Aquatic Consulting Services, Inc., "Aquatic Surveys along the Santa Clara River; Part IV: Ventura County Line to Las Brisas Bridge, Ventura County, California" (June 25, 2002; 2002C)

Mup copy
2000

Original in Matt Carpenter's Office

AQUATIC SURVEYS ALONG THE SANTA CLARA RIVER

PART IV: VENTURA COUNTY LINE TO LAS BRISAS BRIDGE, VENTURA COUNTY, CALIFORNIA

Prepared for:

The Newhall Land and Farming Company
Santa Clarita, California

Prepared by:

Aquatic Consulting Services, Inc.
Ventura, California
Field Report 223.00
July 2002

TABLE OF CONTENTS

LIST OF FIGURES

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's 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.

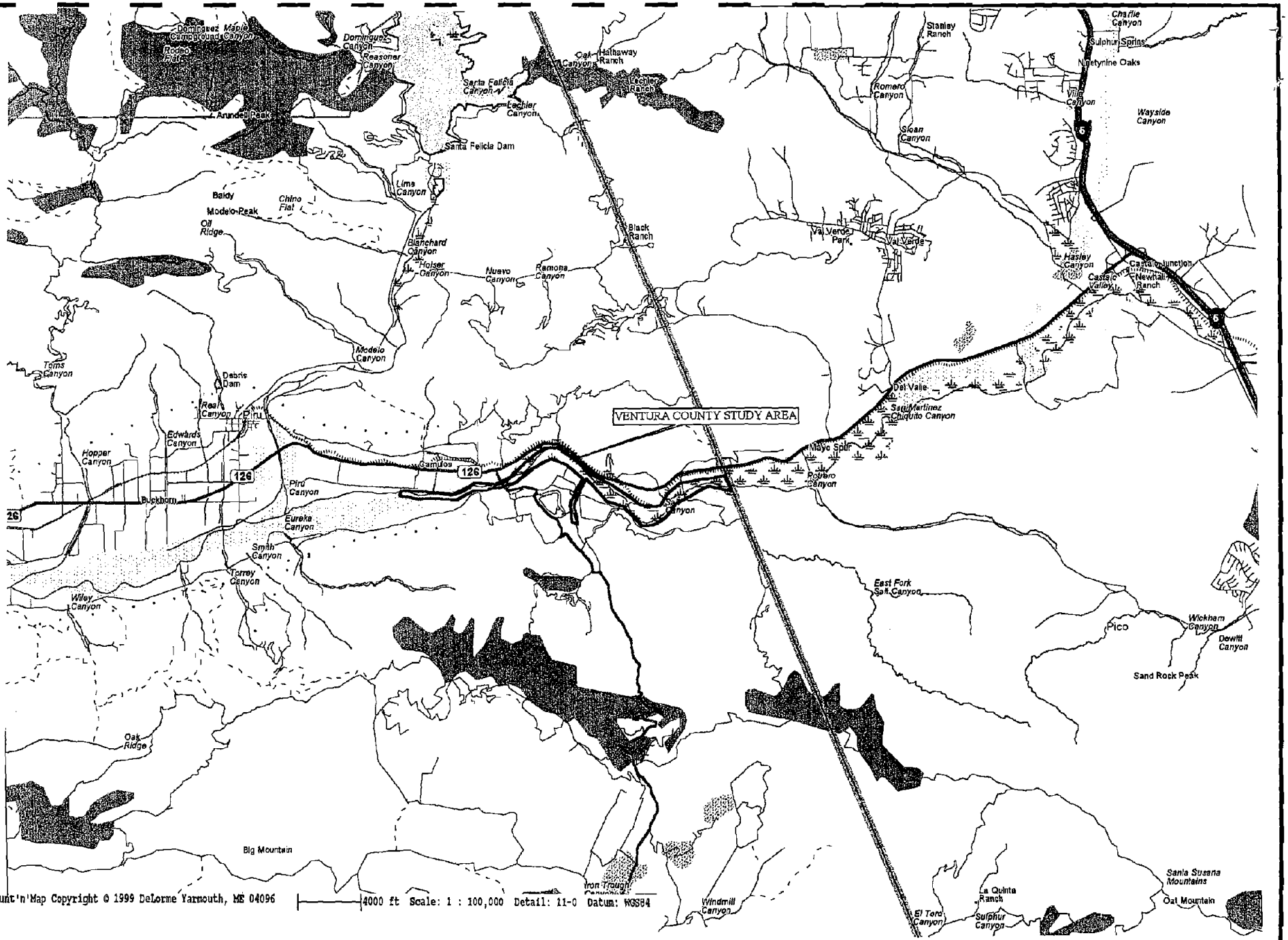
II. PROJECT LOCATION AND FEATURES

The study area is located within the Ventura County portion of the Santa Clara River, starting at the Ventura County line and ending approximately one half mile west of Las Brisas Bridge. 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

The Santa Clara River can be divided into various 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 (*Arundo donax*), willow (*Salix sp.*), cottonwood (*Populus fremontii*), mulefat (*Baccharis salicifolia*), Tamarisk (*Tamarix sp.*), and nettle (*Urtica sp.*). The channel width 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 each reach.

The reach covered by this report extends from the Los Angeles County line downstream into Ventura County. The river bottom is primarily sand with a few sections of gravel and rock. Although the low-flow channel is focused, there is generally little incision present. The riparian zones along both sides of the river are extensive.



ACS

Geographic Location Map Showing the General Study Area

FIGURE 1

crossing, the channel widens and incision is evident. The bottom again consists of alluvium. Below the Las Brisas Bridge, the river bed widens further. Surface water flows and the associated dependent aquatic habitat disappear before reaching the Torrey Road bridge.

Also included within this reach are Tapo and Salt Creeks, which enter the Santa Clara River along the south bank. Tapo Creek is a small incised creek with intermittent flows. Summer flows tend to percolate into the ground within the upper portion of this drainage. Flows along the central portion to the Santa Clara River confluence are generally small, except during winter storms. Bottom materials vary from sand to gravel and rock. This drainage channel contains good riparian cover. Salt Creek is generally dry along the lower portions surveyed during this study. The only location where surface water was present was at the confluence. This drainage was incised but overgrown with grasses along the entire length surveyed.

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.

Flows within Tapo Creek are generally intermittent except during the winter months, when bottom sediments become saturated resulting in continuous flow to the confluence. Some agricultural runoff also enters the creek near the downstream end resulting in slightly larger but more continuous flows during irrigation.

Flows along Salt Creek are ephemeral except during winter months when storms provide sufficient rainfall to generate continuous flow. However, due to the steepness of the drainage within the area studied here, surface flows would cease within 24 hours of a rain event.

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 (*Disticulus*), umbrella sedge (*Cyperus difformis*), mugwort (*Artemisia douglasiana*), stinging nettle *(Urtica sp.*), smartweed (*Polygonum lapathifolium*), and sometimes filamentous algae.

Riffle - 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.

Tapo Creek - Within the study area, this creek is generally narrow within the upper reaches and wider near the confluence. The creekbed typically consisted of alluvium. There was good riparian growth throughout the study area.

Salt Creek - Within the study area, this creek is generally narrow in width with a rather steep gradient. The bottom consists of alluvium and rock. Riparian growth is limited to the area immediately adjacent to the confluence.

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 santannae*), and the mosquitofish (*Gambusia affinis*). Other species rarely 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 (*Xenopis laevis*), and western toad (*Bufo boreas*). Less common amphibians include the Western spadefoot toad (*Scaphiopus hammondi*) and the arroyo southwestern toad (*Bufo microscaphus californicus*) and California red-legged frog (*Rana aurora draytonii*) . Reptiles occurring along the Santa Clara River watershed 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 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.

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 suggests 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 dolomieui*), 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 that may be found within the Santa Clara River Drainage.

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. 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. Requires permanent or nearly permanent pools for larval development, which takes 11 to 20 weeks. 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 August 10, 16 and September 7, 2000. All surveys were 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 primary 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.

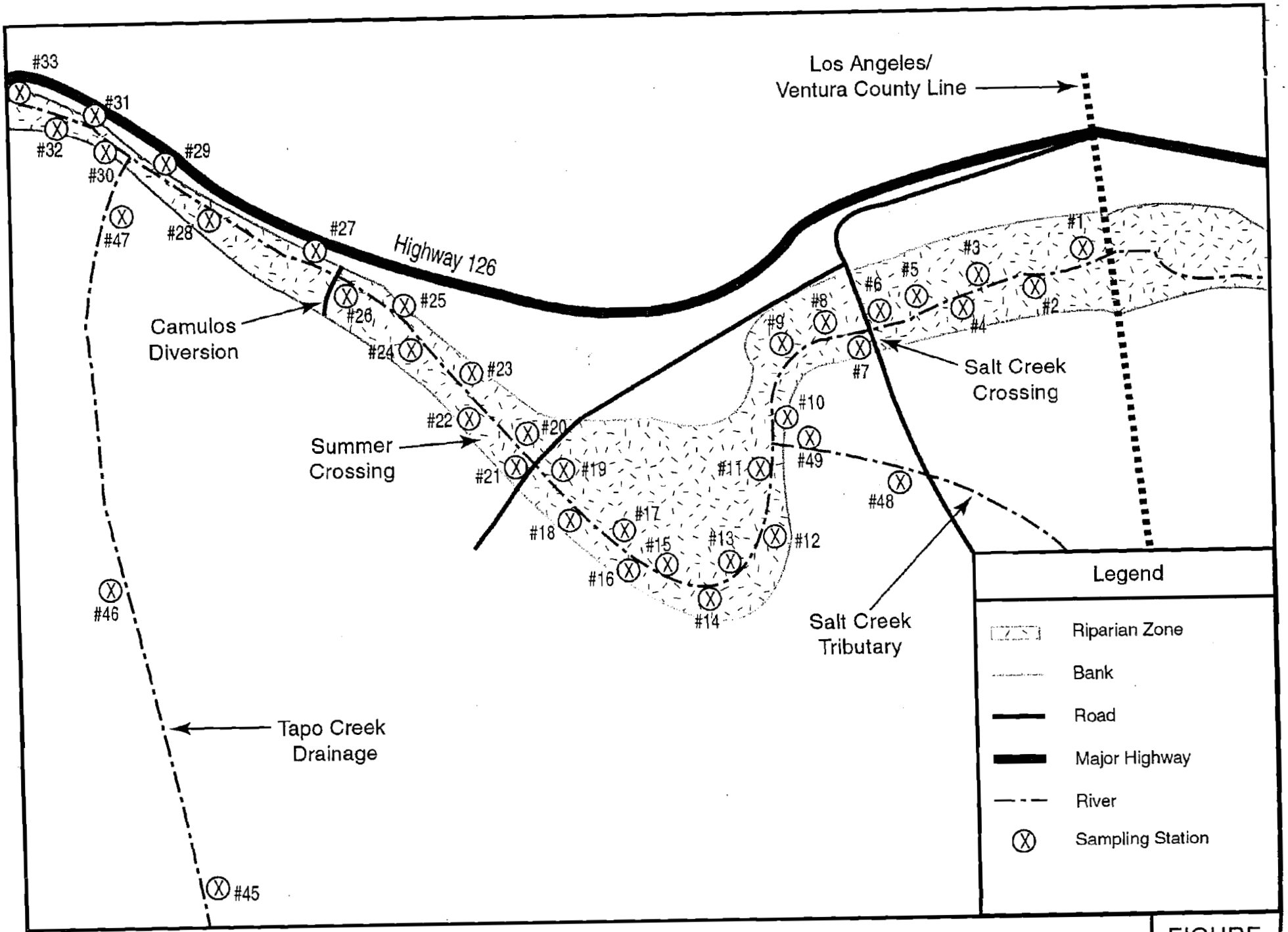
V. RESULTS

The exact location of the 49 sample points within the study area was determined using a GPS receiver. Two of these sample points marked the northern and southern downstream limits of surface flows within the Santa Clara River (Sample Points 43 and 44 respectively). The location of each station was 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. Ten of the 49 (20 percent) sampling locations did not contain any aquatic species. Appendix A lists the species and site characteristics recorded for each sampling location.

Results of the daytime 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. Arroyo chubs (*G. orcutti*) were found at 33 of the 49 (67.3 percent) sampling locations. Mosquitofish (*G. affinis*) was the second most abundant fish being found at 19 of the 49 (38.8 percent) locations. Large-mouth bass (*M. salmoides*) were found at four of the 49 (8.2 percent) sampling locations. Unarmored threespine sticklebacks (*G. aculeatus williamsoni*) were found within only three of the 49 (6.1 percent) sampling locations (points 3, 15, and 18). No Santa Ana suckers or other fish species were collected within the study area.

