability to reach slower velocity areas within downstream reaches. As water velocities diminish, stickleback can seek favorable habitat where they can reproduce. Even during drier winters, stickleback populations survive within small isolated pools along the Santa Clara River that can persist throughout the hot summer months. During wetter-than-normal winters, sticklebacks that survive the elevated flows can reproduce within downstream reaches. Adults remaining within the headwater areas also reproduce, providing continuation of the species.

Arroyo Chub (*Gila orcutti*) - The chub is the dominant species, occurring within the majority of available aquatic habitats (low-flow channels and on-channel pools). The chub may also use secondary channels. The arroyo chub is currently listed as "Species of Concern" by the federal government.

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According to Moyle (1976), the chub is adapted for surviving in the warm fluctuating streams of the Los Angeles Plain. Originally these streams were muddy torrents in the winter and clear intermittent brooks in the summer. Generally, chubs stay in the slowest moving sections of the stream with sandy bottoms, although they prefer mud bottoms. This species is an omnivorous grazer, feeding heavily on algae and other plants, as well as small crustaceans and aquatic insects. Breeding usually takes place in pools during March and April. The existing conditions along the Santa Clara River seem ideally suited for the chub population.

Santa Ana Sucker (*Catostomus santannae*) - Like the chub, the sucker population is found in many different habitats along the Santa Clara River (low-flow channels and on-channel pools). Suckers within the Santa Clara River are not considered to be abundant. The Santa Ana sucker is currently listed as a federally protected "Threatened" species.

According to Moyle (1976), Santa Ana suckers generally live in small (narrow) streams, with a wide range in velocity. Typically these streams are subject to severe flooding. Like the stickleback, they prefer cooler water temperatures (less than 22° C). They can survive in fairly turbid water. Boulders, rubble, and sand are the main bottom materials associated with typical sucker habitat. Algae are the primary food, especially diatoms and detritus that they scrape from rocks and other surfaces. In the Santa Clara River, 98 percent of their diet consists of algae and detritus, although small numbers of aquatic insect larvae are also taken. Suckers generally spawn from early April to early July.

Steelhead - Southern California (*Oncorhynchus mykiss irideus*) - Steelhead may be found in most of the streams flowing to the ocean. This species can be either anadromous or a freshwater resident. There is a considerable overlap in migration and spawn timing between the various populations of the same run type (winter and summer runs). California steelhead generally spawn earlier than those occurring in areas to the north. Spawning generally begins in December. Water depth does not seem to be critical to migrating steelhead because they migrate when high flows are present. The adult fish typically spend two years in the ocean before entering fresh water to spawn. Juvenile steelhead remain in fresh water for one to two years before migrating to the sea. Complete life history data for Southern California steelhead are lacking, but existing data suggest the juvenile can smolt in one year. Steelhead may spawn more than once, but existing data suggest that more than two spawnings is uncommon. This species is currently listed as "Threatened" by the federal government.

Other Fish Species - Large-mouth bass (*Micropterus dolomieu*), prickly sculpin (*C. asper*), rainbow trout (*Salmo gairdneri*), and goldfish (*Carassius auratus*) are only encountered within the river following winter storm runoff or during releases from Castaic Dam. Since the depth of water within the river is too shallow, and suitable spawning and nursery habitat for these species are non-existent, they are not considered to be indigenous to the area. Mosquitofish (*Gambusia affinis*) occur within the river as a result of mosquito abatement activities within the watershed.

B. AMPHIBIANS

There are several different amphibians previously found within the Santa Clara River Drainage.

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Pacific Treefrog (*Hyla regilla*) – This commonly heard frog of the Pacific coastal area is active both day and night (Behler and King 1979). According to Stebbins (1966), Pacific treefrogs frequent a variety of habitats from sea level to high mountains. The frog breeds in marshes, lakes, ponds, roadside ditches, reservoirs, and slow-moving streams in woods, meadows, and grassland. This frog is considered to be chiefly a ground dweller, found among low plant growth near water. This treefrog breeds from January through July.

California Treefrog (*Hyla cadaverina*) – This species is primarily nocturnal. It seeks shade during the day among rock crevices near water. Protective coloration helps it avoid daytime predators. When disturbed, it leaps into the water but returns almost immediately to shore (Behler and King 1979). According to Stebbins (1966), the California treefrog frequents canyon streams and washes where there are rocks, quiet pools, and shade. It ranges from the desert to the pine belt in the mountains, and breeds from March through May.

Western Toad (*Bufo boreas*) – This species is active at twilight. At higher elevations, where nighttime temperatures are low, it is often active during the day. It lives in burrows of its own construction or those of small rodents (Behler and King, 1979). According to Stebbins (1966), the Western toad frequents a great variety of habitats, desert streams and springs, grassland, woodland, and mountain meadows. It is also found in and near ponds, lakes, reservoirs, rivers, and streams. In warm, low-lying areas they are active at night, but at higher elevations or in northern areas they may be diurnal. This toad buries itself in loose soil or seeks shelter in the burrows of gophers or other animals. It breeds during the months of January to September, depending on weather. Egg strings are attached to vegetation in shallow, usually still water.

