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Planning Level Delineation and Geospatial Characterization of Aquatic Resources for San Jacinto and Portions of Santa Margarita Watersheds, Riverside County, California

Robert Lichvar, Gregory Gustina, and Michael Ericsson

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Robert Lichvar, Gregory Gustina, and Michael Ericsson

Cold Regions Research and Engineering Laboratory
72 Lyme Road
Hanover, New Hampshire 03755

Prepared for U.S. Army Engineer District, Los Angeles

Riverside County Flood Control and Water Conservation District

ABSTRACT

A planning level delineation of aquatic resources was performed within the San Jacinto River and portions of Santa Margarita River Watersheds in Riverside County, California. This was the identification of areas that meet both the jurisdictional requirements under Section 404 of the *Clean Water Act* and the California Department of Fish and Game (CDFG) Section 1600 Code at a watershed scale. Although the delineation is highly accurate at the planning level, it is not specific to any one site. Thus, a planning level wetland delineation does not replace the need for a jurisdictional wetland delineation from the Corps of Engineers (COE) permitting program, or the CDFG Section 1600 requirements. As such, this report describes the baseline occurrence of aquatic resources that were observed in these watersheds at the time of the study during the period between August 2001 and May 2002. A total of 16,043 ha (39,643 ac) of aquatic resources in the riparian areas, and 12,701 km (7892 miles) of intermittent streams were delineated as Waters of the United States within both watersheds.

EXECUTIVE SUMMARY

A planning level delineation of aquatic resources was performed within the San Jacinto River and portions of Santa Margarita River Watersheds in Riverside County, California. A planning level delineation is defined here as the identification of areas that meet both the jurisdictional requirements under Section 404 of the *Clean Water Act* and the California Department of Fish and Game (CDFG) Section 1600 Code at a watershed scale. Although the delineation is highly accurate at the planning level, it is not specific to any one site. Thus, a planning level wetland delineation does not replace the need for a jurisdictional wetland delineation from the Corps of Engineers (COE) permitting program, or the CDFG Section 1600 requirements. As such, this report describes the baseline occurrence of aquatic resources that were observed in these watersheds at the time of the study during the period between August 2001 and May 2002.

The modification of standard delineation sampling protocols and the development of wetland ratings for Section 404 regulatory purpose for the riparian vegetation map units allowed for a watershed scale delineation. The sampling protocols outlined in the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987) and 33 CFR 328 were modified for use at the watershed scale. To delineate at this scale, we mapped geomorphic surfaces in the riparian zones representing several different return intervals, which were later interpreted for frequency requirements under Section 404. Individual vegetation units were sampled at 169 sites to develop a characterization of the indicators for both wetlands and other Waters of the United States (WoUS). Wetland decisions were determined by combining the field data for wetland criteria for each separate vegetation map unit with the distribution patterns of vegetation units within the geomorphic surfaces. By combining the wetland indicators with flood frequency information obtained from the geomorphic surface map, we made jurisdictional decisions regarding WoUS, including wetlands across the entire study area.

The vegetation units in the riparian areas were then rated for their probability of meeting the criteria as either wetland or non-wetland WoUS. These ratings resolved the issue that some vegetation units had repeatable characteristics that always meet the criteria of a WoUS, including wetlands, and others were so ecologically diverse that they were able to occur in various landscape positions. By combining field sampling and observations with distribution patterns analyzed within the GIS database, probabilities ratings intended for regulatory purposes were developed to accommodate all variations. Six categories of wetland ratings were assigned to each of the riparian vegetation units, with ratings ranging from always regulated to upland or not regulated.

We delineated a total of 16,043 ha (39,643 ac) of aquatic resources in the riparian areas, and 12,701 km (7892 miles) of intermittent streams as WoUS within both watersheds.

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PREFACE

This report was prepared by Robert Lichvar, Ecologist, Gregory Gustina, Physical Scientist, and Michael Ericsson, Geologist, Remote Sensing /Geographical Information Systems and Water Resources Branch, Cold Regions Research and Engineering Laboratory, U.S. Army Engineer Research and Development Center, Hanover, New Hampshire. Funding was provided by the U.S. Environmental Protection Agency, Riverside County Flood Control and Water Conservation District, and the U.S. Army Engineer District, Los Angeles.

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Commander and Executive Director of ERDC is COL John W. Morris III, EN. Director is Dr. James R. Houston.

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ROBERT LICHVAR, GREGORY GUSTINA, AND MICHAEL ERICSSON

1 INTRODUCTION

1.1 Background

Riverside County Flood Control and Water Conservation District (RCFC), in cooperation with the U.S. Environmental Protection Agency (EPA), recently funded an effort to inventory and map the aquatic resources within the San Jacinto and portions of Santa Margarita River watersheds, Riverside County, California. This effort is being undertaken as part of the Corps of Engineers' Special Management Plan (SAMP) for the Western Riverside County. By combining on-site mapping efforts for vegetation and hydrogeomorphic surfaces with detailed field sampling, we were able to develop a large area wetland planning level delineation for the watershed. Our report provides support to Riverside County and other stakeholders on locations of aquatic resources and their regulatory status (under Section 404 of the *Clean Water Act*) that will be useful for the large area future assessment of impacts to aquatic resources in the watershed. Specifically, it provides information necessary to identify and characterize regulated Waters of the United States (WoUS), including wetlands, in the context of Section 404 permit review. In addition, the planning level delineation of aquatic resources provides a comprehensive mapping of aquatic resources regulated under California Department of Fish and Game's Section 1600 program. (Appendix A contains definition of terms helpful for understanding this report.)

The planning level delineation also supports, in part, a concurrent functional assessment of landscape level aquatic resources for the both watersheds. Because of the ecological breadth of these studies, no effort was made to distinguish between those areas that may or may not be isolated wetlands. Additionally, to establish whether an aquatic resource is an "isolated wetland" requires an effort that exceeds the intent and scope of this study. All jurisdictional limits under

Section 404 for WoUS, including wetlands identified in this report, will be made by the U.S. Army Engineer District, Los Angeles, Regulatory Branch.

1.2 Objectives

The overall objective of this project was to conduct a planning level delineation and geospatial characterization of aquatic resources in the San Jacinto River and portions of the Santa Margarita River watersheds under current conditions to provide a baseline for further evaluation. Following the delineation, a functional assessment of the ecosystems will be done. In turn, the assessment will be used to evaluate the potential impacts of future development projects on the aquatic resources in the watersheds. A similar project has been completed for both the San Diego Creek Watershed (Smith 2000b) and the San Juan Creek and portions of the San Mateo River Watersheds (Smith 2000a) in Orange County.