Amphibians located within the study area during field surveys included the Pacific treefrog (*H. regilla*) California treefrog (*H. cadaverina*), and western toad (*B. boreas*). *Hyla* were located at five of the 49 (10.2 percent) locations (sample points 3, 5, 15, 20, and 47). A western toad was collected at only one of 49 (2.0 percent) location (sample point 20). No arroyo southwestern toads (*B microscophus californicus*) or western spadefoot toad (*S. hammondi*) were found at any sampling location during field surveys. The California red-legged frog (*R. aurora draytonii*) was not observed within the study area during daytime surveys. Western pond turtle (*Clemmys marmorata*) were observed at two (4.0 percent) locations within the study area (sample points 14 and 37). Two-striped gartersnake (*T. couchi hammondi*) were observed only once within the study area during field surveys (sample point 14).

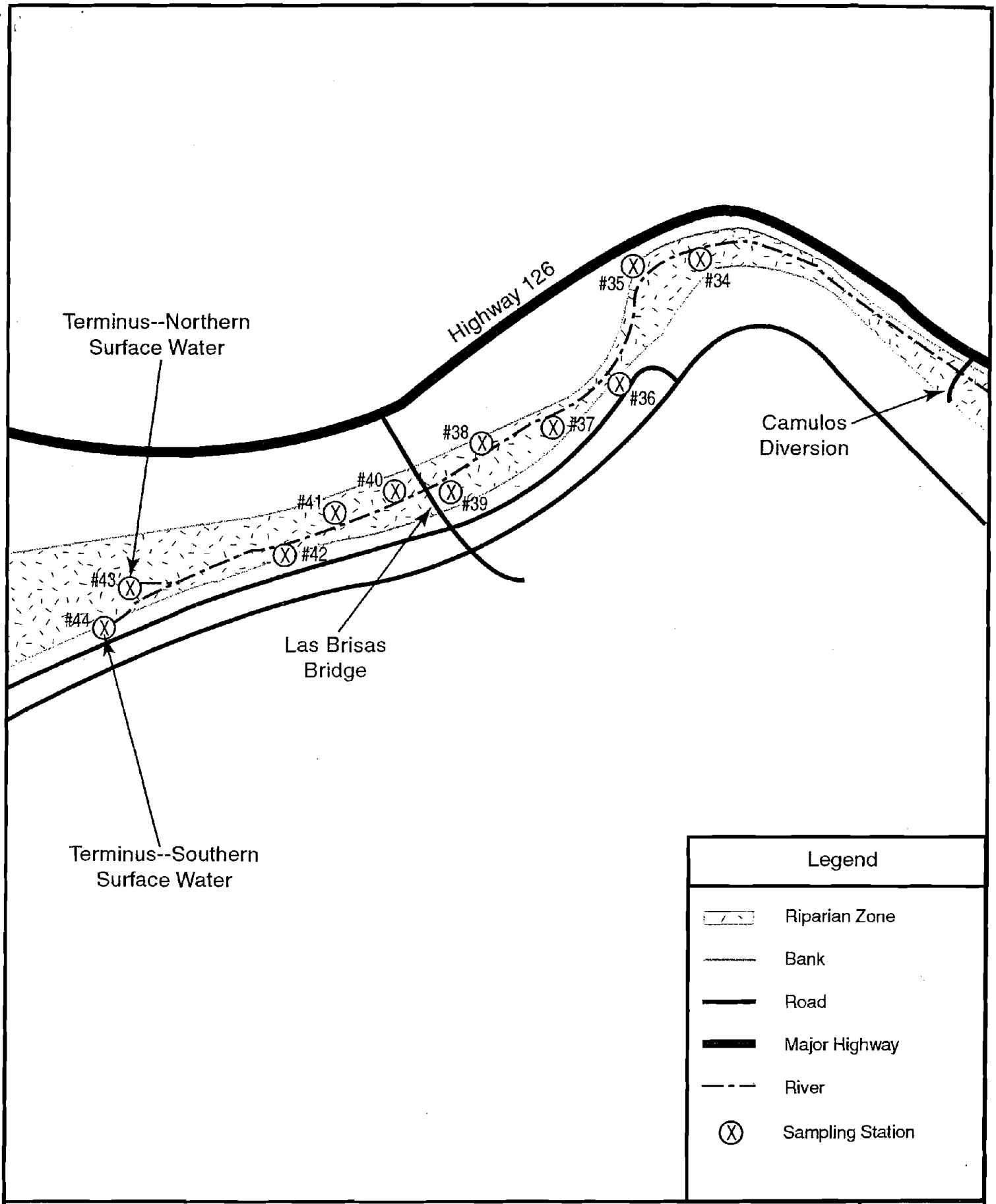
Within Tapo Creek, aquatic species were only collected at the Santa Clara River confluence (sample point 47). No vertebrate species were collected or noted within Salt Creek. Specific information concerning the physical features of each sampling point and species observed are summarized in Appendix A. Photographs of each sampling point are included in Appendix B.



ACS

Map Showing the General Eastern Half of Ventura County Study Area Along the Santa Clara River, and Approximate Locations of Each Aquatic Sampling Station

FIGURE 2



ACS

Map Showing the General Western Half of the Ventura County Study Area Along the Santa Clara River, and approximate Locations of Each Aquatic Sampling Station

FIGURE 3

VI. CONCLUSIONS

Although daytime surveys noted a variety of aquatic habitat types, approximately 20 percent of the areas surveyed did not contain any vertebrate organisms. The dominant fish species was arroyo chub followed by mosquito fish and large-mouth bass. The least abundant fish was the unarmored threespine stickleback. No other species of fish was encountered within the study area. The three amphibians found during field surveys within the study area included both species of tree frog and the western toad. No other amphibians were noted. A western pond turtle was observed but no two-striped gartersnake were noted.

Although aquatic species were found only at the confluence of Tapo Creek and the Santa Clara River, upstream portions of Tapo Creek and all of Salt Creek were generally devoid of vertebrate aquatic species.

VII. REFERENCES

Behler, J.L. and F. W. King. 1979. National Audubon Society Guide to North American Reptiles and Amphibians. Alfred A. Knopf, Inc., New York.

Moyle, P.B. 1976. Inland Fishes of California. University of California Press, Berkeley.

Noda, D.K. 1999. Survey Protocol for the Arroyo Toad. U.S. Fish and Wildlife Service letter dated May 19, 1999. 3 pages.

Stebbins, R.C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston.

APPENDIX A – SAMPLE POINT DATA

VENTURA COUNTY LINE WEST TO SALT CREEK

SAMPLE POINT: 1 **DATE**: 8/10/00 **GPS LOCATION**: N34° 24.159' BY W118° 41.538'

HABITAT DESCRIPTION: South side of river; medium secondary channel off primary channel with good surface flow. Bottom: organic matter, sand, and gravel. Vegetation: mule fat, willow, salt cedar, cattails; grasses, watercress, smartweed, duckweed, and algae also present. Shady.

SPECIES PRESENT: Mosquito fish.

SAMPLE POINT: 2 **DATE**: 8/10/00 **GPS LOCATION**: N 34° 24.191' by W 118° 41.726'

HABITAT DESCRIPTION: North side of river; backwater area with some surface flow evident along the primary channel; created by an upstream snag. Bottom: sand and organic matter. Vegetation: Azolla, duckweed, and algae along bottom. Smartweed and watercress in pool and along shoreline.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 3 **DATE**: 8/10/00 **GPS LOCATION**: N34° 24.164' by W118° 41.814'

HABITAT DESCRIPTION: North side of river; medium secondary channel with good surface flow. Bottom: sand and gravel. Vegetation: along shoreline – duckweed, algae, watercress, grasses, smartweed, and salt cedar. Cattle activity.

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

SAMPLE POINT: 4 **DATE**: 8/10/00 **GPS LOCATION**: N 34° 24.151' by W118° 41.883'

HABITAT DESCRIPTION: South side of river; large secondary channel; split off by sandbar with good flow. Bottom: sand and gravel. Vegetation: algae on bottom. Duckweed, water speedwell, smartweed, and some young salt cedar along edge. No shade.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 5 **DATE**: 8/10/00 **GPS LOCATION**: N34° 24' 0.118"by W118° 41' 0.958"

HABITAT DESCRIPTION: South side of river; small secondary channel with minimal surface flow. Bottom: sand and gravel. Vegetation: some algae on bottom. Surface covered with azolla, duckweed, grasses, and algae. Shading by mature cottonwood, willow, and sedges.

SPECIES PRESENT: California treefrog, pacific treefrog, arroyo chub, and mosquito fish.

SALT CREEK CROSSING TO SUMMER CROSSING

SAMPLE POINT: 6 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.101" by W118° 42' 0.046"

HABITAT DESCRIPTION: Downstream of Salt Crossing where plunge pools were present at downstream end of culverts. Bottom: sand and gravel. Vegetation: algae and duckweed along edge.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 7 **DATE:**8/10/00 **GPS LOCATION:** N34° 24' 0.085"by W118° 42' 0.070"

HABITAT DESCRIPTION: Cut bank along southern river bank. Bottom: sand and gravel. Vegetation: some algae on bottom and along edge. Water speedwell, mule fat, cocklebur, grasses, and smartweed.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 8 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.096"by W118° 42' 0.145"

HABITAT DESCRIPTION: North side of river; slow off-channel area, created by wooden debris upstream. Bottom: sand and gravel. Vegetation: some algae; surface azolla. Water speedwell, duckweed, and some grasses at edge. Smartweed, arundo, and grasses along bank.

SPECIES PRESENT: Arroyo chub and mosquito fish.

SAMPLE POINT: 9 **DATE:** 8/10/00 **GPS LOCATION:** N34° 24' 0.069"by W118° 42' 0.234"

HABITAT DESCRIPTION: North side of river; small secondary channel with good surface flow off main channel, a split created by a sand bar. Bottom: rock, gravel, and sand. Vegetation: duckweed and algae along edge; algae on bottom; willow and cottonwood overhang/shade area.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 10 **DATE:**8/10/00 **GPS LOCATION:** N34° 23' 0.940"by W118° 42' 0.233"

HABITAT DESCRIPTION: West (north) side of river; small off-channel backwater area along west side of river. Bottom: dense organic matter, algae, sand, and gravel. Vegetation: surface with algae and duckweed; shoreline with grasses, smartweed, and young salt cedar.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 11 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.856"by W118° 42' 0.236"

HABITAT DESCRIPTION: West (north) side of river; slower water area along main channel.

Bottom: sand and gravel. Vegetation: overhanging salt cedar, mule fat, unknown Lamiaceae (*Stachys albens*), and cattails. Limited algae and some duckweed under the overhanging vegetation.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 12 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.760'by W118° 42' 0.257"

HABITAT DESCRIPTION: East (south) side of river; large pool upstream of an unknown structure, appears to be a man-made breakwater/barrier. Bottom: sand and large rocks cemented to bottom. Vegetation: little duckweed and algae on edge of rock; some algae on bottom.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 13 **DATE:**8/10/00 **GPS LOCATION:** N34° 23' 0.696"by W118° 42' 0.300"

HABITAT DESCRIPTION: East (south) side of river; more large rocks along the east bank perpendicular to bank, approximately 8 ft long. Backwater area along east (south) bank. Bottom: sand, gravel and some organic matter. Vegetation: overhanging arundo, willow, mule fat, cocklebur, and salt cedar. Duckweed covers surface; algae only on rocks.

SPECIES PRESENT: N/A

SAMPLE POINT: 14 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.690"by W118° 42' 0.351"

HABITAT DESCRIPTION: West (north) side of river; backwater area under trees and stump. Bottom: large rocks and rock bottom. Vegetation: some algae and duckweed on surface; willow overhanging pool; arundo and woody debris.

SPECIES PRESENT: Two-striped garter snake, arroyo chub, and pond turtle.

SAMPLE POINT: 15 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.696"by W118° 42' 0.427"

HABITAT DESCRIPTION: North side of river; small secondary channel, somewhat isolated from main channel, but with obvious surface flow. Bottom: sand and gravel. Vegetation: duckweed and algae along surface and bottom; some watercress and smartweed along edge; also grasses and cattails along edge.

SPECIES PRESENT: Mosquito fish, treefrog, and stickleback.

SAMPLE POINT:16 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.717"by W118° 42' 0.508"

HABITAT DESCRIPTION: South side of river; a wide spot with slower water along the edge. Bottom: sand and gravel. Vegetation: watercress; plants overhanging bank including cattails, grasses, and rushes, and shaded by willow.

SPECIES PRESENT: Arroyo chub and largemouth bass.