Western Spadefoot Toad (*Scaphiopus hammondi*) – This species is nocturnal. It is often numerous where soil conditions are favorable for burrowing. Deep burrows provide a microhabitat with moderate temperatures and humidity. It tolerates a wide range of conditions from semiarid to arid, and prefers shortgrass plains and sandy, gravelly areas such as alkali flats, washes, and river floodplains (Behler and King 1979). According to Stebbins (1966), the Western spadefoot toad is primarily a species of the lowlands, frequenting washes, floodplains of rivers, alluvial fans, playas, and alkali flats, but ranges into the foothills and mountain valleys. It breeds in quiet streams and temporary pools from January through May. Both state and federal governments list this toad as "Species of Concern."

Arroyo Southwestern Toad (*Bufo microscaphus californicus*) – This species is primarily nocturnal, but can also be found foraging during the day (Behler and King, 1979). According to Stebbins (1966), the Arroyo southwestern toad can be found along washes, streams, and arroyos of semi-arid parts of the southwest. It breeds in brooks or streams and frequents sandy banks containing willows, cottonwoods, or sycamores. Adults are nocturnal except during the breeding season from March through July. This species is currently listed as "Endangered" by the federal government and designated as "Special Concern" by the State of California.

African Clawed Frog (*Xenopus laevis*) - This exotic species was introduced into California from Africa and has become established within the Santa Clara River watershed. Although mainly aquatic, this nocturnal frog sometimes occurs along more upland areas, and is known to migrate overland.

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When not actively foraging or mating, the frog rests quietly on the bottom of pools or hides under rocks. This species is highly carnivorous and eats anything it can catch (Behler and King 1979).

California Red-Legged Frog (*Rana aurora draytonii*) - This is a highly aquatic species with little movement away from streamside habitats. Individuals are occasionally found on roads at night during winter and spring rains. Typically these frogs occur in the vicinity of quiet, permanent pools of streams, marshes, and occasionally ponds, but they can also be found in damp woods. This frog prefers shorelines with extensive vegetation and will usually escape to water areas that are typically at least three feet deep. This is a diurnal species that is active all year along the coast, but inactive during late summer to early winter in other areas. This frog breeds from November through March, laying egg masses in permanent bodies of water with dense stands of overhanging willows and an intermixed fringe of cattails. The eggs are deposited in permanent pools attached to emergent vegetation. These eggs require permanent or nearly permanent pools for larval development, which takes 11 to 20 weeks, and may require rains for dispersal. Breeding takes place over a few days. This frog appears to be extinct in most of Southern California, south of the Santa Clara River. This species is currently listed as "Threatened" by the federal government and a "Species of Concern" by the State of California.

C. REPTILES

There are very few reptiles that occur within aquatic habitats located within the Santa Clara River drainage.

Southwestern Pond Turtle (*Clemmys marmorata pallida*) - This species is often observed basking alone. When disturbed, it will quickly dive into water. One turtle may challenge another for a favored basking site by extending its neck, opening its mouth, and exposing its yellow-edged jaws and reddish interior. According to Stebbins (1966), this is a thoroughly aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches that typically have rocky or muddy bottoms with cattails, water lilies, or other aquatic vegetation. This turtle may be seen basking on logs, cattail mats, and mudbanks. It nests from May to August, mostly June and mid-July, time varying with locality. Food consists of aquatic plants, insects, and carrion. This turtle is currently designated "Species of Concern" by both the state and federal governments.

Two-stripe Garter Snake (*Thamnophis couchi hammondi*) - This species can be found in a variety of habitats from marshes to clear, swift streams and rivers (Behler and King 1979). According to Stebbins (1966), this snake occurs primarily in rivers and streams but may also occur in a great variety of aquatic environments. It usually retreats to water when frightened, and is primarily diurnal but active at dusk during warmer weather. It feeds on fish, fish eggs, frogs, toads, tadpoles, salamanders, earthworms, and leeches. This live-bearer breeds in the spring and produces young in late summer. This snake is currently designated a "Species of Concern" by both state and federal governments.

IV. SURVEY PROTOCOLS

Field surveys were conducted on May 23, August 3, and August 10, 2000. All surveys were

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conducted during normal daylight hours and consisted of walking the river and randomly selecting sampling locations. If the location potentially offered suitable habitat characteristics for aquatic species, it was sampled. During this site selection, no attempt was made to pre-determine whether or not an area contained any aquatic resources. Since stickleback are quiet-water fish, sampling areas were selected based upon general habitat features where stickleback are typically found (weedy ponds and shallow backwaters, or among emergent plants at stream edges, over bottoms of sand and mud). Since this species is a visual feeder, any selected sampling area needed to also have clear water. Key habitat characteristics included: reduced flows (such as that found within off-channel backwater areas, pools, and other isolated waters), available cover (vegetation or algae), and water clarity. Many of the areas which seemed suitable for stickleback would also provide habitat to other aquatic species (fishes, amphibians, and reptiles). Since the survey also included other aquatic species (fishes, amphibians, and reptiles), other randomly-selected areas without the typical stickleback characteristics were also included as sampling stations. These locations generally had overhanging cover/shade along the stream edge and usually higher water velocities.