Five specific tasks were identified to meet the overall project objective. The first was to identify aquatic resources at a planning level within the boundaries of San Jacinto River and parts of Santa Margarita River* watersheds through the interpretation of orthophoto quadrangles and stereoscopic aerial photography.

The second task was to verify the jurisdictional status and location of identified aquatic resources using sampling and global positioning system (GPS) techniques at a representative numbers of field locations.

The third task, to produce a planning level map of aquatic resources, including jurisdictional WoUS, provided a tool for the visualization of these resources within an ArcINFO or ArcView based geographical information system (GIS). These data were used for the fourth task, which was to develop a GIS database of riparian ecosystem and watershed characteristics.

The fifth and final task was to characterize aquatic resources, including data about the occurrence of the resources as well as digital coverages to support a concurrent assessment of landscape level wetland functions within the watersheds.

The overall purpose of this study is to identify aquatic resources in the San Jacinto River and Santa Margarita River watersheds in western Riverside County as part of the Special Area Management Plan (SAMP) currently underway in this region. The SAMPs are comprehensive aquatic resource planning efforts in the context of Section 404 of the *Clean Water Act*. The ultimate goal of the SAMP is to provide a management tool whereby a balance is reached between protection of aquatic resources and reasonable economic development. The U.S. Army

* References to Santa Margarita River Watershed include those within the study area.

Corps of Engineers, Los Angeles District, is leading the development of the SAMP in western Riverside County, California. The Riverside County Flood Control District, representing the County of Riverside, is the local stakeholder in developing of the SAMP. The aquatic resource delineation will be used as the basis for identifying the resources regulated under Section 404. Additional studies are currently underway to characterize the aquatic resources in terms of hydrological, habitat, and water quality functions.

2 STUDY AREA

The San Jacinto River and Santa Margarita River watersheds together encompass approximately 36,1953 ha (894,405 ac) located 12 km (7.5 miles) east of the city of Riverside in Riverside County, California. The cities of Perris and Murrietta are located on the western side of the watersheds. Several other communities are located within or near the San Jacinto watershed, including Moreno Valley, Sun City, Wildomar, San Jacinto, and Hemet. The watersheds are bounded by the Cleveland National Forest on the west and south, and the San Bernardino National Forest to the northeast (Fig. 1). The southern boundary of the study area was limited to the border of Riverside County and did not cross into San Diego County. However, in some instances, those subwatersheds draining from San Diego County into Riverside County were inventoried and mapped because they influence the riparian wetlands and flooding within Riverside County.

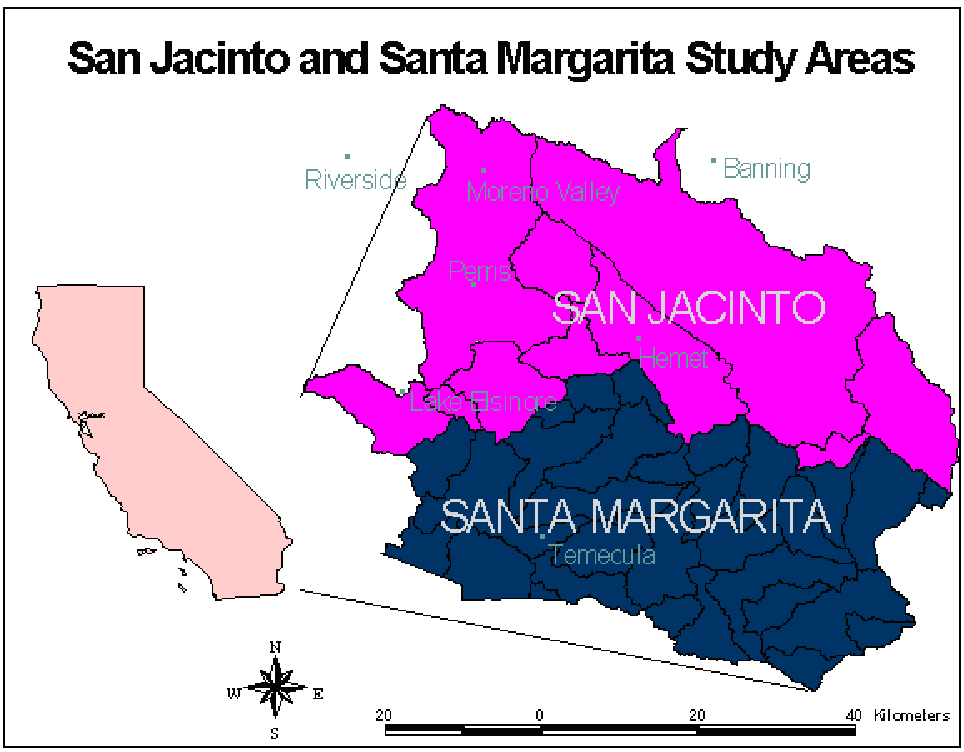

Figure 1. Study area site and location map.

2.1 Climate

The climate for the study area ranges considerably in response to distance from the ocean and elevation changes. In general, the regional climate in the San Jacinto and Santa Margarita watersheds is characterized by warm, dry summers and mild, wet winters. Precipitation averages approximately 30 cm (12 in.) per year in lower elevations to 66 cm (26 in.) in higher elevations and is associated with low-intensity storms in the winter and spring. In lower elevations, frosts are light and infrequent, with the growing season ranging from 345 to 360 days. In higher elevation areas in the San Jacinto Mountains, frosts can occur much more frequently, with average lows below freezing from November to March. For valley areas, the average annual temperature is about 18°C (64°F), the average annual high is 27°C (81°F), and the average annual low is 8°C (47°F). For high mountain areas, the average annual temperature is about 12°C (53°F), the average annual high is 20°C (68°F), and the average annual low is 3°C (37°F).

The major influences on the regional climate are the Eastern Pacific High, a strong, persistent anticyclone, and the moderating effects of the cool Pacific Ocean (USACE 2000). During summer, the Eastern Pacific High blocks storm systems originating in the Gulf of Alaska and produces a temperature inversion that traps air pollutants near the earth's surface. Temperature inversions, combined with photochemical smog produced from emitted pollutants exposed to conditions of intense sun, have resulted in relatively poor air quality throughout the Los Angeles basin. Cool marine air condenses into fog and stratus clouds below the inversion layer during the evening but dissipates the following morning as the land warms. Onshore air flows, associated with low-pressure systems over the inland desert, are normal conditions, whereas precipitation associated with tropical air masses during the summer is generally infrequent and unsubstantial.