SAMPLE POINT: 17 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.785"by W118° 42' 0.611"

HABITAT DESCRIPTION: North side of river; river split in two by sandbar, this is the northern channel. Bottom: gravel and sand. Vegetation: some algae and duckweed along edge; sedges, cattails, and willow overhang the north edge.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 18 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.879"by W118° 42' 0.706"

HABITAT DESCRIPTION: North side of river; small secondary channel with some surface flow visible. Bottom: sand. Vegetation: algae, azolla, and duckweed along edge and bottom; also present are smartweed, watercress, grasses, typha, and mule fat.

SPECIES PRESENT: Mosquito fish (adults and juvenile), stickleback (juvenile), and arroyo chub (adult).

SAMPLE POINT:19 **DATE:** 8/10/00 **GPS LOCATION:** N34° 23' 0.911" by W118° 42' 0.778"

HABITAT DESCRIPTION: South side of river; small tributary with obvious surface flow that is somewhat isolated from the main channel. Bottom: sand, algae and organic matter. Vegetation: duckweed on surface; large willow, arundo, salt cedar, mule fat providing shade to pools; sedges and wild celery also present.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SUMMER CROSSING TO CAMULOS DIVERSION

SAMPLE POINT: 20 **DATE:**8/16/00 **GPS LOCATION:** N34° 23' 0.996"by W118° 42' 0.794"

HABITAT DESCRIPTION: Immediately downstream of Summer crossing. Bottom: sand with gravel along edge. Vegetation: duckweed, algae, smartweed, speedwell, and grasses all along edge.

SPECIES PRESENT: Arroyo chub, treefrog, western toad (adult), and largemouth bass.

SAMPLE POINT: 21 **DATE:**8/16/00 **GPS LOCATION:** N34° 24' 0.013"by W118° 42' 0.826"

HABITAT DESCRIPTION: South side of river; backwater area behind vegetation with some surface flow. Bottom: sand, organic matter, and algae. Vegetation: grasses, typha, smartweed, water speedwell, and some duckweed all along edge.

SPECIES PRESENT: N/A

SAMPLE POINT: 22 **DATE**:8/16/00 **GPS LOCATION:** N34° 24' 0.051"by W118° 42' 0.879"

HABITAT DESCRIPTION: North side of river; delta area with good surface flow. Bottom: sand and gravel. Vegetation: edge of primary channel covered with water speedwell, watercress, grasses, and smartweed; some duckweed interspersed with the other aquatic plants. No algae.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 23 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.112"by W118° 42' 0.913"

HABITAT DESCRIPTION: Center area of river; the north side of a sandbar with good surface flow. River splits into three channels. Central channel is large mat of vegetation. Bottom: gravel and sand. Vegetation: grasses, water speedwell, smartweed, and sedges all along edge; slower areas with algae and duckweed.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 24 **DATE**:8/16/00 **GPS LOCATION:** N34° 24' 0.153"by W118° 42' 0.927"

HABITAT DESCRIPTION: North side of river. Large sand bar still splits channel into two. Vegetation: edge of bank with typha, cottonwood and willow which all overhang the bank. Some algae along base of roots; some duckweed along quiet areas. Hydrogen sulfide smell along bottom.

SPECIES PRESENT: N/A

SAMPLE POINT: 25 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.207"by W118° 42' 0.982"

HABITAT DESCRIPTION: North side of river with small sandbar in center of river; small secondary channel along edge with good surface flow. Bottom: sand, gravel and some algae along edge at base of trees. Vegetation: typha, smartweed, willow, and salt cedar all overhanging edge.

SPECIES PRESENT: N/A

CAMULOS DIVERSION TO LAS BRISAS BRIDGE

SAMPLE POINT: 26 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.289"by W118° 43' 0.166"

HABITAT DESCRIPTION: Diversion structure forces river north through weir. Several large backwater areas created upstream and downstream of the diversion. Bottom: sand, gravel, and some rock. Vegetation: cocklebur, grasses, smartweed, water speedwell, willow, and arundo.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 27 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.286"by W118° 43' 0.178"

HABITAT DESCRIPTION: Southwest side of Camulos diversion; a large isolated pool without obvious surface flow. Bottom: pondweed, organic matter, and algae. Vegetation: surface covered with algae, duckweed, and grasses; surrounded by water speedwell, grasses, smartweed, and sedges.

SPECIES PRESENT: Mosquito fish (large school visible).

SAMPLE POINT: 28 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.323"by W118° 43' 0.249"

HABITAT DESCRIPTION: South side of river; small backwater area along primary channel. Bottom: sand and gravel. Vegetation: some grasses, some watercress, algae along root masses, typha, willow, arundo, salt cedar, cocklebur, and smartweed overhang edge of bank.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 29 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.399"by W 118° 43' 0.344"

HABITAT DESCRIPTION: South side of river. This area is narrower and deeper: approximately 50 ft wide and 1-2 ft deep. Bottom: sand and gravel with some algae and duckweed near edge. Vegetation: south bank with smartweed and grasses.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 30 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.425"by W118° 43' 0.367"

HABITAT DESCRIPTION: South side of river; small off-channel pool with some water from upstream percolation and no surface flow. Bottom: algae and rocks. Vegetation: surface with algae, duckweed and grasses; edges of sedge, water speedwell, and smartweed.

SPECIES PRESENT: Mosquito fish.

SAMPLE POINT: 31 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.460"by W118° 43' 0.394"

HABITAT DESCRIPTION: North side of river; slower backwater area created by large upstream rock. A large willow overhangs the area. Bottom: some algae, sand, and gravel. Vegetation: willow, arundo, and cottonwood.

SPECIES PRESENT: Arroyo chub and crawfish.

SAMPLE POINT: 32 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.507"by W118° 43' 0.491"

HABITAT DESCRIPTION: South side of river; deep hole created by various vegetation and rock with much surface flow. Bottom: sand and gravel. Vegetation: algae and organic matter under

surface; duckweed and grasses downstream.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 33 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.607"by W118° 43' 0.692"

HABITAT DESCRIPTION: North side of river; off-channel secondary stream with good surface flow and isolated by sandbar. Bottom: sand and gravel. Vegetation: large overhanging willow providing shade; bank with sedges, tules, smartweed, watercress, and narrowleaf willow.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT: 34 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.608"by W118° 43' 0.744"

HABITAT DESCRIPTION: North side of river; small backwater area with good surface flow, created by large rock. Bottom: sand, gravel and organic matter. Vegetation: sedges, water speedwell, and grasses; tules observed along backwater area.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 35 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.523"by W118° 43' 0.912"

HABITAT DESCRIPTION: North (west) side of river; secondary channel along edge with surface flow and colder water--possibly a secondary inflow. Deep holes with large rocks. River splits into two channels. Channel surface flow from a western, upstream, unknown source. Vegetation: overhanging tules, cocklebur, water speedwell, arundo, grasses, duckweed, mule fat, and willow.

SPECIES PRESENT: Arroyo chub.

SAMPLE POINT:36 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.352"by W118° 44' 0.005"

HABITAT DESCRIPTION: South side of river; an off-channel (main) slower backwater area created by fallen tree and rock. Bottom: sand and gravel. Vegetation: edge covered with watercress, water speedwell, grasses, and some duckweed; bottom with organic matter and algae. Water clear.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 37 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.325"by W118° 44' 0.088"

HABITAT DESCRIPTION: North side of river; isolated pool with slight surface flow in center of large sandbar. Bottom: gravel and sand, organic matter, and algae. Vegetation: surface covered with duckweed, algae, and azolla; edged with water speedwell, smartweed, tules, and grasses.
SPECIES PRESENT: Mosquito fish and pond turtle observed approximately 50 ft downstream.

SAMPLE POINT: 38 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.310"by W118° 44' 0.172"

HABITAT DESCRIPTION: North side of small secondary channel with obvious surface flow. Bottom: sand with organic matter and some algae. Vegetation: overhanging willow creating some shade; along bank: grasses, water speedwell, salt cedar, willow, mule fat, arundo, and smartweed.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 39 **DATE:**8/16/00 **GPS LOCATION:** N34° 24' 0.267"by W118° 44' 0.274"

HABITAT DESCRIPTION: South side of river; backwater area with good surface flow created by large vegetative stand. Bottom: sand and gravel. Vegetation: edges covered with grasses, salt cedar, smartweed, and water speedwell.

SPECIES PRESENT: Arroyo chub.

LAS BRISAS BRIDGE TO RIVER TERMINUS

SAMPLE POINT: 40 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.208"by W118° 44' 0.401"

HABITAT DESCRIPTION: North side of primary channel. Bottom: sand and gravel; some organic matter and algae along bottom. Vegetation: duckweed along surface; smartweed, grasses, water speedwell, watercress, and tules on lateral edge.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 41 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.143"by W118° 44' 0.729"

HABITAT DESCRIPTION: North side of river; small secondary channel with good surface flow, isolated by sandbar. Bottom: sand and organic matter. Vegetation: along the edge are grasses, watercress, some arundo, and willow overhanging downstream end.

SPECIES PRESENT: Mosquito fish and arroyo chub.

SAMPLE POINT: 42 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.107"by W118° 44' 0.899"

HABITAT DESCRIPTION: South side of primary channel. Bottom: sand, and some organic matter under plants; no algae is present. Vegetation: sedges, water speedwell, smartweed, and cocklebur occur along the edge, creating a dense stand of vegetation.

SPECIES PRESENT: Arroyo chub.

NORTHERN BRANCH TERMINUS OF SURFACE FLOW

SAMPLE POINT: 43 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.046"by W 118° 45' 0.223"

HABITAT DESCRIPTION: Surface water flow and dependent aquatic vegetation disappear at this location.

SPECIES PRESENT: NA.

SOUTHERN BRANCH TERMINUS OF SURFACE FLOW

SAMPLE POINT: 44 **DATE:** 8/16/00 **GPS LOCATION:** N34° 24' 0.016"by W118° 45' 0.252"

HABITAT DESCRIPTION: Surface water flow and dependent aquatic vegetation disappear at this location.

SPECIES PRESENT: NA.

TRIBUTARY SAMPLING –TAPO CREEK

SAMPLE POINT: 45 **DATE:** 9/7/00 **GPS LOCATION:** N34° 23.277'by W118° 43.217'

HABITAT DESCRIPTION: Upper Tapo Creek above wooden bridge. Small stream with obvious surface flow. Algae along bottom. Vegetation consists of sedges and grasses. Limited cover provided by mulefat and willow. No pool areas.

SPECIES PRESENT: N/A

SAMPLE POINT: 46 **DATE:** 9/7/00 **GPS LOCATION:** N34° 23.587'by W118° 43.334'

HABITAT DESCRIPTION: Mid-Tapo Creek at farm road crossing near large oak. Bottom bed rock. Surface water flow evident, and some algae growing along the rock. Cover by willows, cottonwoods, and mulefat. Some salt cedar, cocklebur, grasses, and sedges on downstream section. No pool areas.

SPECIES PRESENT: Set baited trap. No species caught.

SAMPLE POINT: 47 **DATE:** 9/7/00 **GPS LOCATION:** N34° 24.329'by W118° 43.309'

HABITAT DESCRIPTION: Confluence of lower Tapo Creek with the Santa Clara River. Open channel with some algae, leaf litter, cocklebur, and grasses on bottom. Bottom consists of sand and soil. Vegetation: mature willow and Arundo providing 100 percent cover.

SPECIES PRESENT: Mosquitofish and treefrog.

TRIBUTARY SAMPLING –SALT CREEK

SAMPLE POINT: 48 **DATE:** 9/7/00 **GPS LOCATION:** N34° 23.928'by W118° 42.182'

HABITAT DESCRIPTION: Salt Creek drainage approximately 100 feet upstream of Santa Clara River confluence. Dry channel bottom consisting of rock and sand. Little vegetation is present.

SPECIES PRESENT: N/A

SAMPLE POINT:49 **DATE:** 9/7/00 **GPS LOCATION:** N34° 23.922'by W118° 42.210'

HABITAT DESCRIPTION: Salt Creek confluence with Santa Clara River. No surface flow or standing water within the Salt Creek section. Drainage greatly incised. Bottom: sand and rock; soil is moist. Vegetation consists of some cottonwoods, willows, mulefat, tall grasses, sedges, and cocklebur.

SPECIES PRESENT: N/A

APPENDIX B - SITE PHOTOGRAPHS

Photo 1. View looking downstream towards station # 1 . Date of photograph 8-10-00.

Photo 2. View looking upstream of station # 1. Date of photograph 8-10-00.

Photo 3. View looking downstream towards station # 2. Date of photograph 8-10-00.