At each sampling point, two photographs were taken—one looking downstream and one facing upstream. The survey location was established using a Ground Position Satellite (GPS) receiver. The physical features of the site (general location relative to the main river channel, bottom composition, presence of vegetation, etc.) were observed and noted. If the area was an isolated pool, the site was observed for a few minutes to determine if any aquatic species were present. A large dip net, aquarium net, and small minnow seine (mesh size 1/8- and 3/16-inch, respectively) were used to sample each location. An area approximately ten feet upstream to ten feet downstream of the sampling station was sampled. All species captured were identified and released back into the same location. If captured tadpoles were determined to be arroyo southwestern toad, further sampling at that location was discontinued to avoid take per U.S. Fish and Wildlife Service guidelines (Noda 1999). During all daytime surveys, care was taken to minimize noise so any nearby pond turtles or garter snakes located along the riverbanks and sandbars could be observed and noted. The approximate location of each sampling location is shown on Figures 2 and 3.

V. RESULTS

The exact location of the 56 sample points within the study area was determined using a GPS receiver. The location of each station was subsequently plotted on a project map using DeLorme software. Figures 2 and 3 show the approximate location of each sampling point as determined by the GPS receiver. Four of the 56 sampling locations (6.8 percent) did not contain any aquatic species (# 7, 18, 35, 55). Appendix A lists the species and site characteristics recorded for each daytime sampling location.

Results of the field survey revealed that a variety of aquatic species occur along the Santa Clara River within the study area. The dominant fish species was the arroyo chub (*G. orcutti*) found at 45 of the 56 (80.4 percent) sampling locations. Mosquitofish (*G. affinis*) were the second most abundant fish found at 16 of the 56 (28.6 percent) sampling locations. Large-mouth bass (*M. salmoides*) was the third most abundant fish found at 9 of the 56 (16.0 percent) sampling locations. Unarmored threespine sticklebacks (*G. aculeatus williamsoni*) were found within only 7 of the 56 (12.5 percent)