During winter, polar storm systems begin to pass through the area as the Eastern Pacific High weakens and shifts south. Most regional precipitation occurs during this period. Excessive rain can fall when the jet stream maintains a position over southern California and carries multiple storms across the region. Major flooding events for this region typically occur December to March and have been documented for the following years during the 20th century: 1910, 1916, 1937, 1938, 1943, 1969, 1978, 1980, 1983, 1993, 1995, and 1998. A strong northeastern wind prevalent in the fall, called the "Santa Ana's," can ventilate the basin, preventing the easterly buildup of air pollutants. In winter, photochemical smog exists at decreased atmospheric concentrations because of the shorter daylight duration and the absence of temperature inversions.

2.2 Regional Geology

The San Jacinto and Santa Margarita watersheds lie in the eastern portion of the Santa Ana Quadrangle described by Morton (1999) for the U.S. Geological Service (USGS) as follows:

> The Santa Ana Quadrangle is in the northern part of the Peninsular Ranges Province as defined by Jahns (1954), except for the northeast corner, which is underlain by basement rocks of the Transverse Ranges Province. A summary of the general geology of the Peninsular Ranges Province is given by Jahns (1954) and a generalized geologic map of this part of the Peninsular Ranges Province is given by Rogers (1965).

Physiographically, the northern part of the Peninsular Ranges Province is divided into three major, fault-bounded blocks—the Santa Ana, Perris, and San Jacinto. The Santa Ana block is the westernmost of the three, extending eastward from the coast to the Elsinore fault zone.

East of the Santa Ana block and west of the San Jacinto fault zone is the Perris block, a roughly rectangular area of relatively low relief that has remained relatively stable and undeformed during the Neogene. The Perris block is underlain by lithologically diverse prebatholithic metasedimentary rocks intruded by plutons of the Cretaceous Peninsular Ranges batholith. Supra-batholithic volcanic rocks are preserved in the western part of the block. Several erosional and depositional surfaces are developed on the Perris block (e.g., Dudley 1936, Woodford et al. 1971), and thin to relatively thick sections of non-marine, mainly Quaternary sediments discontinuously cover the basement. The older surfaces are of probable Paleogene age and there is suggestive evidence that Paleogene sedimentary deposits once covered at least the western part of the block.

The San Jacinto block lies east of the Perris block, but only the northern part of it extends into the Santa Ana quadrangle. A thick section of Miocene through Pleistocene non-marine sedimentary rocks underlies most of the northern San Jacinto block, allowing limited granitic and metamorphic rocks to show through only in the southern part of the quadrangle.

2.3 Soils

The soils of primary interest for this study are those developed in riparian areas and active floodplains. The majority of these floodplain soils are classified as Entisols and are poorly developed. The USDA (1978) soil survey for Orange County and the western portions of Riverside County describes the soils along the streambeds as somewhat excessively drained to poorly drained, nearly level to moderately sloping soils on alluvial fans and floodplains and in basins of the coastal plains. Floodplain soils are young and are mainly composed of silt loam and silty clay loam alluvial deposits. In terrace locations in the floodplain, where fine silts and organic material have accumulated for years, the soils have developed horizons within the soil profile.

The floodplain is dominated by the Riverwash map unit (Rm), which is located in intermittent stream channels and in floodplains with slopes of 0–8% (USDA 1978). This floodplain soil unit is composed of soil that has developed on alluvium and is moderately well drained to excessively drained. In the upper reaches of the watersheds, another land type, Stony land (SvE), is commonly associated with smaller reach bottoms. Stones, rocks, or boulders located on the soil surface typically dominated this map unit. In our study area, this soil was usually located on the terrace where the flood return interval is 10–100 years.

Outside of the floodplains are a variety of soil associations that are used to describe alluvial fans, slopes of both fine and cobbly materials, and other sandstone, shale, metavolcanic, and sedimentary formations.

The digital soil maps for the study area were developed as a STATSGO coverage (Fig. 2). STATSGO is a digitally generated soil map developed by the National Cooperative Soil Survey. It consists of a broad-based inventory of soils and non-soil areas that occur in a repeatable pattern on the landscape and that can be cartographically shown at 1:250,000 scale. The soil maps for STATSGO are compiled by generalizing more detailed soil survey maps. Where more detailed soil survey maps are not available, data on geology, topography, vegetation, and climate are assembled, together with Land Remote Sensing Satellite (LANDSAT) images. Soils of like areas are studied, and the probable classification and extent of the soils are determined. Map unit composition for a STATSGO map is determined by transecting or sampling areas on the more detailed maps and expanding the data statistically to characterize the whole map unit (Table 1, USDA 1994).

The STATSGO soil map units provides another level of soil description for large scale map units in Riverside County. For example, floodplains along the San Jacinto mapped as alkali plains correspond to the NRCS Willows soil series (Fig. 2). The Willows soil series within the San Jacinto watershed formed on the nearly level valley floor in fine-textured alluvium. Because of the very low slopes and soil texture, the soils are poorly drained, runoff is slow, and infiltration is very slow. The soils have cracks more than 1 mm wide to a depth of 50 cm (20 in.) or more and the cracks remain open through summer and autumn (unless irrigated) and are closed during winter and spring. Exchangeable sodium content is greater than 15% within 100 cm (40 in.) of the surface. The A horizon ranges from clay to silty clay. The A horizon is slightly acid to very strongly alkaline and, except where the soil has been plowed and mixed, is least acid at the surface and increases sharply as depth increases. The B horizons are clay or silty clay to a depth of 100 cm (40 in.) or more. Reaction is usually strongly alkaline and the pH ranges from a little less than 8.5 to a little more than 9.0. All parts are weakly to strongly calcareous and usually calcium carbonate concretions are in the upper part. Gypsum or salt crystals or both are common (USDA, NRCS 2001). This level of characterization is therefore available for all STATSGO map units.