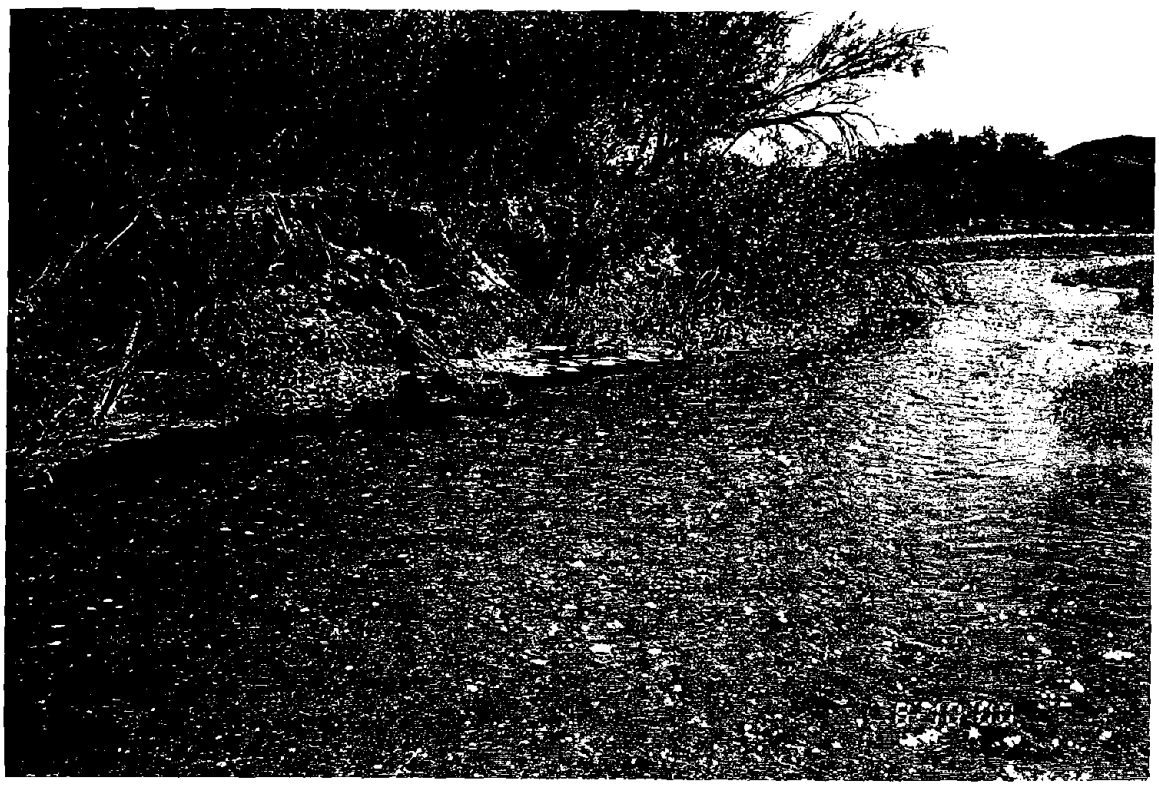


Photo 4. View looking upstream of station # 2. Date of photograph 8-10-00.

Photo 5. View looking downstream towards station # 3. Date of photograph 8-10-00.

Photo 6. View looking upstream of station # 3. Date of photograph 8-10-00.

Photo 7. View looking downstream towards station # 4. Date of photograph 8-10-00.

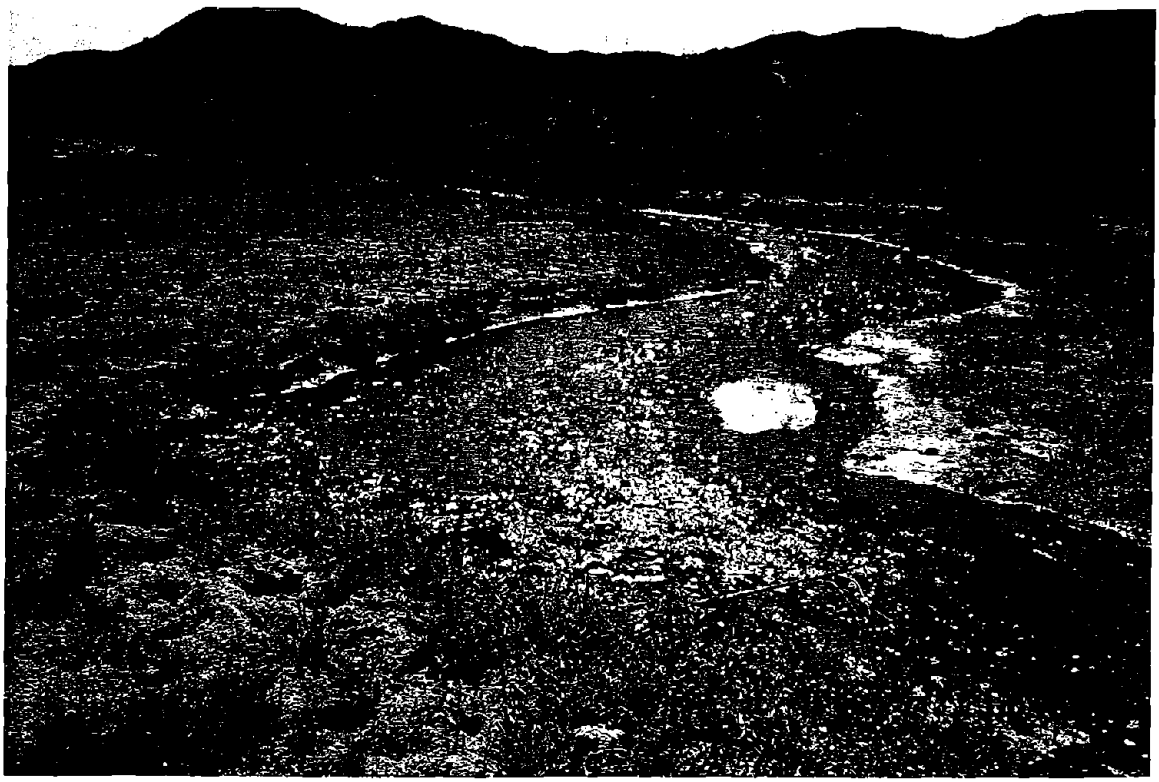


Photo 8. View looking upstream of station # 4. Date of photograph 8-10-00.

Photo 9. View looking downstream towards station # 5. Date of photograph 8-10-00.

Photo 10. View looking upstream of station # 5. Date of photograph 8-10-00.

Photo 11. View looking downstream towards station # 6. Date of photograph 8-10-00.

Photo 12. View looking upstream of station # 6. Date of photograph 8-10-00.

Photo 13. View looking downstream towards station # 7. Date of photograph 8-10-00.

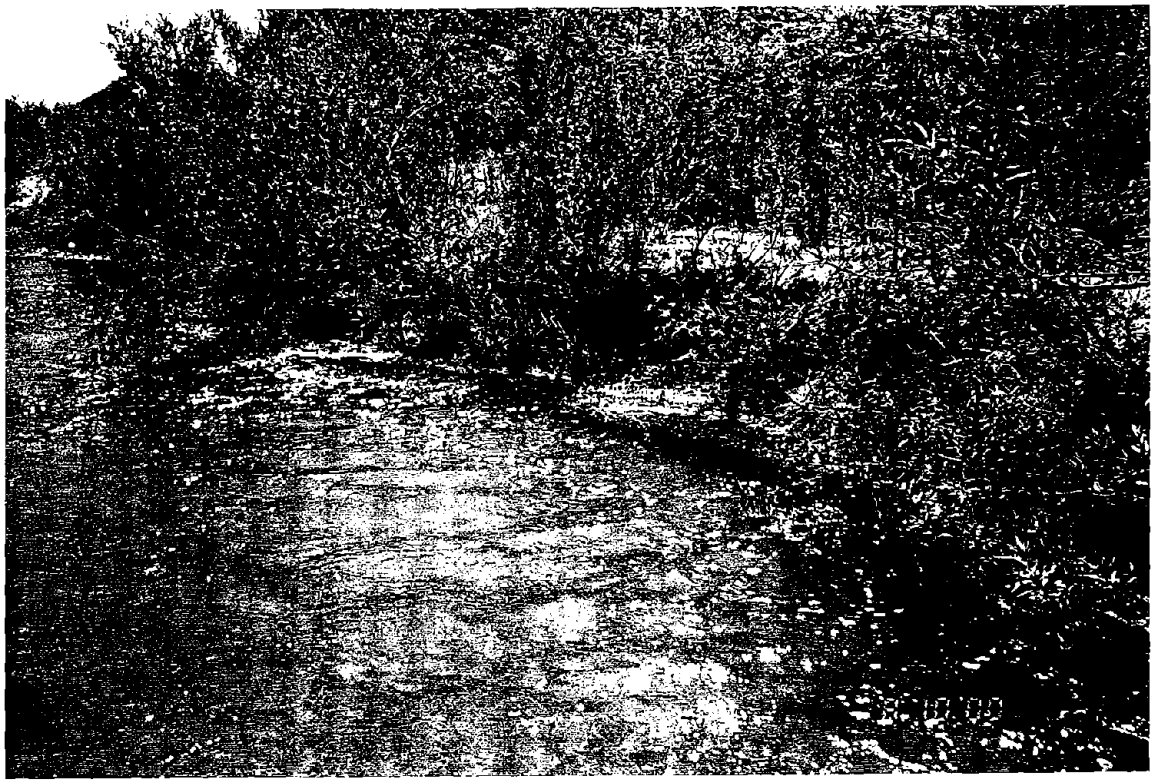


Photo 14. View looking upstream of station # 7. Date of photograph 8-10-00.

Photo 15. View looking downstream towards station # 8. Date of photograph 8-10-00.

Photo 16. View looking upstream of station # 8. Date of photograph 8-10-00.

Photo 17. View looking downstream towards station # 9. Date of photograph 8-10-00.

Photo 18. View looking upstream of station # 9. Date of photograph 8-10-00.

Photo 19. View looking downstream towards station # 10. Date of photograph 8-10-00.

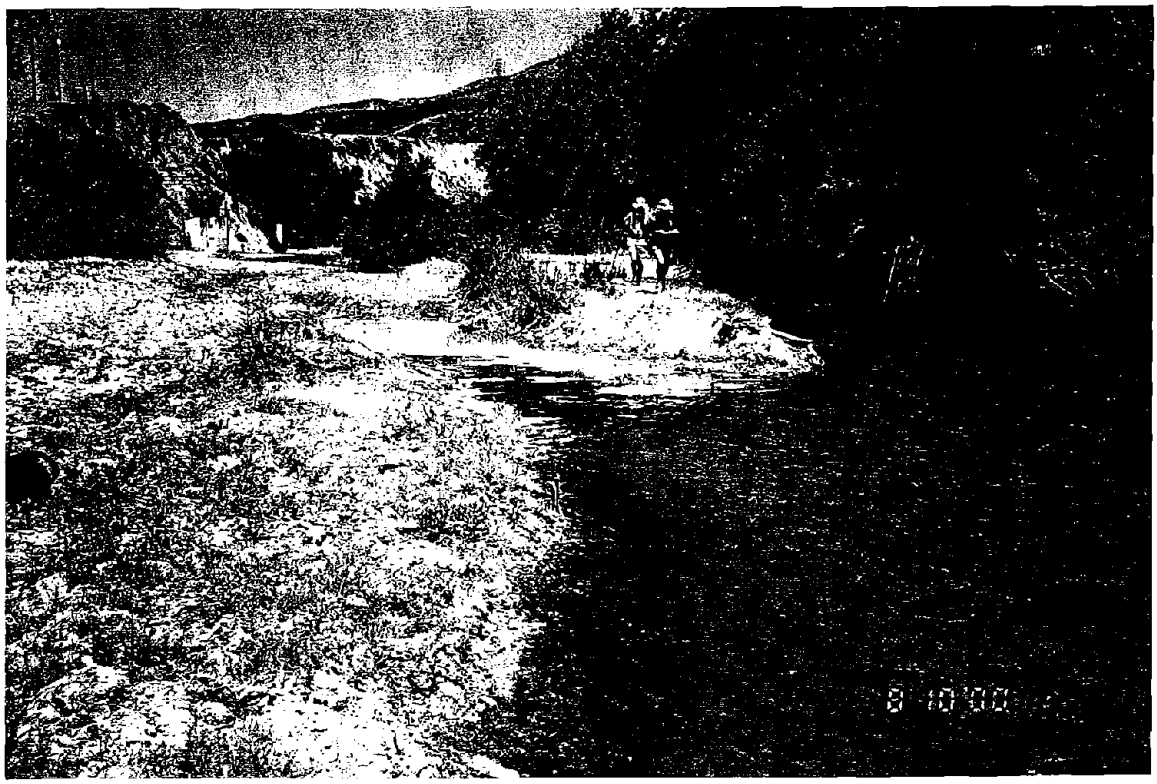


Photo 20. View looking upstream of station # 10. Date of photograph 8-10-00.