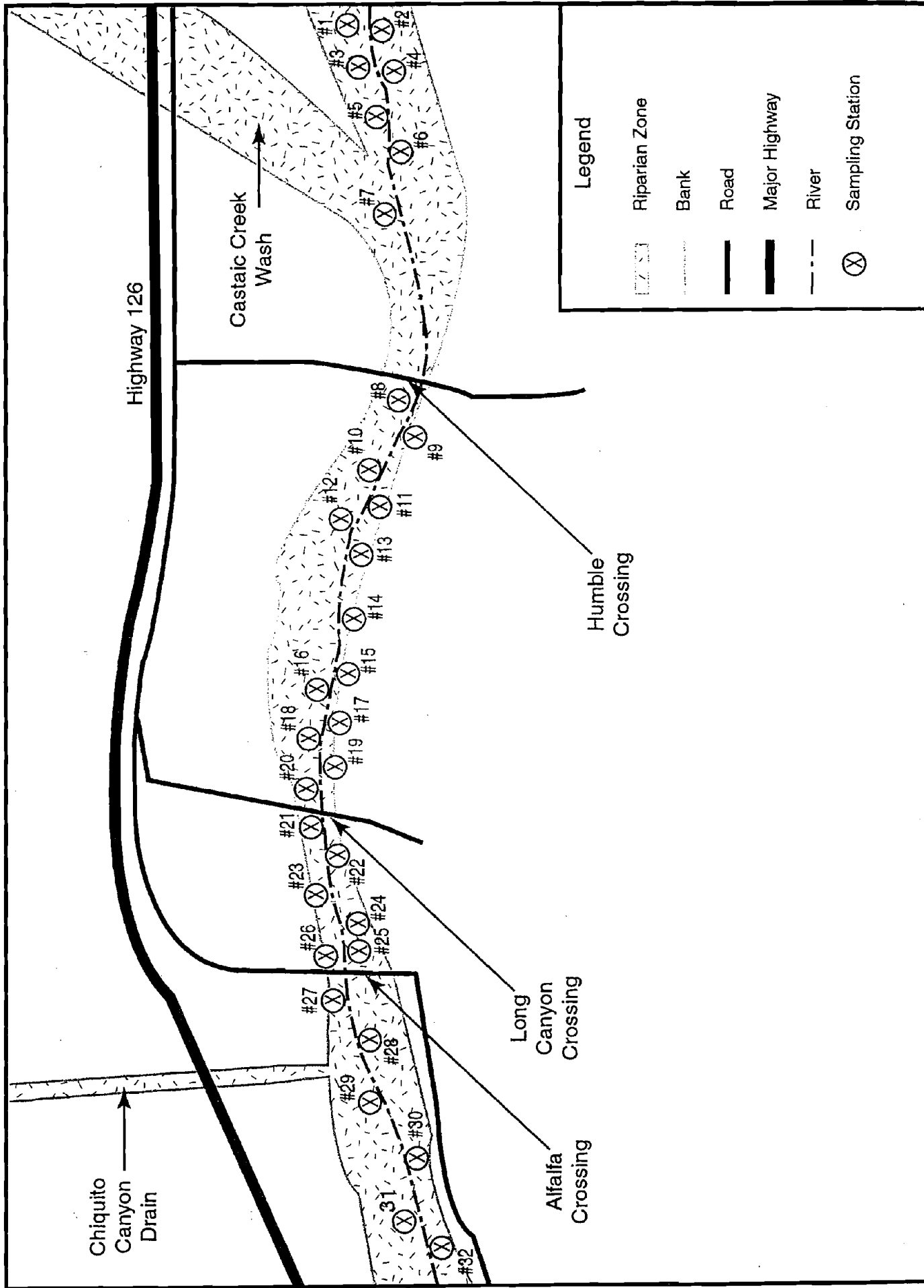
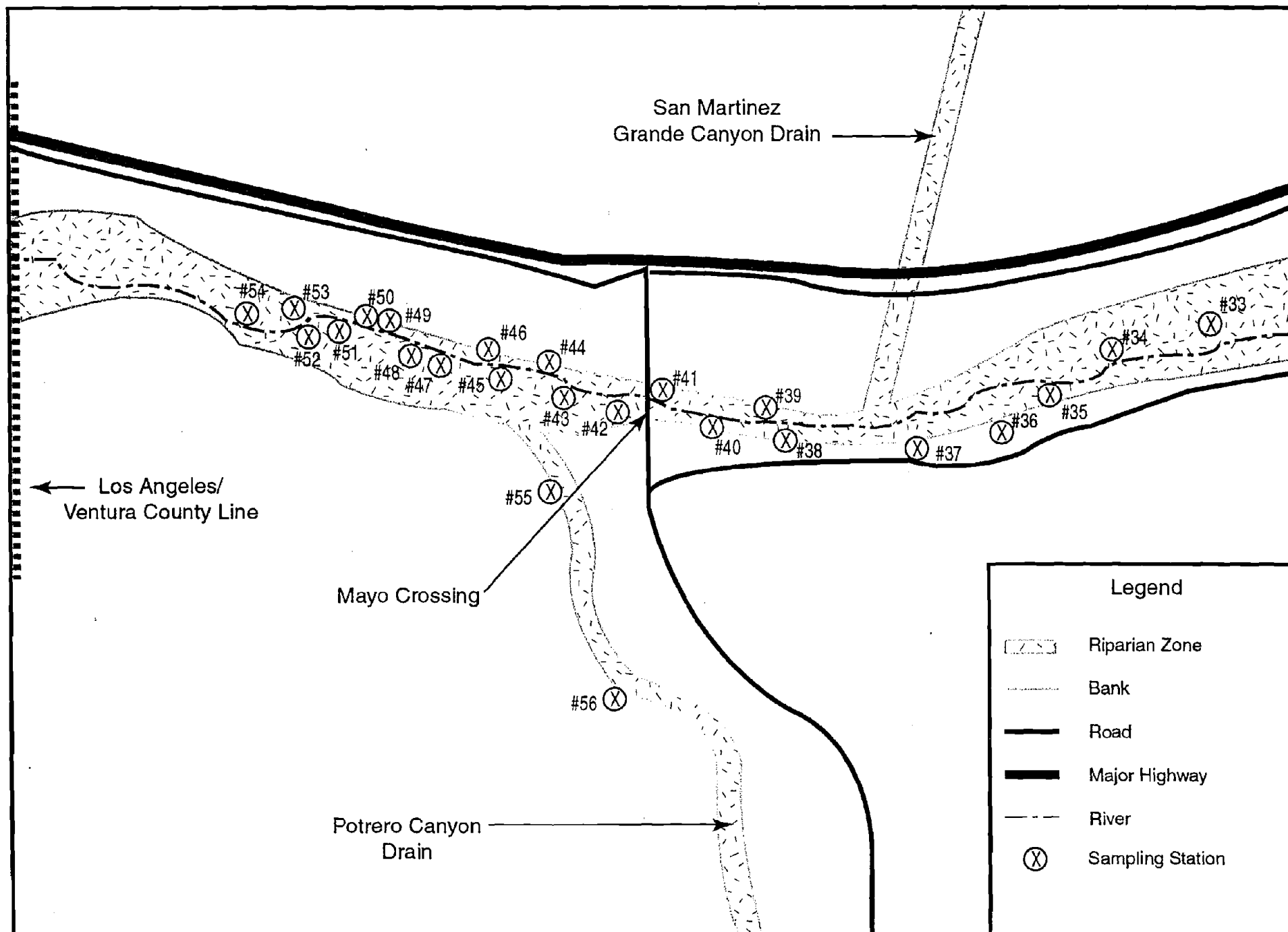


FIGURE 2

Map Showing the General Los Angeles County Study Area Downstream of Commerce Center Bridge along the Santa Clara River. Approximate Location of Each Aquatic Sampling Station is Indicated



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sampling locations (points 12, 24, 26, 38, 41, 51, and 53). No Santa Ana suckers, or other fish species were collected within the study area. The only amphibians located within the study area during field surveys included the Pacific treefrog (*H. regilla*) and California treefrog (*H. cadaverina*). *Hyla* were found at 12 of the 56 (21.4 percent) sampling locations (sample points 1, 9, 11, 20, 24, 26, 27, 28, 29, 32, 44, and 46). The California red-legged frog (*R. aurora draytonii*), western toad (*B. boreas*), arroyo southwestern toad (*B. microscophus californicus*), and western spadefoot toad (*S. hammondi*) were not observed within this study area. Potrero Creek did not contain any vertebrate species.

Western pond turtle (*Clemmys marmorata*) and two-striped gartersnake (*T. couchi hammondi*) were also not observed within the study area.

Specific information concerning the physical features of each sampling point and species observed are summarized in Appendix A. Photographs of each sampling point are included in Appendix B.