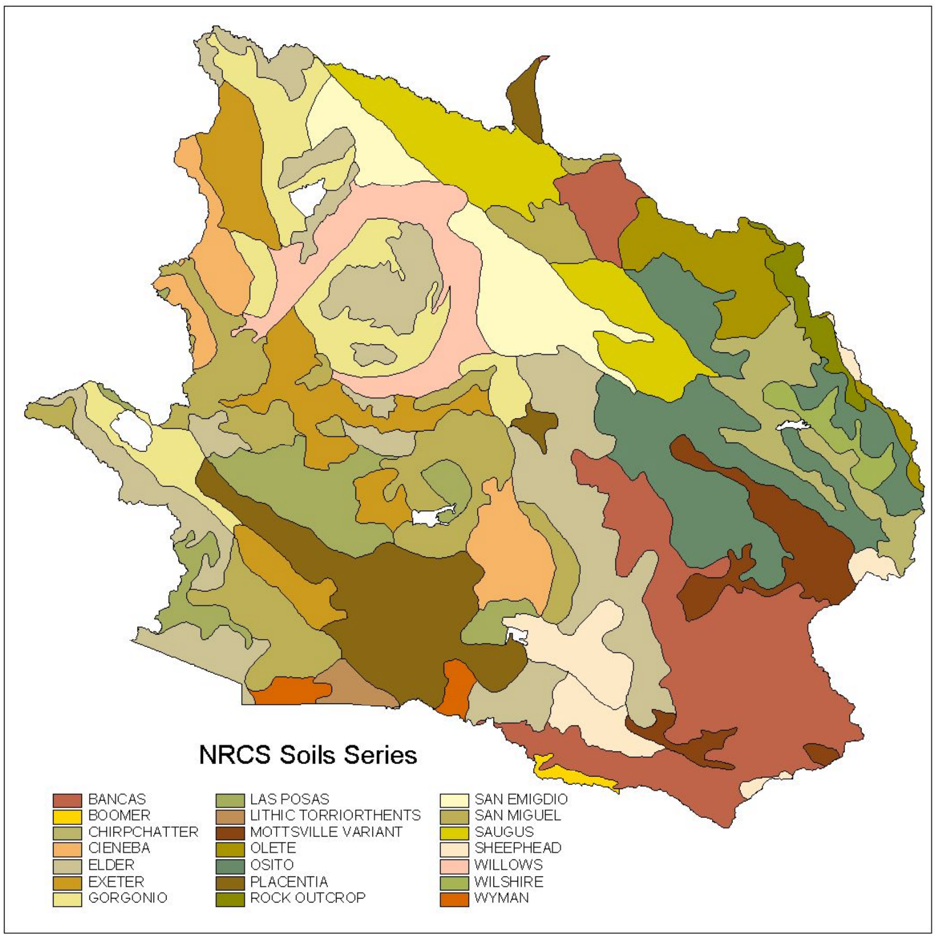

Figure 2. STATSGO soils map for San Jacinto and San Margarita watersheds (USDA 1994).

Table 1. STATSGO map units for study area. (Descriptions are NRCS official soil series descriptions [USDA, NRCS 2001].)

Soil series	Description
Bancas	The Bancas series consists of moderately deep, well drained soils formed in residuum weathered from rock. Bancas soils are on steep uplands and have slopes of ------ percent. 46 cm (18 in.) to 76 cm (30 in.) and the mean annual temperature is about 13 to 14ºC (56 to 58ºF).
Boomer	The Boomer series consists of deep and very deep, well drained soils that formed in material weathered from metavolcanic rock. These soils are on uplands. Slopes ranges from 2 to 75%. The mean annual precipitation is about 114 cm (45 in.) and the mean annual temperature is about 13ºC (55ºF).
Chirpchatter	The Chirpchatter series consists of very deep, well drained soils formed in material weatered from volcanic ash. They are on hills, plateaus, hill toeslopes, and fan terraces. Slopes range from 2 to 50%. Mean annual temperature is about 8ºC (47ºF) and mean annual precipitation is about 53 cm (21 in.).
Cieneba	The Cieneba series consists of very shallow and shallow, somewhat excessively drained soils that formed in material weathered from granitic rock. Cieneba soils are on uplands and have slopes of 9 to 85%. The mean annual precipitation is about 64 cm (25 in.) and the mean annual air temperature is about 16ºC (60ºF).
Elder	The Elder series consists of very deep and deep, well drained soils that formed in alluvial material derived from mixed rock sources. Elder soils are on alluvial fans and in floodplains and have slopes of 0 to 15%. The mean annual precipitation is about 51 cm (20 in.) and the mean annual air temperature is about 14ºC (58ºF).
Exeter	The Exeter series consists of moderately deep to a duripan, moderately well drained soils that formed in alluvium mainly from granitic sources. Exeter soils are on alluvial fans and stream terraces and have slopes of 0 to 9%. The mean annual precipitation is about 28 cm (11 in.) and the mean annual air temperature is about 18ºC (64ºF).
Gorgonio	Typically, Gorgonio soils have dark grayish brown and brown, gravelly loamy fine sand, slightly and medium acid A horizons and brown, somewhat stratified; medium acid, gravelly loamy sand C horizons.
Las Posas	The Las Posas series consists of moderately deep, well drained soils that formed in material weathered from basic igneous rocks. Las Posas soils are on mountainous uplands and have slopes of 5 to 50%. The mean annual precipitation is about 41 cm (16 in.) and the mean annual air temperature is about 17ºC (62ºF).
Mottsville Variant	No Description Available
Olete	Typically, Olete soils have dark reddish brown and dusky red very gravelly silt loam B horizons, weak red very stony silt loam C horizons, and basalt bedrock at depth of about 61 cm (24 in.).
Osito	The Osito series consists of shallow, well drained soils formed in material weathered from interbedded sandstone and shale. Osito soils are on uplands and have slopes of 15 to 70%. Mean annval precipitation is 43 cm (17 in.) and mean annual temperature is 14ºC (58ºF).
Placentia	The Placentia series is a member of the fine, montmorillonitic, thermic family of Typic Natrixeralfs. Typically, Placentia soils have brown, medium acid, sandy loam A horizons, dark reddish brown, clay and heavy sandy clay loam B2t horizons with prismatic structure in the upper part and strong brown, gravelly sandy loam C horizons.