Photo 21. View looking downstream towards station # 11. Date of photograph 8-10-00.

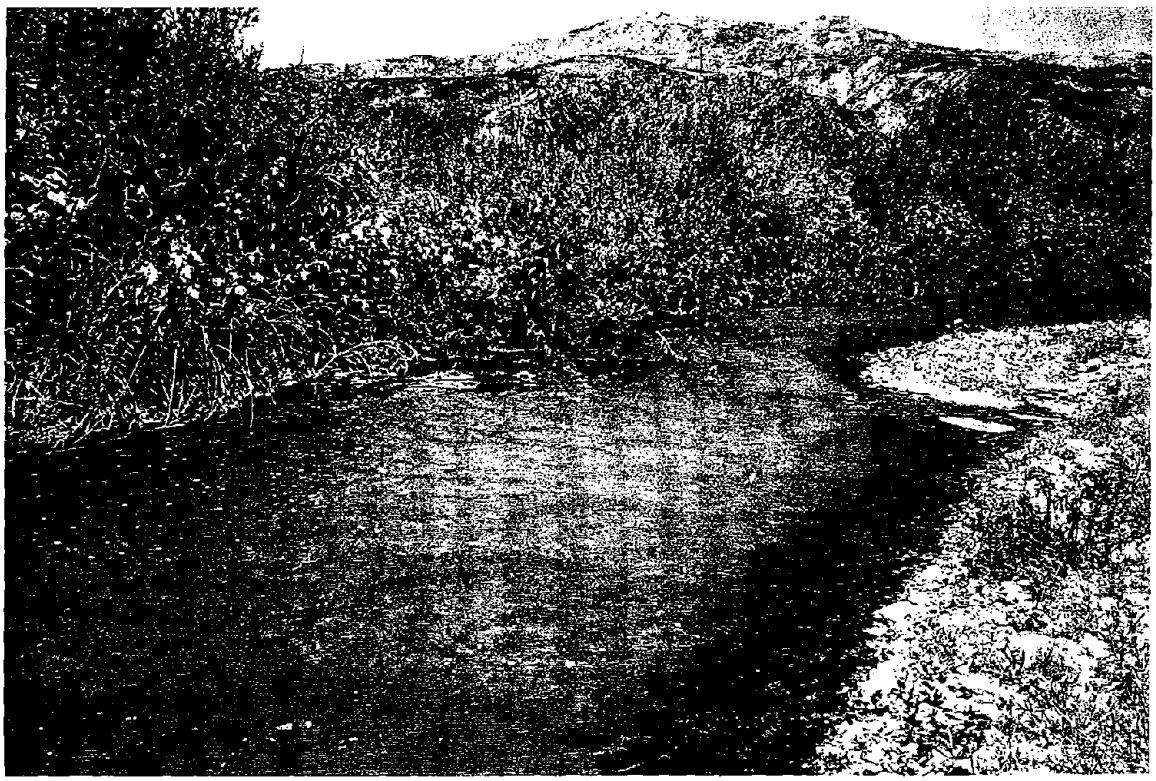


Photo 22. View looking upstream of station # 11. Date of photograph 8-10-00.

Photo 23. View looking downstream towards station # 12. Date of photograph 8-10-00.

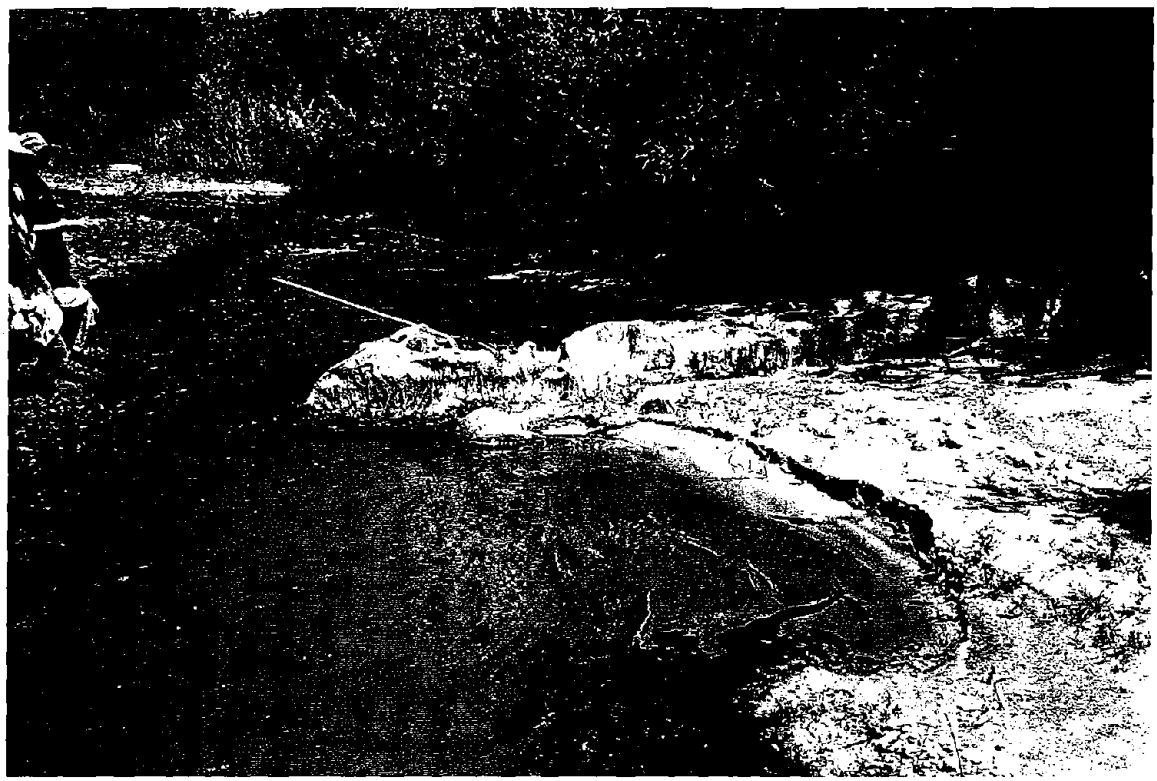


Photo 24. View looking upstream of station # 12. Date of photograph 8-10-00.

Photo 25. View looking downstream towards station # 13. Date of photograph 8-10-00.

Photo 26. View looking upstream of station # 13. Date of photograph 8-10-00.

Photo 27. View looking downstream towards station # 14. Date of photograph 8-10-00.

Photo 28. View looking upstream of station # 14. Date of photograph 8-10-00.

Photo 29. View looking downstream towards station # 15. Date of photograph 8-10-00.

Photo 30. View looking upstream of station # 15. Date of photograph 8-10-00.

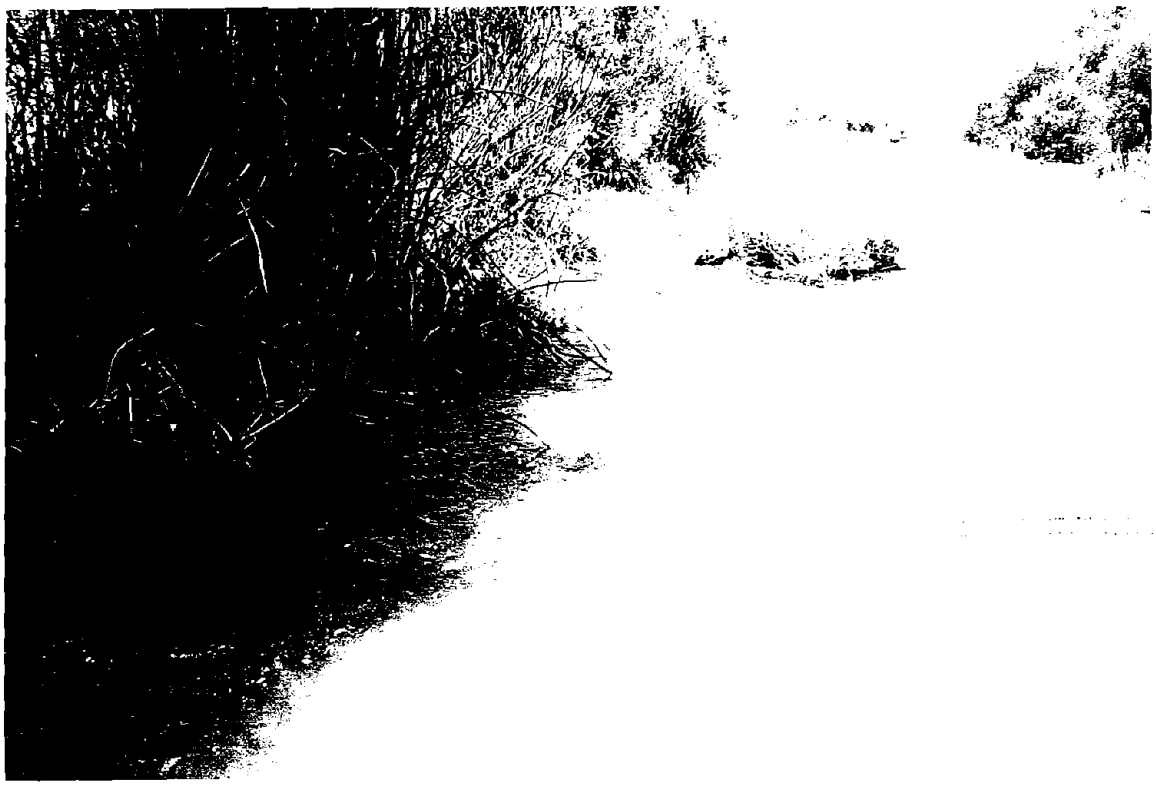


Photo 31. View looking downstream towards station # 16. Date of photograph 8-10-00.

Photo 32. View looking upstream of station # 16. Date of photograph 8-10-00.

Photo 33. View looking downstream towards station # 17. Date of photograph 8-10-00.

Photo 34. View looking upstream of station # 17. Date of photograph 8-10-00.

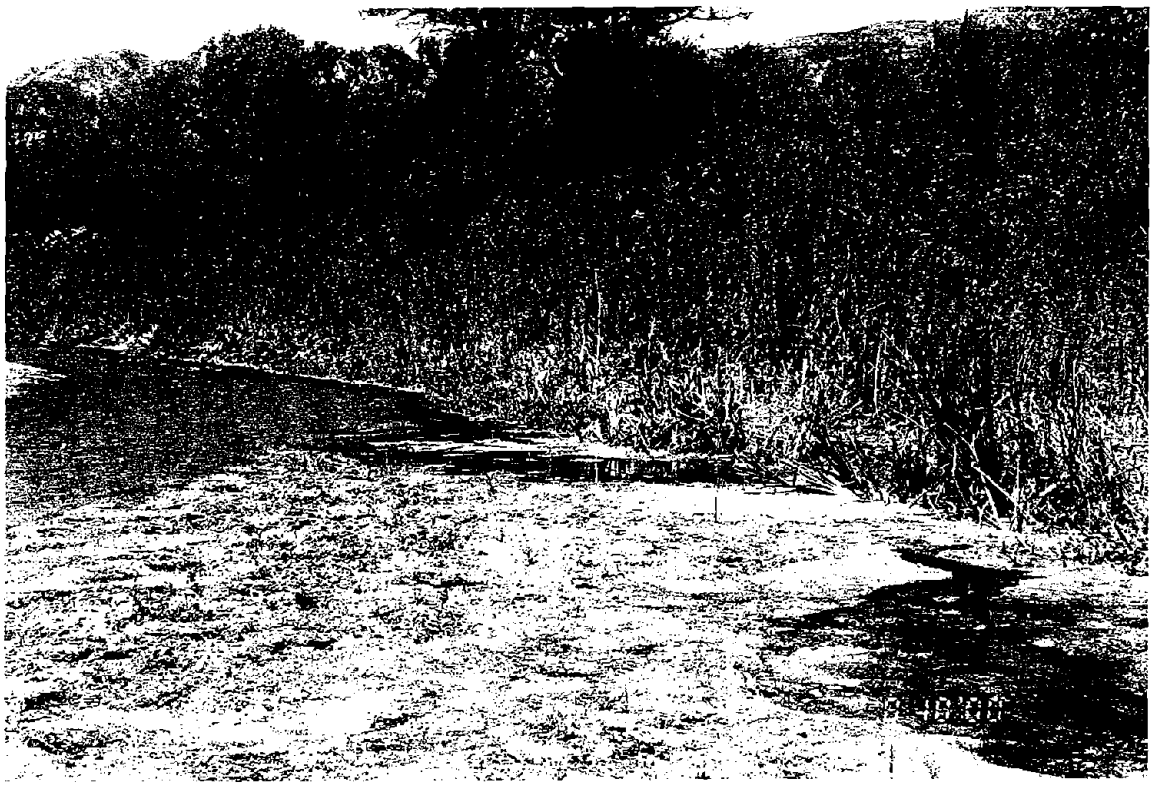


Photo 35. View looking downstream towards station # 18. Date of photograph 8-10-00.