VI. CONCLUSIONS

The daytime surveys noted a variety of aquatic habitat types, consisting of a variety of fish species. Only *Hyla* tadpoles were collected during daytime surveys within this study area. The occurrence of large-mouth bass within this study area could account for the reduced number of total species. Approximately 7.1 percent of the areas surveyed did not contain any vertebrate organisms. The dominant fish species was arroyo chub, followed by mosquitofish and large-mouth bass. The least abundant was the unarmored threespine stickleback. No other fish species was encountered within the study area. The two amphibians found during daytime surveys within the study area included both species of treefrog. No other amphibians were noted. The western pond turtle and two-striped gartersnake were not observed within the study area. No vertebrate species were noted within the Potrero drainage.

VII. REFERENCES

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APPENDIX A – SAMPLE POINT DATA

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LOS ANGELES COUNTY WEST OF COMMERCE CENTER BRIDGE

SAMPLE POINT: 1 **DATE:** 5/23/00 **GPS LOCATION:** N34° 25' 307" by W118° 37' 641"

HABITAT DESCRIPTION: South side of river. Back-water area created by vegetation along the south side of the river. Surface flow evident. Good algae cover. Edge with willow, arundo, jimson weed, umbrella sedge, watercress, grasses, smartweed, and water speedwell.

SPECIES PRESENT: Pacific treefrog.

SAMPLE POINT: 2 **DATE:** 5/23/00 **GPS LOCATION:** N34° 25' 301" by W118° 37' 725"

HABITAT DESCRIPTION: South side of river, upstream of turbid water inflow (from Castaic Creek). Sand bottom. Much shade along the south bank. Willow, jimson weed, arundo, mulefat, and some grasses. Slightly cut bank. Some algae along bottom.

SPECIES PRESENT: Arroyo chub.

HUMBLE CROSSING TO LONG CANYON CROSSING

SAMPLE POINT: 3 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.134" by W118° 38' 111"

HABITAT DESCRIPTION: Humble crossing center line, downstream from crossing. Plunge-pool immediately downstream of culvert outfall. Bottom: sand and some rock. Good water clarity. No vegetation over crossing. Shoreline vegetation: smartweed, cocklebur, grasses, some duckweed, and some watercress.

SPECIES PRESENT: Largemouth bass (juvenile) and arroyo chub.

SAMPLE POINT: 4 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.113" by W118° 38' 0.126"

HABITAT DESCRIPTION: Off channel pool on south side of river with limited water flow. Covered with duckweed; algae on bottom. Bottom: sand and organic matter. Overhead vegetation: willow, arundo, salt cedar and some grasses along sandy bank.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 5 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.136" by W118° 38' 0.118"

HABITAT DESCRIPTION: North side of river approximately 500 ft downstream of Hummel

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crossing. Bottom: sand, gravel, and organic matter. Edge overhanging surface with watercress, duckweed, and water speedwell.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 6 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.146" by W118° 38' 0.253"

HABITAT DESCRIPTION: Small secondary channel off main river; south side of river. Bottom: sand and organic matter. Surface with algae and duckweed approximately 90% coverage. Edge vegetation: cocklebur, nettle, grasses, willow, smartweed, and tules.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 7 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.148" by W118° 38' 0.317"

HABITAT DESCRIPTION: Small secondary channel off main river with obvious surface flow. Bottom: sand and organic matter. Duckweed and algae cover surface approximately 70%. Vegetation: some water speedwell and grasses.

SPECIES PRESENT: N/A

SAMPLE POINT: 8 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.128" by W118° 38' 0.402"

HABITAT DESCRIPTION: South side of river at bend. Slight backwater area. Overhanging vegetation: willow, mule fat, and arundo. Some duckweed on surface. Some grasses along edge. Bottom: sandy with some vegetative debris and algae.

SPECIES PRESENT: Largemouth bass and arroyo chub.

SAMPLE POINT: 9 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.117" by W118° 38' 0.418"

HABITAT DESCRIPTION: Off-channel backwater on south side of river. Bottom: sand, gravel and organic matter. Limited surface flow. Vegetation: willow, reeds, mule fat, smartweed, and grasses overhang and shade pool.

SPECIES PRESENT: Arroyo chub, mosquito fish, and pacific treefrog.

SAMPLE POINT: 10 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.083" by W118° 38' 0.509"

HABITAT DESCRIPTION: South side of river; secondary channel with surface flow. Large pieces of bedrock. Bottom: sand, gravel, and rock. Algae and duckweed on surface and bottom. Vegetation: grasses, smartweed, and cocklebur along edge.

SPECIES PRESENT: Arroyo chub.

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SAMPLE POINT: 11 **DATE:** 8/3/00 **GPS LOCATION:** N 34° 25' 0.083" by W 118° 38' 0.634"

HABITAT DESCRIPTION: Primary channel on north side of river. Bottom: sand, gravel, and rock. Overhanging vegetation: willow, smartweed, and grasses. Some duckweed and algae along edge.

SPECIES PRESENT: California treefrog and arroyo chub.

SAMPLE POINT: 12 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.080" by W118° 38' 0.701"

HABITAT DESCRIPTION: Off-channel pool on north side of river with obvious surface flow. Bottom: sand; covered with algae and grasses. Vegetation: some willow, cocklebur, arundo, and smartweed along edge providing limited cover.