Soil series	Description
Rock Outcrop	No Description Available
San Emigdio	The San Emigdio series consists of very deep, well drained soils that formed in dominantly sedimentary alluvium. San Emigdio soils are on fans and floodplains and have slopes of 0 to 15%. The mean annual precipitation is about 38 cm (15 in.) and the mean annual air temperature is about 17ºC (62ºF).
San Miguel	The San Miguel soils have light yellowish brown, medium acid, silt loam A1 horizons, very pale brown, strongly acid, silt loam A2 horizons, strong brown and yellowish brown, strongly and very strongly acid, clay and gravelly clay B2t horizons over hard metavolcanic bedrock at a depth of 58 cm (23 in.).
Saugus	The Saugus series consists of deep, well drained soils that formed from weakly consolidated sediments. Saugus soils are on dissected terraces and foothills and have slopes of 9 to 50%. The mean annual precipitation is about 41 cm (16 in.) and the mean annual air temperature is about 17ºC (63ºF).
Sheephead	The Sheephead series consists of shallow, somewhat excessively drained soils that formed in material weathered from mica, schist, gneiss, or granite. Sheephead soils are on mountainous uplands and have slopes of 9 to 75%. The mean annual precipitation is about 76 cm (30 in.) and the mean annual temperature is about 14ºC (57ºF).
Willows	The Willows series consists of very deep, poorly to very poorly drained sodic soils formed in alluvium from mixed rock sources. Willows soils are in basins. Slope ranges from 0 to 2%. The mean annual precipitation is about 41 cm (16 in.) and the mean annual temperature is about 16ºC (60ºF).
Wilshire	The Wilshire series consists of deep, somewhat excessively drained soils formed in mixed alluvium derived from granitic and metamorphic rocks. Wilshire soils are on floodplains and alluvial fans. Slopes range from 2 to 10%. The mean annual precipitation is 64 cm (25 in.) and the mean annual temperature is 13ºC (55ºF).
Wyman	The Wyman series consists of deep, well drained soils that formed in alluvium from andesitic and basaltic rocks. Wyman soils are on nearly level to strongly sloping terraces and alluvial fans and have slopes of 0 to 15%. The mean annual precipitation is about 30 cm (12 in.) and the mean annual air temperature is about 17ºC (62ºF).

2.4 Topography

Elevations range from 366 m (1200 ft) at Lake Elsinore and the lower end of the Santa Margarita River in Riverside County to 3296 m (10,814 ft) on San Jacinto Peak on the northeast side of the San Jacinto watershed. The terrain includes rugged mountains, steep-walled canyons, and gently sloping floodplains. The western part of the watershed is composed of coastal foothills and canyons with moderate to steep slopes. The eastern section changes from a relatively flat valley to high mountain peaks with deeply incised canyons.

2.5 Riparian Vegetation Communities

The riparian vegetation is one of the most dynamic vegetation communities within the watershed. The dramatic changes in vegetation patterns over short time scales are a result of periodic cycles of destruction and regrowth from flooding events and human disturbance. As a result of these disturbances, the ability of riparian vegetation to have "pure stands" or "climax" vegetation is limited in these dynamic environments. The natural events caused by periodic flooding can quickly change the distribution and species composition and reset the disturbance–recovery cycle. Additionally, land development within parts of some watersheds has modified the potential of the natural vegetation to reestablish itself after flooding events. These disturbances have modified watercourse directions, altered silt loads, and have affected areas such that they may retain water for longer periods than previously. Increased surface runoff from paved parking lots and other developed areas has resulted in impacts to willow forests and ponds. Finally, most of the major native riparian vegetated areas located within the lower elevation portions of the watershed have been eliminated and replaced by concrete-lined flood control structures.

2.6 Subwatersheds

The San Jacinto watershed encompasses two eight-digit USGS Hydrologic Units (HUs). These are San Jacinto and San Margarita. The 198,228 ha (489,832 ac) of the San Jacinto HU has been further divided into 10 units using the State of California classification and database (California Department of Forestry and Fire Protection's Fire and Resource Assessment Program [FRAP] 1999). In that classification, which we adopted (Table 2), FRAP provides a standard nested watershed delineation scheme using the State Water Resources Control Board numbering method. The hierarchy of watershed designations consists of six levels of increasing specificity: Hydrologic Region (HR), Hydrologic Unit (HU) (equal to the USGS eight-digit HU), Hydrologic Area (HA), Hydrologic Sub-Area (HSA), Super Planning Watershed (SPWS), and Planning Watershed (PWS). The San Jacinto watershed drains in an arc from the southeast to the southwest ending at Lake Elsinore, which can discharge water when the elevation reaches 383 m (1255 ft). The main drainage is the San Jacinto River, with numerous tributaries arising in the San Jacinto Mountains to the east. Lake Hemet, San Jacinto Reservoir, Perris Reservoir, and Canyon Lake are artificial impoundments within the watershed. The small number of HUs with large land area indicates less topographic complexity, with high mountains and low-gradient valleys.

In contrast to the San Jacinto, the relevant portions of the Santa Margarita watershed covered 164,020 ha (405,302 ac) across 30 HSs. Thus, topography is generally more complex within the Santa Margarita drainage than within the San Jacinto. The watershed drains from east to the southwest and empties through the Santa Margarita River into the Pacific Ocean at Camp Pendleton. Other tributaries contributing to the Santa Margarita River are Murrieta Creek, Temecula

Creek, Tucalota Creek, and Cahuilla Creek. Other artificial impoundments in the watershed are Vail Lake, Skinner Reservoir, and Diamond Valley Lake.

Table 2. Hydrologic Unit (HU) and Hydrologic Sub-Area (HSA) name and size.

Name	Hectares	Acres
San Jacinto Watershed	**198,225**	**489,852**
Bautista	2,564	6,337
Elsinore	10,404	25,728
Gilman Hot Springs	78,282	193,439
Hemet	20,071	49,597
Hemet Lake	17,022	42,061
Lakeview	8,402	20,762
Menifee	10,458	25,843
Perris Valley	43,045	106,367
Railroad	2,021	4,994
Winchester	5,954	14,724
Santa Margarita Watershed	**164,020**	**447,040**
Anza	10,012	24,740
Bachelor Mountain	8,766	21,662
Burnt	942	2,327
Chihuahua	2,307	5,700
Deluz Creek	3,986	37,928
Devils Hole	2,419	5,977
Diamond	2,864	7,076
Dodge	2,893	7,148
Domenigoni	2,652	6,554
French	8,364	20,668
Gavilan	7,825	28,932
Gertrudis	8,383	20,714
Lancaster Valley	5,842	14,435
Lewis	4,023	9,942
Lower Coahuila	5,360	13,246
Lower Culp	3,814	9,425
Lower Domenigoni	1,274	3,148
Lower Tucalota	2,723	6,730
Murrieta	12,999	32,121
Pauba	6,968	17,218
Previtt Canyon	10,568	26,115

Name	Hectares	Acres
Redec	5,240	12,948
Reed Valley	6,262	15,474
Tucalota	3,915	9,675
Tule Creek	9,408	23,247
Upper Coahuila	4,543	11,226
Vail	8,664	21,408
Vallecitos	474	6,054
Wildomar	5,303	13,103
Wolf	4,937	12,199
Total	**361,953**	**936,892**

2.7 Streams and Riparian Ecosystems

Streams within the study area fall into several of the Rosgen (1996) stream classes. Ephemeral and some intermittent and first order streams fall into the "A3-4" stream type, which is characterized as steep, entrenched, cascading step/pool streams often in sand and gravel or bedrock and boulder-dominated channels.