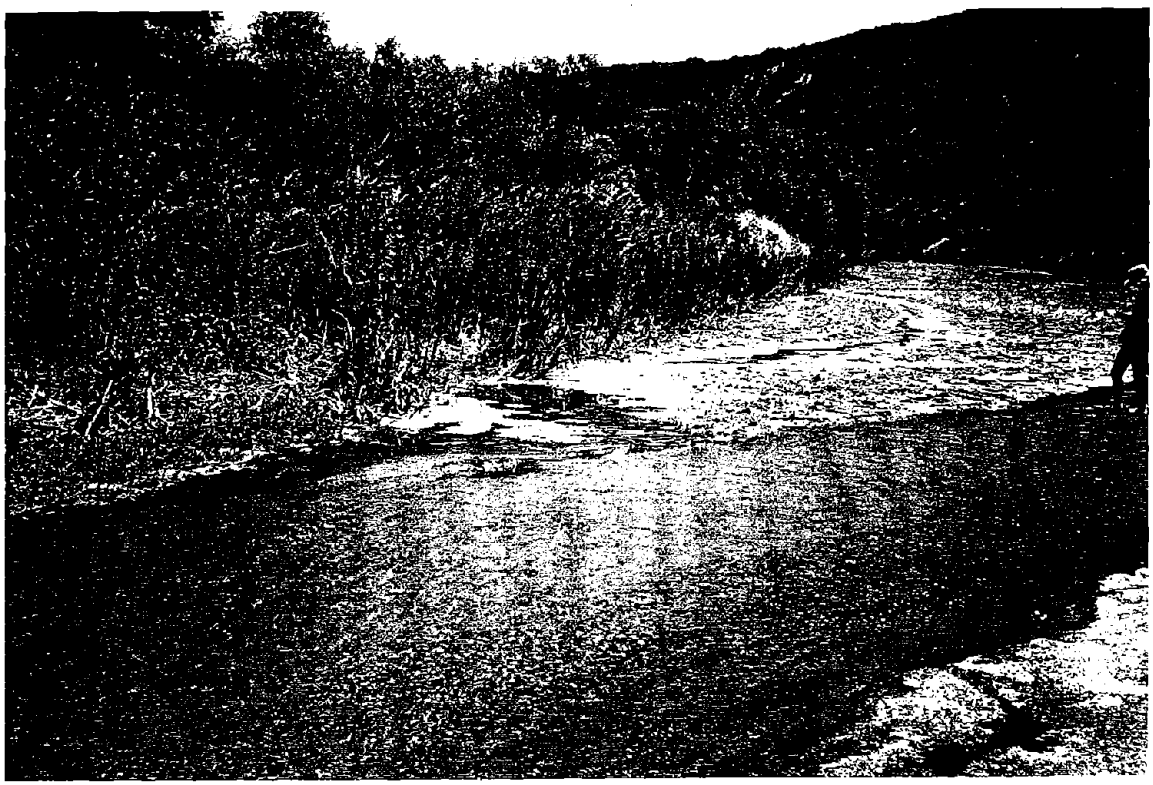


Photo 36. View looking upstream of station # 18. Date of photograph 8-10-00.

Photo 37. View looking downstream towards station # 19. Date of photograph 8-10-00.

Photo 38. View looking upstream of station # 19. Date of photograph 8-10-00.

Photo 39. View looking downstream towards station # 20. Date of photograph 8-16-00.

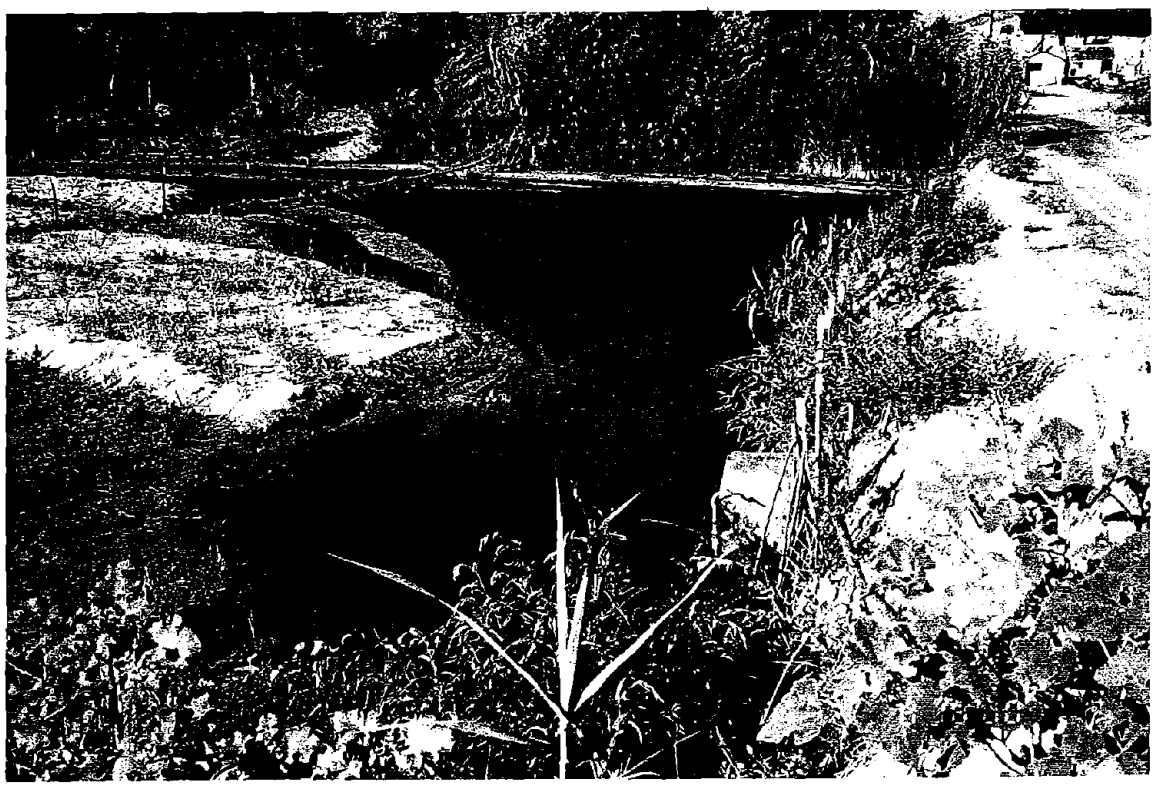


Photo 40. View looking upstream of station # 20. Date of photograph 8-16-00.

Photo 41. View looking downstream towards station # 21. Date of photograph 8-16-00.

Photo 42. View looking upstream of station # 21. Date of photograph 8-16-00.

Photo 43. View looking downstream towards station # 22. Date of photograph 8-16-00.

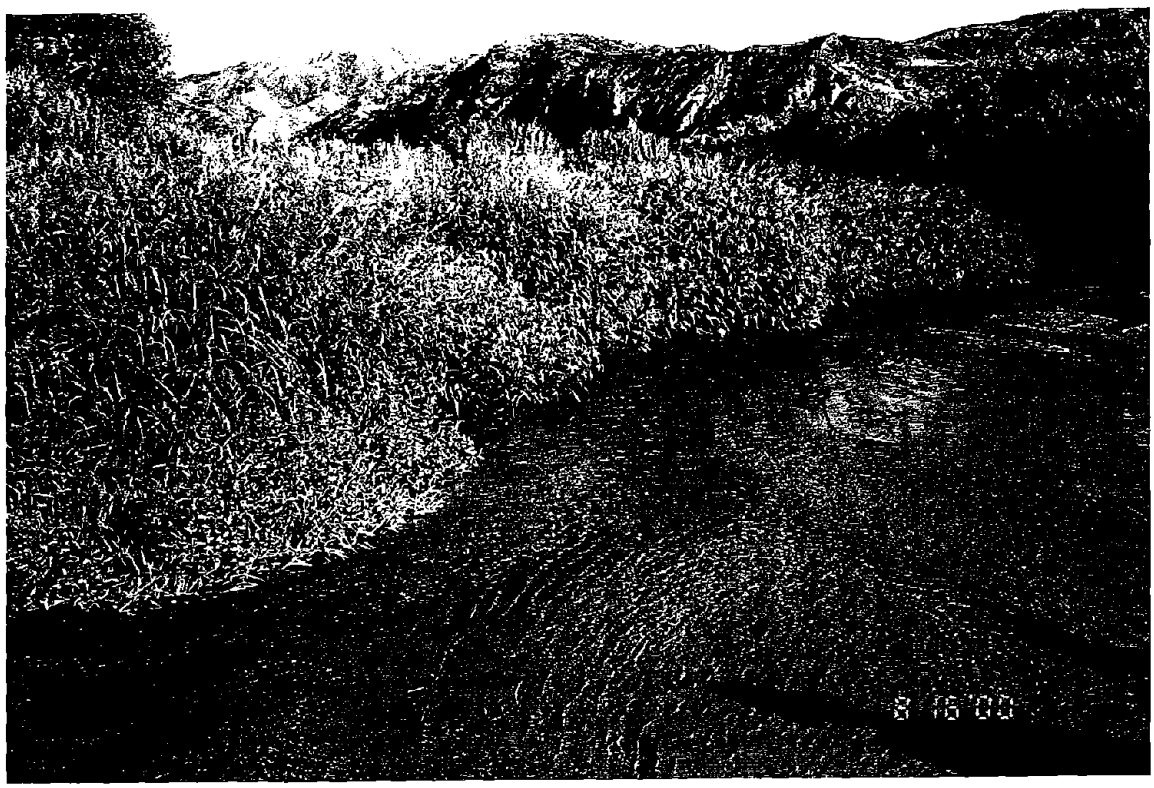


Photo 44. View looking upstream of station # 22. Date of photograph 8-16-00.

PHOTOGRAPH MISSING

Photo 45. View looking downstream towards station # 23. Date of photograph 8-16-00.

PHOTOGRAPH MISSING

Photo 46. View looking upstream of station # 23. Date of photograph 8-16-00.

Photo 47. View looking downstream towards station # 24. Date of photograph 8-16-00.

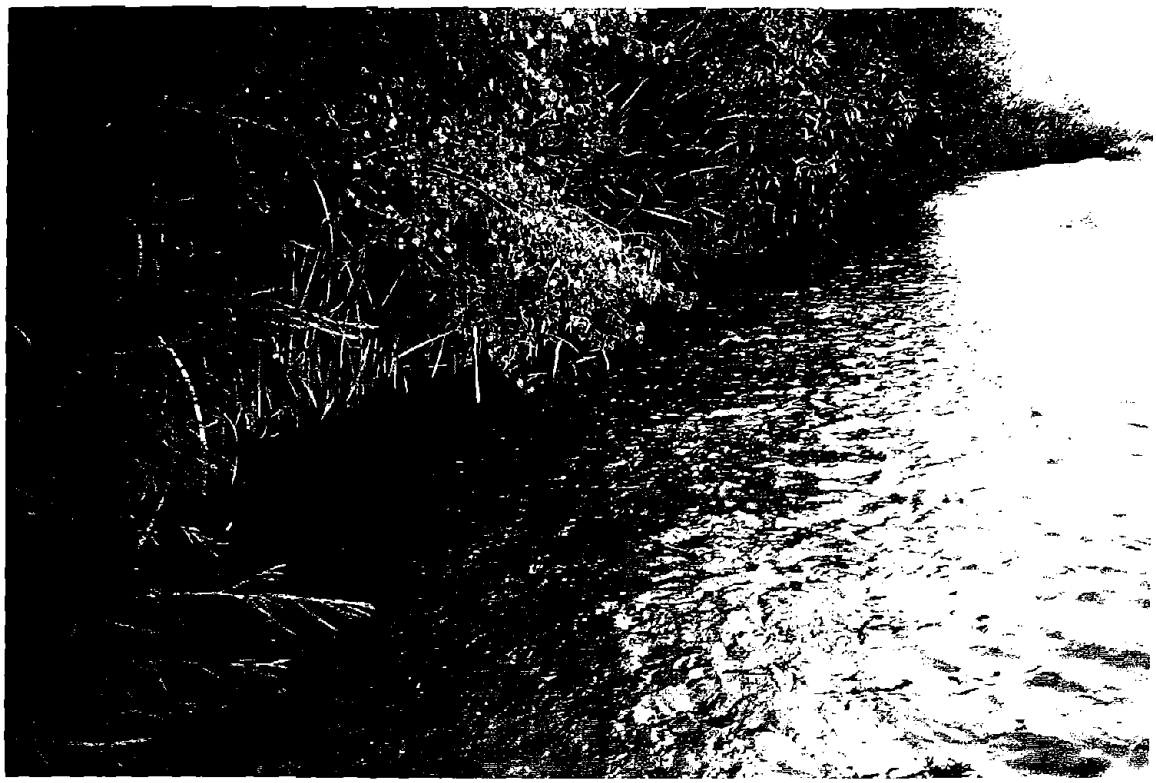


Photo 48. View looking upstream of station # 24. Date of photograph 8-16-00.