SPECIES PRESENT: Stickleback (juvenile) and arroyo chub (juvenile).

SAMPLE POINT: 13 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.077" by W118° 38' 0.740"

HABITAT DESCRIPTION: North side of river. Off-channel pool with obvious flow. Bottom: sand and gravel; covered with algae and organic matter. Duckweed and algae cover surface.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 14 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.065" by W118° 38' 0.755"

HABITAT DESCRIPTION: South side of river. Primary channel; slow flow, backwater area. Bottom: rock and gravel; covered with algae and duckweed. Edge vegetation: smartweed, Spanish clover, cattails, watercress, cocklebur, and reeds.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 15 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.069" by W118° 38' 0.883"

HABITAT DESCRIPTION: North side of river. Small backwater off primary channel. Bottom: sand and gravel with algae and duckweed. Vegetation: few overhanging willow and mule fat. Some vegetative debris. Very swift current in main channel.

SPECIES PRESENT: Arroyo chub and largemouth bass.

LONG CANYON CROSSING TO ALFALFA CROSSING

SAMPLE POINT: 16 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.040" by W118° 38' 0.958"

HABITAT DESCRIPTION: Long Canyon Crossing. Bottom: sand and gravel. Plunge-pools

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below outflow from culverts. No vegetation on crossing. Some duckweed, smartweed, and grasses along edge.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT:17 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.040" by W118° 38' 0.995"

HABITAT DESCRIPTION: North side of river. Small secondary channel off primary channel, behind sandbar. Bottom: gravel and sand. Algae and duckweed cover surface. Vegetation: some watercress and grasses along edge.

SPECIES PRESENT: Mosquito fish and arroyo chub (juvenile).

SAMPLE POINT:18 **DATE:** 8/3/00 **GPS LOCATION:** N34° 25' 0.021" by W118° 39' 0.067"

HABITAT DESCRIPTION: Primary channel splits into 3 secondary channels. This is the most northern channel on north side of the river. Vegetation: water speedwell, some algae, some watercress, and smartweed. Bottom: sand and gravel. Algae and some duckweed along edge.

SPECIES PRESENT: N/A

SAMPLE POINT:19 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.966" by W118° 39' 0.138"

HABITAT DESCRIPTION: South side of river, small secondary channel with minimal surface flow. Smartweed and mule fat shade area. Some algae along bottom and watercress and duckweed. Bottom: sandy and organic matter.

SPECIES PRESENT: Mosquito fish.

SAMPLE POINT:20 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.964" by W118° 39' 0.172"

HABITAT DESCRIPTION: North side of river. Bottom: gravel, rock and sand. Algae and duckweed cover north bank. Vegetation: water speedwell, cocklebur, smartweed, grasses, and salt cedar cover is approximately 10% providing shade.

SPECIES PRESENT: Treefrog (tadpole) and arroyo chub.

SAMPLE POINT:21 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.949" by W118° 39' 0.229"

HABITAT DESCRIPTION: North side of river. Bottom: sand and gravel. Overhanging vegetation: smartweed, cattail, some algae, and duckweed in slower sections.

SPECIES PRESENT: Arroyo chub.

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ALFALFA CROSSING TO MAYO CROSSING

SAMPLE POINT: 22 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.937" by W118° 39' 0.253"

HABITAT DESCRIPTION: Alfalfa Crossing. Plunge-pools immediately below culvert outfall. Bottom: sand and gravel; below outflow. Limited vegetation along edge: algae, grasses, smartweed, and water speedwell.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 23 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.912" by W118° 39' 0.305"

HABITAT DESCRIPTION: South side of river. River splits into 3 channels, this is most southern. Bottom: sand, gravel, and rock. Vegetation: water speedwell and grasses, duckweed on surface.

SPECIES PRESENT: Arroyo chub (adult and juvenile).

SAMPLE POINT: 24 **DATE:** 8/3/00 **GPS LOCATION:** N 4° 24' 0.821" by W118° 39' 0.431"

HABITAT DESCRIPTION: South side of river; off-channel pool with minimal surface flow, covered with algae and duckweed. Bottom: sandy. Vegetation: watercress, water speedwell, smartweed, sedge, and grasses along edge.

SPECIES PRESENT: Arroyo chub (juvenile), treefrog (tadpole), and stickleback (juvenile).

SAMPLE POINT: 25 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.783 by W118° 39' 0.473"

HABITAT DESCRIPTION: South side of river; small secondary flow. Bottom: algae and sand cover bottom; some rocks and duckweed. Vegetation: grasses, water speedwell, and smartweed cover lateral edge.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 26 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.779" by W118° 39' 0.500"

HABITAT DESCRIPTION: South side of river; large isolated pool, shallow with organic matter and sandy bottom. Covered with duckweed, algae, and grasses. Abundant fry.

SPECIES PRESENT: Treefrog (tadpole), stickleback, mosquito fish, and arroyo chub.

SAMPLE POINT: 27 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.747" by W118° 39' 0.614"

HABITAT DESCRIPTION: North side of river; small secondary channel with obvious surface flow. Bottom: sand and rock. Vegetation: algae on bottom, algae and duckweed on surface; some

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grasses, and water speedwell.

SPECIES PRESENT: California treefrog.