More typically in these watersheds, ephemeral and intermittent streams fall into the higher gradient areas (2–6% slopes) in "B4" or "B5" stream types with sand and gravel substrates. Second and third order streams are typically of the "C3-4" stream type, with slopes mostly less than 2% and cobble, gravel, or sandy substrates. Fourth, fifth, and sixth order streams are of the braided channel "D3-5" stream types with slopes less than 2%.

Associated with the higher order streams are riparian ecosystems. Based on the work of Richards (1982), Harris (1987), Kovalchik and Chitwood (1990), Gregory et al. (1991), Malanson (1995), and Goodwin et al. (1997), riparian ecosystems were defined as the relatively narrow ecotones that exist between the bankfull channel of alluvial streams and adjacent upland habitat. The riparian ecosystem consists of two distinct parts or zones, although either may be absent under certain circumstances, i.e., in narrow canyons. The first zone is that portion of riparian ecosystems flooded by surface water from the stream channel at least every 2 to 10 years. Throughout this report, we refer to this part of the riparian ecosystem as active floodplain or Riparian Zone 1 (Fig. 3).

The second zone of the riparian ecosystem consists of abandoned floodplains and terraces formed by fluvial processes operating under different climatic or hydrologic regimes. Under current climatic and hydrologic conditions, these areas experience episodic flooding during larger magnitude events (Dunne and

Leopold 1978). This part of the riparian ecosystem is referred to as terrace or Riparian Zone II (Fig. 3).

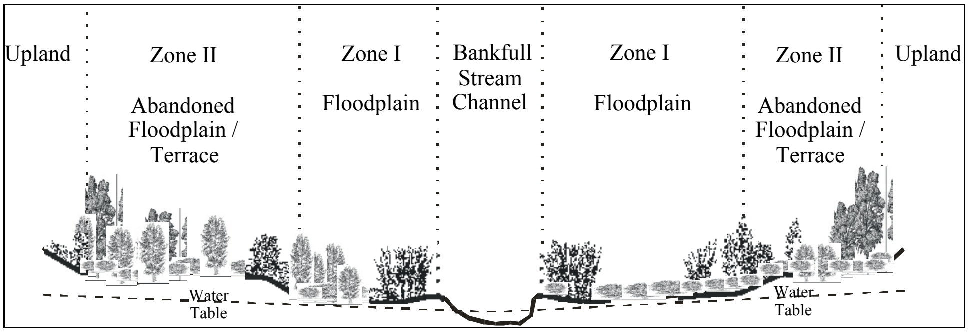

Figure 3. Cross-section depicting hydrogeomorphic floodplain surfaces.

3 DEFINITIONS

3.1 Riparian Ecosystems

Riparian areas, which typically border rivers and streams, link landscapes together by serving as corridors through which water, materials, and organisms move. In arid regions, riparian ecoystems are critical to maintaining regional biodiversity because they provide habitat for a disproportionately large number of species, despite their limited area. Riparian areas typically include a zone of frequent flooding (bankfull) that is regulated under existing federal and state law, as well as a less frequently flooded transition zone between these areas and adjacent uplands (active floodplain to floodplain terrace). Although they contribute greatly to the habitat, hydrological, and biogeochemical functions performed by riparian areas, transition zones vary in their regulatory status: some portions are regulated as WoUS (including wetlands), while others are non-regulated uplands. In this planning level delineation and characterization, we identified all the units, rather than only the jurisdictional areas, because they constitute the functional riparian ecosystem.

3.2 Waters of the United States

Waters of the United States (WoUS) are regulated under Section 404 of the *Clean Water Act* (CWA). The areas delineated as WoUS in this study met the requirements outlined in the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987), subsequent guidance from the Office of the Chief of Engineers (1992, 1995), and 33 CFR 329.11(a)(1–7). These areas include the following:

> …1) all waters that are currently used, or were in the past, for interstate or foreign commerce, including all waters that are subject to the ebb or flow of the tide; 2) all interstate waters including interstate wetlands; 3) all other waters such as intrastate lakes, rivers, streams, (including intermittent streams), mud flats, sandbars, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds; 4) all impoundments of waters otherwise defined as waters of the United States; 5) tributaries of waters identified in numbers 1–4 above; 6) the territorial seas; and 7) wetlands adjacent to waters listed in 1–6 above.

All surface waters within the study area boundary were considered WoUS, including ephemeral and intermittent tributaries, intermittent streams, ponds, lakes, and reservoirs. Furthermore, there was an attempt made to include all other waters, regardless of whether they would be considered isolated or connected to navigable waters.

3.3 Ordinary High Water Mark

The jurisdictional limits of streams are defined by using the "ordinary high water mark" (OHW). The OHW is defined at 33 CFR 328.3(e) as

> ... that line on the shore established by fluctuations of water and indicated by physical characteristics such as clear, natural lines impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area.

Additionally, seasonal wetlands, as described in the Corps of Engineers *Wetland Delineation Manual*, are where "... water in a depression (is) ... sufficiently persistent to exhibit an ordinary high-water mark or the presence of wetland characteristics."

The regulated waters under Section 404 of the CWA delineated in this study include ephemeral, intermittent, and perennial tributaries, which may or may not include riverine wetlands. The isolated depressions and parts of the riverine system were determined to be wetlands because they met the three parameter criteria. The intermittent stream and some portions of the perennial streams were treated as WoUS.

3.4 Wetlands

Wetlands are one of six types of special aquatic sites regulated as WoUS under Section 404 of CWA (40 CFR 230); sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes make up the other types of special aquatic sites granted special consideration under Section 404(b)(1) guidelines. Wetlands are defined as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3(b)). The methodology for delineating the boundaries of jurisdictional wetlands, using hydrologic, hydrophytic vegetation, and hydric soil criteria, is outlined in the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987).

Although "wetlands" are WoUS, throughout this report we will follow the common convention of distinguishing between wetlands and non-wetland WoUS. The term "wetland" will refer to regulated WoUS that meet the hydrologic, hydrophytic vegetation, and hydric soils criteria outlined in the Corps of

Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987). The term non-wetland WoUS will refer to non-wetland waters regulated under Section 404 of the CWA.