Photo 49. View looking downstream towards station # 25. Date of photograph 8-16-00.

Photo 50. View looking upstream of station # 25. Date of photograph 8-16-00.

Photo 51. View looking downstream towards station # 26. Date of photograph 8-16-00.

Photo 52. View looking upstream of station # 26. Date of photograph 8-16-00.

Photo 53. View looking downstream towards station # 27. Date of photograph 8-16-00.

Photo 54. View looking upstream of station # 27. Date of photograph 8-16-00.

Photo 55. View looking downstream towards station # 28. Date of photograph 8-16-00.

Photo 56. View looking upstream of station # 28. Date of photograph 8-16-00.

Photo 57. View looking downstream towards station # 29. Date of photograph 8-16-00.

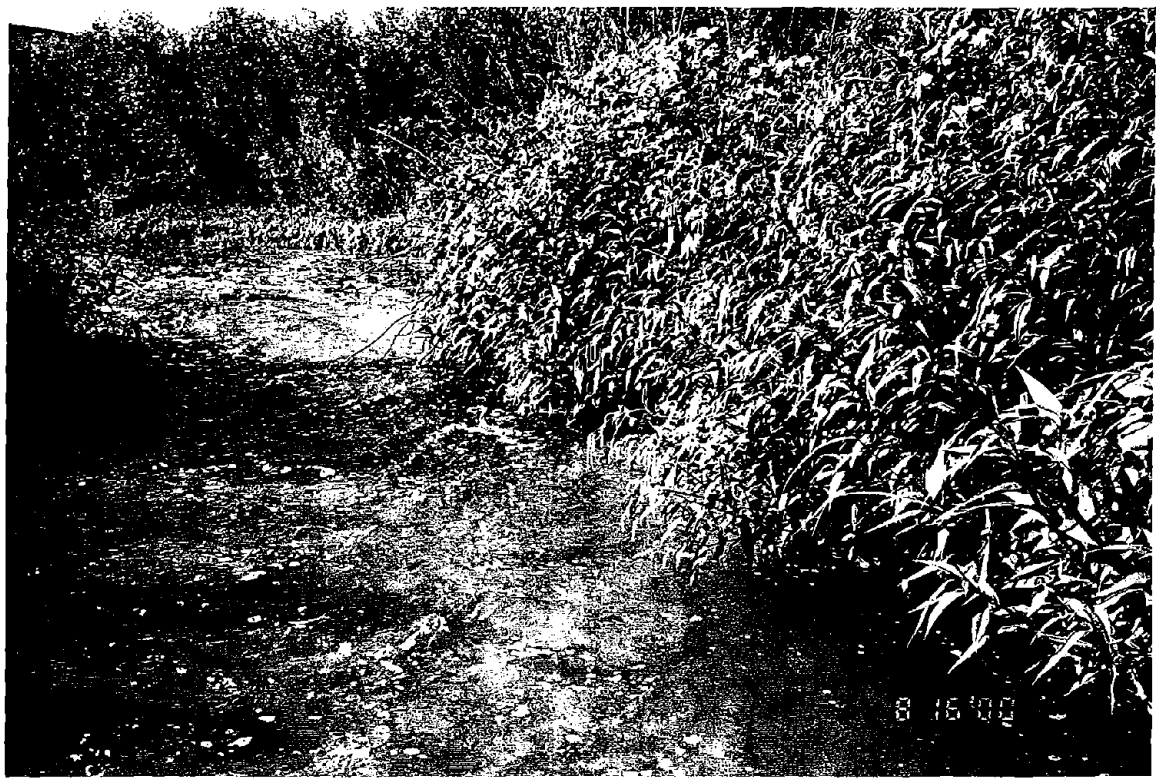


Photo 58. View looking upstream of station # 29. Date of photograph 8-16-00.

Photo 59. View looking downstream towards station # 30. Date of photograph 8-16-00.

Photo 60. View looking upstream of station # 30. Date of photograph 8-16-00.

Photo 61. View looking downstream towards station # 31. Date of photograph 8-16-00.

Photo 62. View looking upstream of station # 31. Date of photograph 8-16-00.

Photo 63. View looking downstream towards station # 32. Date of photograph 8-16-00.

Photo 64. View looking upstream of station # 32. Date of photograph 8-16-00.

PHOTOGRAPH MISSING

Photo 65. View looking downstream towards station # 33. Date of photograph 8-16-00.

PHOTOGRAPH MISSING

Photo 66. View looking upstream of station # 33. Date of photograph 8-16-00.

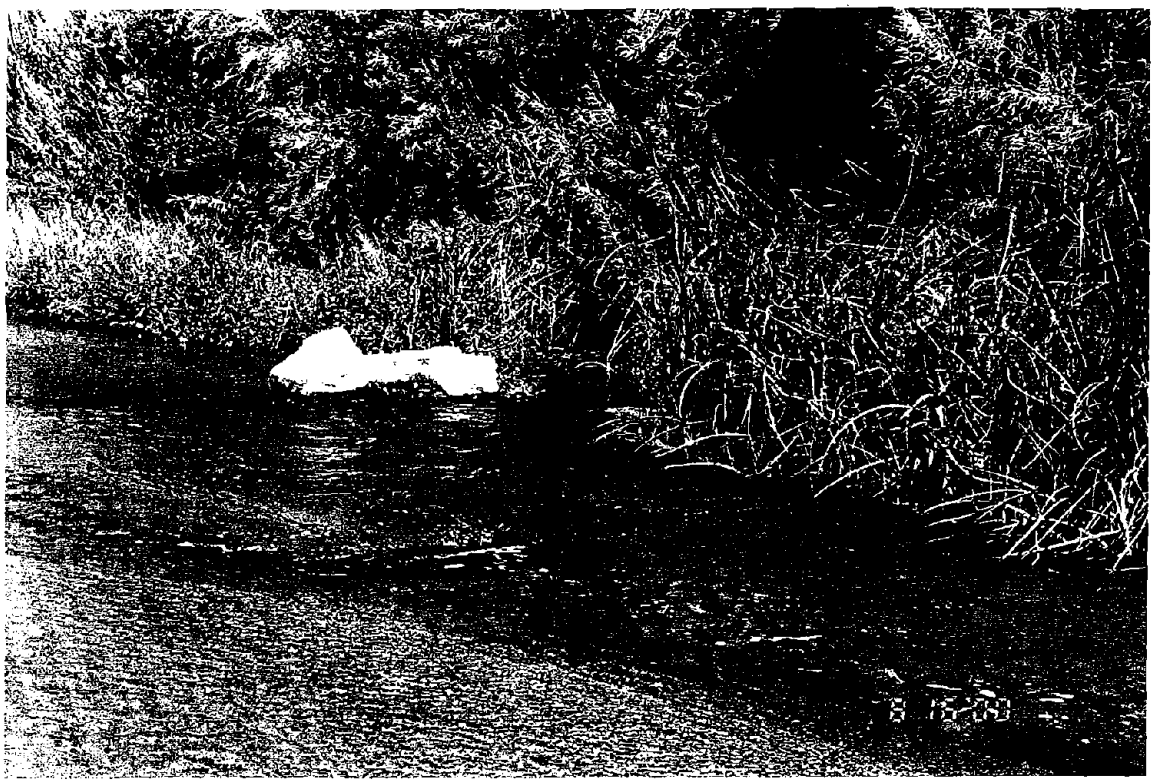


Photo 67. View looking downstream towards station # 34. Date of photograph 8-16-00.

Photo 68. View looking upstream of station # 34. Date of photograph 8-16-00.

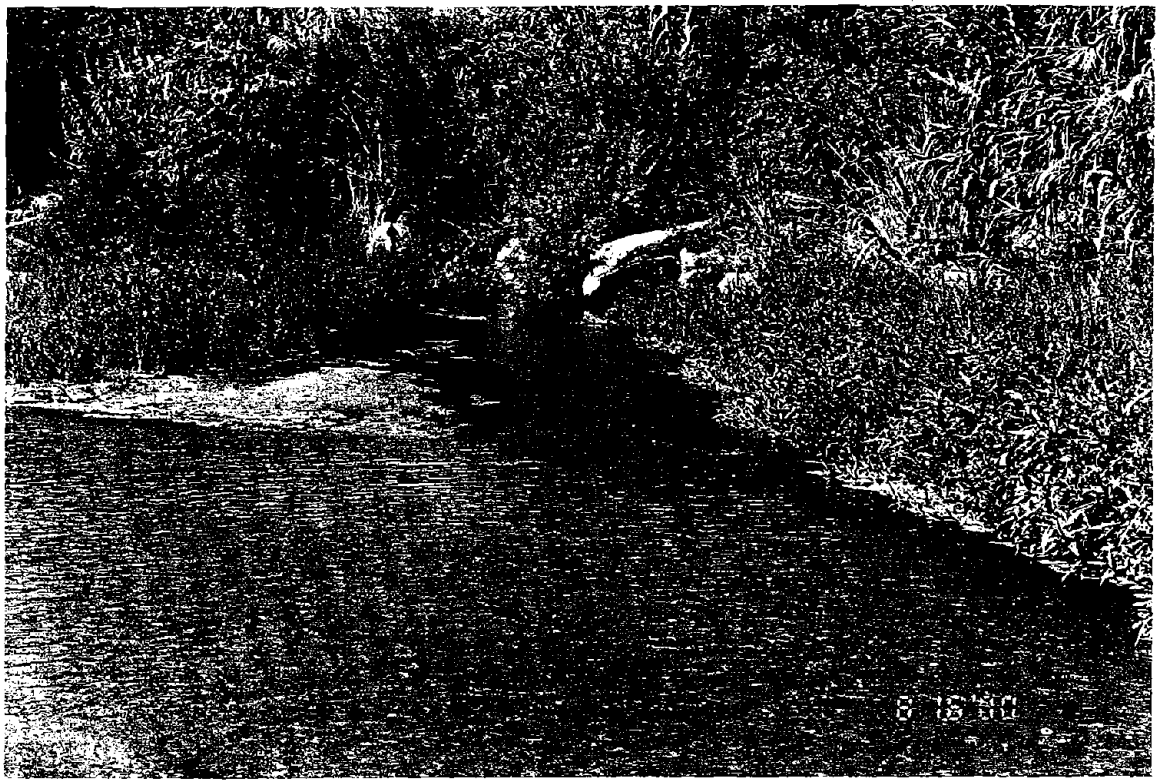


Photo 69. View looking downstream towards station # 35. Date of photograph 8-16-00.

Photo 70. View looking upstream of station # 35. Date of photograph 8-16-00.

Photo 71. View looking downstream towards station # 36. Date of photograph 8-16-00.

Photo 72. View looking upstream of station # 36. Date of photograph 8-16-00.

Photo 73. View looking downstream towards station # 37. Date of photograph 8-16-00.

Photo 74. View looking upstream of station # 37. Date of photograph 8-16-00.

Photo 75. View looking downstream towards station # 38. Date of photograph 8-16-00.

Photo 76. View looking upstream of station # 38. Date of photograph 8-16-00.