SAMPLE POINT: 28 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.711" by W118° 39' 0.647"

HABITAT DESCRIPTION: North side; small secondary channel with obvious surface flow, parallel with primary channel, isolated by vegetation only. Bottom: sand and gravel. Vegetation: surface covered by duckweed, algae, water speedwell, and grasses.

SPECIES PRESENT: Treefrog (tadpole), arroyo chub, and mosquito fish.

SAMPLE POINT: 29 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.648" by W118° 34' 0.690"

HABITAT DESCRIPTION: South side of river; medium secondary channel with obvious surface flow; backwater area. Bottom: sand and gravel; some algae on bottom. Vegetation: duckweed and algae with grasses cover surface; Water speedwell, mule fat, and grasses cover south edge.

SPECIES PRESENT: Arroyo chub and treefrog (tadpole).

SAMPLE POINT: 30 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.630" by W118° 39' 0.732"

HABITAT DESCRIPTION: North side of river; primary channel splits into 2 streams, this is the northern stream forming a large pool adjacent to channel under willow. Bottom: sand, some gravel, and some rock. Vegetation: grasses, smartweed, and water speedwell cover south edge. Algae and duckweed along north edge. Algae, duckweed, and vegetative debris.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 31 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.583" by W118° 39' 0.826"

HABITAT DESCRIPTION: North side of river below confluence of 2 upstream channels. Bottom: sand and gravel. Covered by large willow. Vegetation: grasses, water speedwell, duckweed, and algae along north bank.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 32 **DATE:** 8/3/00 **GPS LOCATION:** N 4° 24' 0.498" by W118° 39' 0.939"

HABITAT DESCRIPTION: South side of river; isolated pool. Pool water temperature is less than the river water temperature. Bottom: rocks, gravel, and sand. Covered with algae, duckweed, and azolla. Vegetation: edges covered with water speedwell, grasses, smartweed, and watercress.

SPECIES PRESENT: Mosquito fish and treefrog (tadpole).

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SAMPLE POINT: 33 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.431" by W118° 40' 0.006"

HABITAT DESCRIPTION: South side of river; small secondary channel. Bottom: sand and gravel with algae along bottom. Algae, duckweed, and grasses on surface. Vegetation: watercress, smartweed, water speedwell, and mule fat.

SPECIES PRESENT: Arroyo chub and mosquito fish.

SAMPLE POINT: 34 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.405" W118° 40' 0.083"

HABITAT DESCRIPTION: North side of river, off channel backwater. Bottom: sand and gravel; algae. Vegetation: smartweed, water speedwell, mule fat, grasses, and cocklebur. Duckweed and algae cover edge surface.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 35 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.377" by W118° 40' 0.272"

HABITAT DESCRIPTION: South side of river; small secondary channel with obvious surface flow. Bottom: sand and gravel. Algae and duckweed cover edge. Vegetation: water speedwell, smartweed, and grasses along banks.

SPECIES PRESENT: N/A

SAMPLE POINT: 36 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.380" by W118° 40' 0.289"

HABITAT DESCRIPTION: North side of river; medium secondary channel off main channel with obvious surface flow. Bottom: sand and gravel. Algae and duckweed along edge and bottom. Vegetation: grasses, smartweed, water speedwell, cocklebur, willow, and sedge.

SPECIES PRESENT: Arroyo chub and mosquito fish.

SAMPLE POINT: 37 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.339" by W118° 40' 0.355"

HABITAT DESCRIPTION: South side of river; small isolated secondary channel with obvious surface flow. Bottom: sandy; algae and duckweed cover approximately 75% of bottom. Vegetation: water speedwell, smartweed and grasses along edge. Willow overhanging and shading south bank.

SPECIES PRESENT: Arroyo chub (juvenile).

SAMPLE POINT: 38 **DATE:** 8/3/00 **GPS LOCATION:** N34° 24' 0.335" by W118° 40' 0.467"

HABITAT DESCRIPTION: North side of river. Near Mayo crossing high voltage wires. Northeast corner of Mayo crossing; stagnant pool without surface flow. Vegetation: cattails, grasses, mule fat, willow, and pond weed.

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SPECIES PRESENT: Mosquito fish and stickleback.

MAYO CROSSING TO SALT CROSSING

SAMPLE POINT: 39 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.309" by W118° 40' 0.465"

HABITAT DESCRIPTION: Downstream of Mayo Crossing. Bottom: gravel, rock, and sand. Vegetation: algae and some duckweed on surface, smartweed, water speedwell, and grass on edge.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 40 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.315" by W118° 40' 0.529"

HABITAT DESCRIPTION: South side of river; primary channel. Bottom: rock and gravel. Vegetation: algae and watercress along bottom, duckweed on surface, and mulefat, salt cedar, and grasses along edge.

SPCIES PRESENT: Arroyo chub.

SAMPLE POINT: 41 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.315" by W118° 40' 0.538"

HABITAT DESCRIPTION: South side of river; off-channel pool with visible surface flow. Bottom: rock, sand, and gravel. Vegetation: algae and duckweed present on water and bottom; smartweed, watercress, and grasses interspersed. Evidence of cattle wandering through area.

SPECIES PRESENT: Arroyo chub, stickleback, and mosquito fish.