4 METHODS

4.1 Delineation of Aquatic Resources

Aquatic resources were identified using a high-precision, planning-level delineation approach, which is a modified version of the sampling methods outlined in the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987) and 33 CFR 328, that was applied at a watershed scale. The delineation approach allowed different types of regulated wetlands and non-wetland WoUS to be identified over a large area. While the approach provided a high-quality map of jurisdictional WoUS suitable for use in project planning, the planning level delineation does not serve as a substitute for the on-site jurisdictional delineation conducted as part of the Section 404 permit review process.

4.2 Identification of Aquatic Resources

Delineation geospatial databases were developed with an iterative process, combining both field and laboratory efforts. Aquatic resources were initially identified by interpretation of color infrared digital orthoquads (DOQs) imagery obtained from the USGS (via the Internet). Using DOQs at a scale of 1:4800 with a minimum mapping unit size of approximately 405 m^2 (0.1 ac), we delineated riparian vegetation resources in the field and labeled the resources using a modified Holland (1986) classification for California vegetation. Vegetation units were digitized in the field using the DOQs and ArcView geographic information system (GIS) software on a Fujitsu 3500 Stylistic pen tablet computer. Other landscape features in electronic format used for digitizing included contours (at a scale of 1:24,000 at the 10-ft (3-m) contour interval), vegetation communities, hydrology, soils, and major roads that were obtained from Riverside County. A list of the riparian vegetation and other map unit types is provided in Appendix B.

The same sources of information mentioned above were used to develop a GIS coverage of the hydrogeomorphic surfaces within the riparian ecosystem. Two types of fluvial surfaces were identified within the study area: a combined bankfull channel with active floodplain, and the abandoned floodplain terrace. Hydrogeomorphic surfaces were mapped in the field using the same aerial copies as were used to delineate the vegetation units. Likewise, the hydrogeomorphic surface polygons were digitized on-screen using the orthophoto quadrangle, along with GIS coverage as a base map, to produce a spatial database with two accessible attribute fields, the riparian vegetation (hereafter referred to as the riparian vegetation base map), and the fluvial geomorphic surfaces within the riparian ecosystem.

Vegetation map units were developed through a series of modifications to the California natural community classification by Holland (1986). In previous SAMP efforts by CRREL in other watersheds in southern California, CRREL found that existing vegetation classifications lacked sensitivity for use in delineating wetlands at the watershed scale. To meet our needs, we developed a classification that followed the hierarchical schemes of both Holland (1986) and Sawyer and Keeler-Wolf (1995), but added another level of specificity at the species level. Our classification shares the use of growth forms and dominant species with expanded use of additional species identifiers for both for native and non-native units (Appendix C).

The first order, ephemeral, and intermittent streams were digitized using the DOQs as a background. This category of streams, identified on the coverages in this report as “blue lines,” are typically up to 3 m (10 ft) wide. In several instances, second and third order Stahler stream orders were also identified as a single blue line owing to their narrow width and lack of other hydrogeomorphic surfaces. Typically, these single lined second and third order stream channels resulted from human influences that caused down-cutting in the channel. Associated vegetation was assigned a hydrogeomorphic code of non-floodplain riparian. As a result of these methods, the resulting “blue line” coverage is more extensive and detailed than depicted on the USGS 7.5 minute quadrangle map at a scale of 1:24,000.

Strahler stream order refers to a stream numbering method in which the smallest, terminal stream segments receive a designation of first order or “1” (Fig. 4). A stream segment downstream from the confluence of two first order stream segments receives a designation of second order or “2.” A stream segment downstream from the confluence of two second order stream segments receives a designation of third order or “3,” and so on. In all cases, stream order increases only when two stream segments of equal order join.

4.3 Field Verification

We sampled 169 sites in the field to verify the regulatory status of riparian vegetation communities identified on the riparian vegetation base map (example sample point sheet in Appendix C). Representative sites were selected using a stratified random approach with riparian vegetation communities and hydrogeomorphic surfaces serving as the stratification criteria. At each sample point, the information necessary to complete a routine wetland delineation was collected. In addition, physical and biological information, including geomorphic surface (channel, active floodplain, and terrace), soil texture, plant species and abundance by stratum, adjacent land use/land cover, and cultural alterations was collected to help classify and characterize vegetation communities and riparian reaches and provide information for the functional assessment.

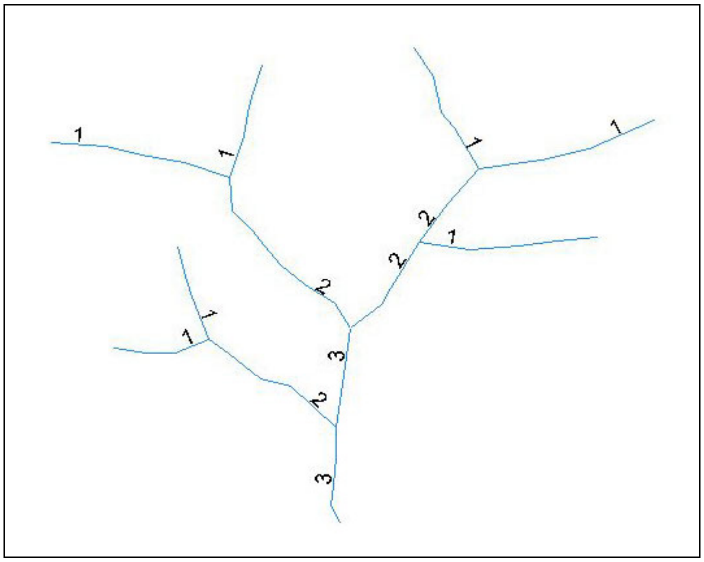

Figure 4. Example of Strahler stream orders.

The data collected during field sampling were summarized to describe the geomorphology, hydrology, soils, and vegetation of various vegetation community types. These data were used to modify the riparian vegetation and geomorphic surface base maps.

Over 500 observation points were also collected to verify the quality of the field mapping effort (example observation point data sheet in Appendix D). Data collected at observation points included yes or no responses for hydrophytic vegetation, hydric soils, disturbance, and jurisdictional status, as well as a determination of the hydrology indicator and geomorphology. Plant species recorded at sample points and presented in this report follow nomenclature in *The Jepson Manual* (Hickman 1993).

During the sampling process, all field digitized polygons and lab digitized "blue lines" were reviewed for correct placement and labeling. Boundaries and labels were corrected in the field, or coordinates were taken and edits were made later in the laboratory.