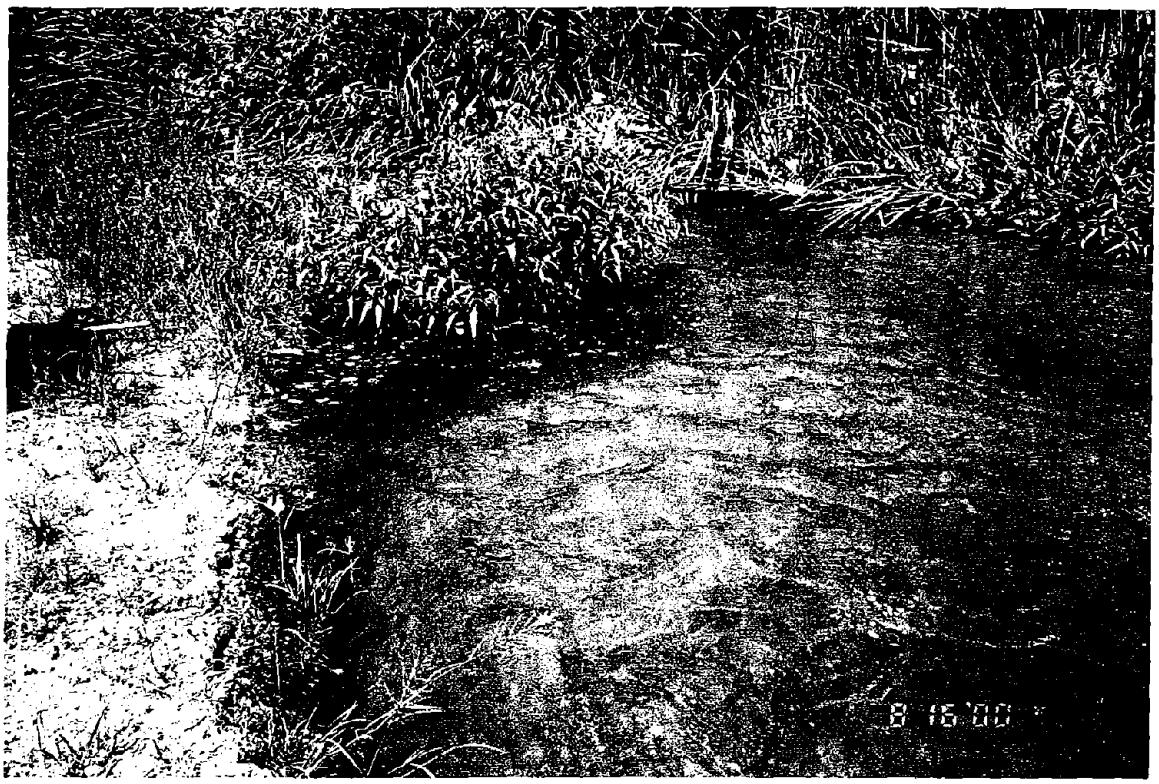


Photo 77. View looking downstream towards station # 39. Date of photograph 8-16-00.

Photo 78. View looking upstream of station # 39. Date of photograph 8-16-00.

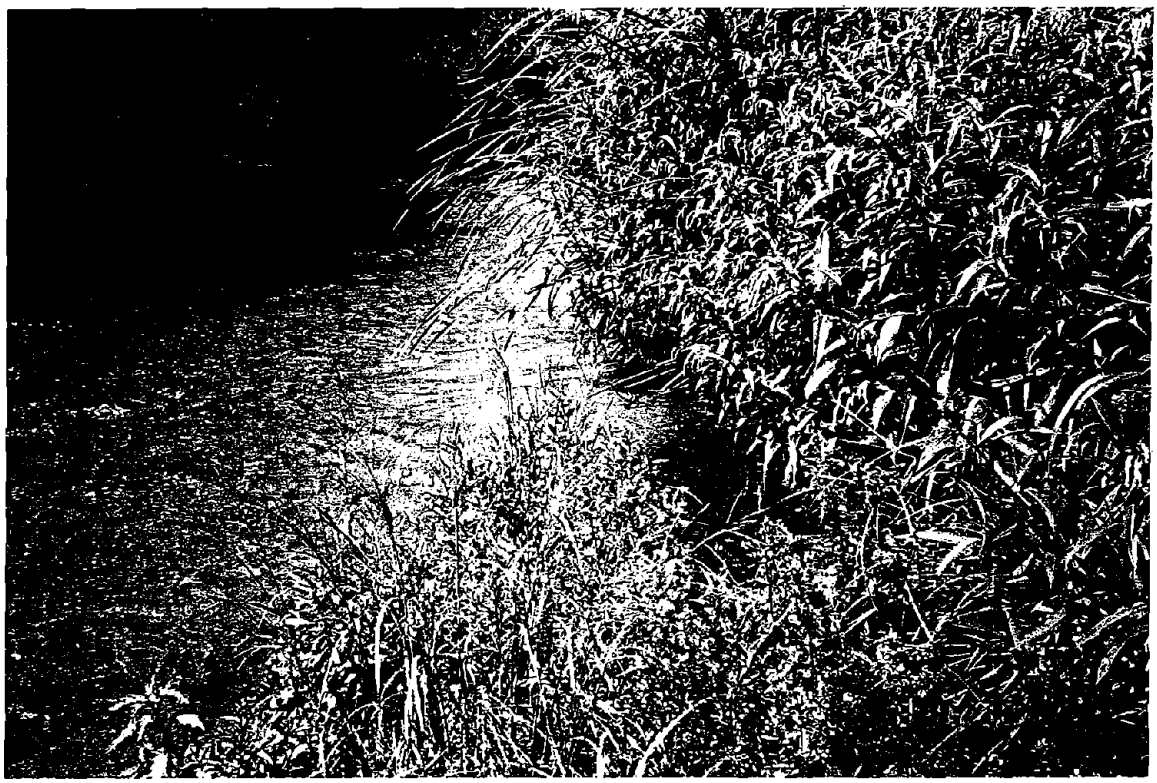


Photo 79. View looking downstream towards station # 40. Date of photograph 8-16-00.

Photo 80. View looking upstream of station # 40. Date of photograph 8-16-00.

Photo 81. View looking downstream towards station # 41. Date of photograph 8-16-00.

Photo 82. View looking upstream of station # 41. Date of photograph 8-16-00.

Photo 83. View looking downstream towards station # 42. Date of photograph 8-16-00.

Photo 84. View looking upstream of station # 42. Date of photograph 8-16-00.

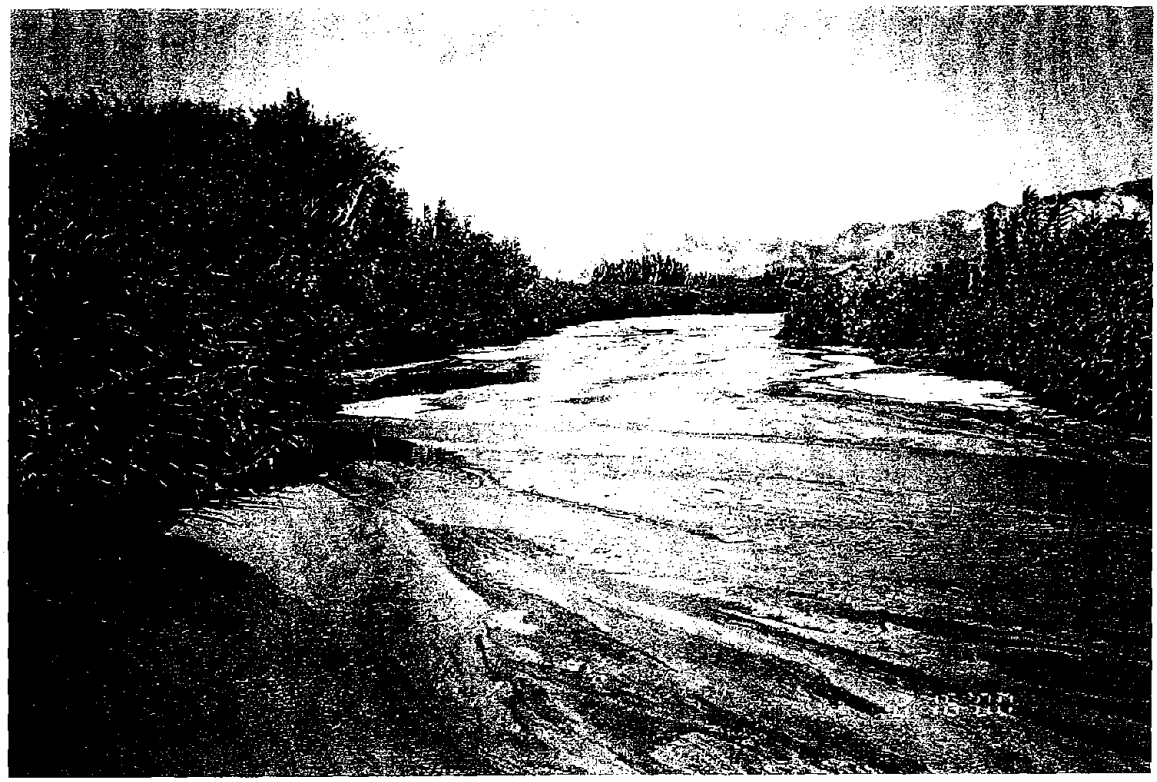


Photo 85. View looking downstream towards station # 43. Date of photograph 8-16-00.

Photo 86. View looking upstream of station # 43. Date of photograph 8-16-00.

Photo 87. View looking downstream towards station # 44. Date of photograph 8-16-00.

Photo 88. View looking upstream of station # 44. Date of photograph 8-16-00.

Photo 89. View looking downstream towards station # 45. Date of photograph 9-7-00.

Photo 90. View looking upstream of station # 45. Date of photograph 9-7-00.

Photo 91. View looking downstream towards station # 46. Date of photograph 9-7-00.

Photo 92. View looking upstream of station # 46. Date of photograph 9-7-00.

PHOTOGRAPH MISSING

Photo 93. View looking downstream towards station # 47. Date of photograph 9-7-00.

PHOTOGRAPH MISSING

Photo 94. View looking upstream of station # 47. Date of photograph 9-7-00.

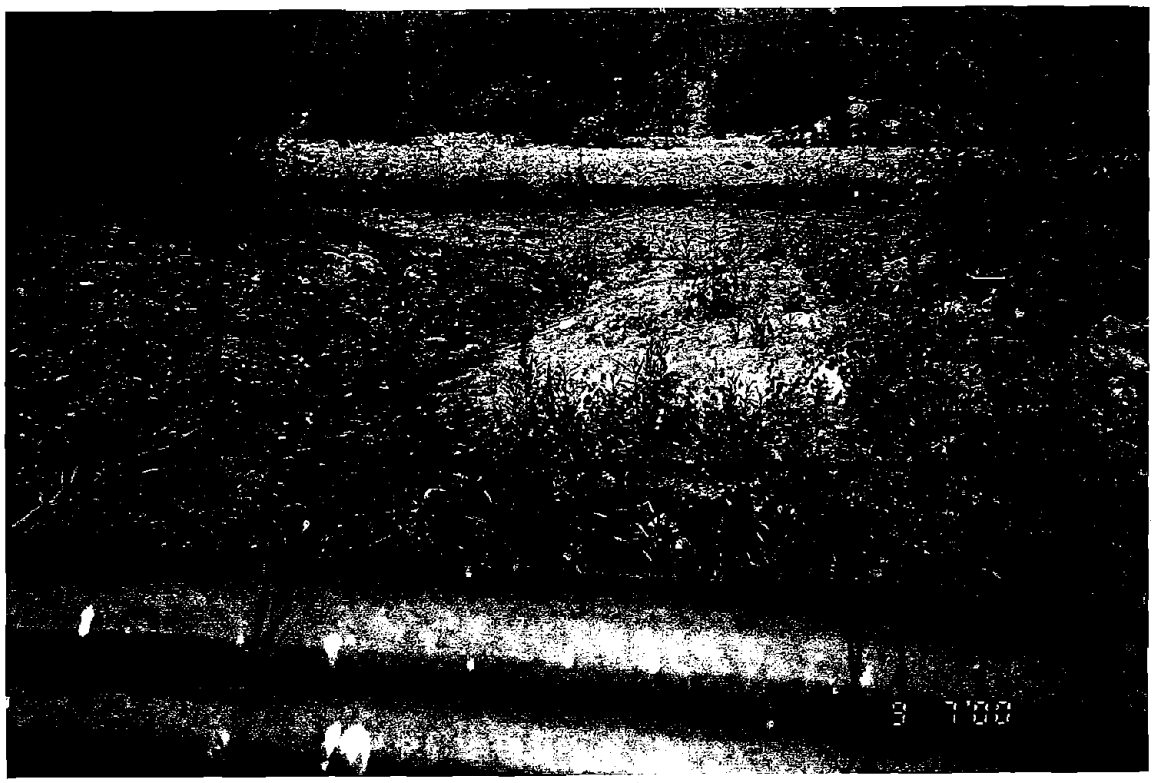


Photo 95. View downstream looking at station #49. Date of photograph 9-7-00.

Photo 96. View looking upstream of station #48. Date of photograph 9-7-00.