SAMPLE POINT: 42 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.306" by W118° 40' 0.624"

HABITAT DESCRIPTION: South side of primary channel. Bottom: sand, gravel, and some rock. Vegetation: algae along bottom. Duckweed, grasses, mule fat, salt cedar, cocklebur, watercress, and smartweed along edge.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 43 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.322" by W118° 40' 0.691"

HABITAT DESCRIPTION: North side of river near bend. Bottom: sand and gravel. Vegetation: some algae on bottom. Cattails, sedges, willow, mule fat, and smartweed along edge. Duckweed and vegetative debris along edge.

SPECIES PRESENT: Arroyo chub, largemouth bass, and mosquito fish.

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SAMPLE POINT: 44 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.290" by W118° 40' 0.773"

HABITAT DESCRIPTION: North side of river; small secondary channel adjacent to main flow with good surface flow visible. Bottom: rock, gravel, and sand. Vegetation: algae, duckweed, watercress, grasses, and smartweed.

SPECIES PRESENT: Arroyo chub (juvenile) and treefrog (tadpole).

SAMPLE POINT: 45 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.288" by W118° 40' 0.793"

HABITAT DESCRIPTION: South side of river; backwater area with good water circulation. Bottom: sand and gravel. Vegetation: shaded by mule fat, arundo, cocklebur, and willow. Some duckweed on surface and some algae on bottom.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 46 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.288" by W118° 40' 0.962"

HABITAT DESCRIPTION: South side of river; an off-channel isolated pool with no visible flow. Bottom: gravel and sand. Vegetation: algae and grasses; salt cedar along bank; willow and mule fat along edge. Sign of much cattle activity.

SPECIES PRESENT: Treefrog (tadpole).

SAMPLE POINT: 47 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.280" by W118° 41' 0.005"

HABITAT DESCRIPTION: South side of river. Large debris pile at bend with a big hole at bottom. Bottom: sand and gravel. Vegetation: some algae; duckweed; mule fat, cocklebur, water speedwell, and tules along edge.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 48 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.236" by W118° 41' 0.071"

HABITAT DESCRIPTION: South side of river; small secondary channel isolated by partial sandbar and vegetation with good surface flow. Bottom: sand and organic matter. Vegetation: algae along bottom at places. Duckweed, algae, water speedwell, and grasses along edges and sandbar.

SPECIES PRESENT: Arroyo chub (juvenile) and mosquito fish.

SAMPLE POINT: 49 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.225" by W118° 41' 0.121"

HABITAT DESCRIPTION: South side of river; primary channel with slow water area. Bottom: gravel, sand, and few rocks. Vegetation: grasses and duckweed cover surface. Some algae along bottom. Shaded by mule fat, salt cedar, and willow.

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SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 50 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.239"by W118° 41' 0.165"

HABITAT DESCRIPTION: North side of river near bend; slow backwater area. Bottom: sand and gravel. Vegetation: algae along bottom. Grasses and watercress along edge. Some woody debris.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 51 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.218"by W118° 41' 0.228"

HABITAT DESCRIPTION: North side of river; small secondary channel with good surface flow. Bottom: rock and sand. Vegetation: duckweed, grasses, and watercress along edge and channel.

SPECIES PRESENT: Stickleback, arroyo chub, and mosquito fish.

SAMPLE POINT: 52 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.197"by W118° 41' 0.327"

HABITAT DESCRIPTION: South side of river; an off-stream backwater area isolated by small sandbar with good surface flow. Bottom: sand and rock. Vegetation: algae and duckweed along edge and bottom. Grasses and smartweed along bank. Some vegetative debris. Shading by salt cedar, willow, and mule fat.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 53 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.181"by W118° 41' 0.319"

HABITAT DESCRIPTION: South side of river; small tributary with good visible surface flow to river, possible flow from Potrero. Bottom: sand and gravel. Vegetation: water surface covered with algae, duckweed, and azolla. Grasses, cattails, and young salt cedar along edge and within channel.

SPECIES PRESENT: Mosquito fish, stickleback, and arroyo chub.

SAMPLE POINT: 54 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.194"by W118° 41' 0.434"

HABITAT DESCRIPTION: North side of river. River splits into 2 channels of equal size; this is a secondary channel off the most northern branch; visible surface flow. Bottom: sand and gravel. Vegetation: edge covered with duckweed, azolla, water speedwell, smartweed, and watercress; algae present but not abundant. Cattle activity in area.

SPECIES PRESENT: Arroyo chub and mosquito fish.

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POTRERO DRAINAGE

SAMPLE POINT: 55 **DATE:** 9/7/0 **GPS LOCATION:** N34° 24' 0.042"by W118° 40' 0.390'

HABITAT DESCRIPTION: Potrero drainage immediately inside cattle guard fence. Large meadow drains into a sedge marsh. Standing water with visible surface flow. Water depth 1-2 inches. No pools, canopy, soil may be salty based upon crystals on surface. Bottom covered with dead organic matter, grasses, sedges, algae, and cattle feces.

SPECIES PRESENT: N/A

SAMPLE POINT: 56 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24'160" by W118° 40' 404"

HABITAT DESCRIPTION: Potrero drainage approximately 500 feet south of Santa Clara River. Some surface flow visible. Bottom consists of mud and silt covered with grasses. Vegetation consists of some sedges and watercress. Limited canopy consisting of mulefat along edge of small channel.

SPECIES PRESENT: Aquatic insect larvae.