4.4 Analysis of Field Verification Data

Data collected during the field verification were summarized and analyzed to characterize the common riparian vegetation types in terms of riparian vegetation species and environmental variables. Canonical Correspondence Analysis (CCA) was used to determine the relationship between species density values and environmental variable values among 169 samples in the study area. CCA is a direct gradient analysis technique that relies on the assumption of unimodal, or single-peaked, relationships between species and environmental variables (ter Braak 1988). For example, the relationship between abundance of species may be measured as a function of habitat area. Furthermore, it may be assumed that there is a unique set of optimal conditions of habitat area for a particular species, with one point along the gradient of habitat area (hence, the term unimodal) at which the species has its greatest abundance, and as conditions diverge from this optimal point, species abundance decreases in turn.

CCA, like other ordination techniques, is used to construct a multidimensional graph whereby each axis represents some environmental descriptor. Within the graph (see Fig. 5), those species occurring in clusters generally occur in similar habitats, whereas species found relatively far from each other occur in differing habitats. The environmental descriptor associated with each axis can be interpreted by examining the environmental variables that extend roughly parallel to the axis. The distance of the variable from the origin is an indicator of the strength of the relationship between that variable and the axis. Therefore, the greater the distance, the greater is the relationship between the species, the environmental variable, and the axis. To determine which components explain the greatest proportion of variance in the data, stepwise, forward selection of environmental variables was employed. Environmental variables examined in this study were primarily descriptors of the vegetation and soil characteristics at the site (Table 3). A Monte Carlo permutation analysis (one of several probabilistic analysis techniques) was performed on the ordination axes to determine their significance (Manly 1990). In addition, descriptive statistics were performed on the values for select environmental variables.

Table 3. Environmental variables collected at each sample point in San Jacinto and Santa Margarita watersheds.

Biotic variables	Physical variables
% Cover—coarse woody debris	% Silt
% Cover—trees	% Sand
% Cover—shrubs	% Gravel
% Cover—exotics	Gravel size (cm)
% Cover—litter	% Cobble
% Cover—total	Cobble size (cm)
Species richness (# species)	Geomorphic position
Prevalence index value	

4.5 Final Map of Wetlands and Waters of the United States

For regulatory purposes (Section 404), the final map for WoUS was developed by assigning probability ratings to the riparian vegetation/hydrogeomorphic base map. These designations were made on the basis of results of the field verification sampling, and by evaluating the hydrology for each geomorphic surface, and its vegetation type. Furthermore, the regulatory probability designations (applying to Section 404 only) were evaluated using GIS software to compare their spatial distribution patterns with distributions of other types of designations, including watersheds, human disturbance, and geomorphic surfaces.

Most of the areas delineated as within the bankfull, active floodplain, and first order ephemeral streams were found to be WoUS, and therefore were regulable under Section 404 of the CWA. The wetland status of vegetation types occurring in terrace geomorphic surfaces and along some of the first order streams varied, depending on a number of factors, and therefore could be placed in one of several Section 404 jurisdictional wetland categories (Table 4). Owing to the variability in both site conditions and patterns of occurrence for certain riparian vegetation types in terrace and first order stream positions with similar site conditions, probability ratings were adopted to determine the likelihood of wetlands or non-wetland WoUS occurring in both the floodplain and non-floodplain areas (Table 4).

Each riparian vegetation type within the three geomorphic surfaces (i.e., bankfull, active floodplain, and ephemeral first order stream), hereafter referred to as floodplain riparian vegetation, was assigned a rating of 1 through 6 (Table 4). Also shown in Table 4 are separate ratings for the non-riparian wetlands located outside the floodplain or riparian corridor, which are associated with first order streams and outlier positions, hereafter referred to as non-floodplain riparian vegetation. This allowed for distinguishing the different hydrologic regimes associated with each major ecological setting. The ratings assigned to both the floodplain and non-floodplain riparian vegetation ratings are compared and shown in Appendix E.

Table 4. Wetland or WoUS ratings assigned to riparian vegetation types.

Rating	Description
1	Types meet the criteria for a wetland or WoUS 100% of the time
2	Types meet the criteria for a wetland or WoUS 67–98% of the time
3	Types meet the criteria for a wetland or WoUS 33–66% of the time
4	Types meet the criteria for a wetland or WoUS 2–32% of the time (primarily uplands)
5	Types meet the criteria for a wetland or WoUS less than 2% of the time (primarily uplands)
6	Unregulated upland

Section 404 jurisdictional designations were assigned to each polygon, intermittent, and ephemeral stream reaches as follows. The bankfull channel geomorphic surface meets the criteria for a jurisdictional wetland if it is vegetated with hydrophytes because the hydrology criteria have been met "in most years or [with a] greater than 50 percent probability." Because these vegetated geomorphic surfaces met the hydrology criteria, the soils may be considered hydric as a result of long periods of flooding or ponding. However, when hydrophytic vegetation is absent, the polygon qualifies as a non-wetland WoUS based on the presence of a bed and bank or OHW.

Unlike the bankfull channel geomorphic surface, the active floodplain geomorphic surface is characterized by a recurrence interval of 10 years or less, and, consequently, may not meet the hydrologic criteria required for a jurisdictional wetland (Section 404). Furthermore, because of the infrequency of flooding events, the active floodplain surfaces may be considered non-wetland WoUS regardless of the hydrophytic nature of the vegetation or the status of the hydric soils. However, included within the active floodplain were areas that met the criteria for a jurisdictional wetland. Also, occasional tributary channels bisecting the active floodplain and the terrace met the criteria for a non-wetland WoUS.

Terraces had the following types of regulated units: the lateral tributary, adjacent wetlands, and areas that receive over-bank flooding or with adequate groundwater influence such that wetland features were developed. Adjacent wetlands that met all three criteria were usually located in the linear paleo channels. In the upper most reaches of the watershed, the first, second, and some third order streams were identified as WoUS based on the location of the OHW, i.e., bed and bank. Riparian vegetation communities associated with these locations were assigned probability ratings for non-floodplain riparian vegetation. These non-floodplain riparian wetlands also included isolated wetlands scattered throughout the watershed.

5 RESULTS AND DISCUSSION

5.1 Description of Vegetation Community Types

A total of 201 community types, including 31 unvegetated types such as lined channels and sewage ponds, were identified during the field mapping phase of the delineation effort. Subsequently, for the final map, we developed a condensed list of community types that included 110 map units, 15 of which contained no vegetation. Appendix F summarizes the final vegetation units by area and frequency of occurrence. Samples (169) were collected across 39 of the map units (Appendix C). Table 5 shows the species associated with six of the largest map units. Additionally, presented in Table 6 are the means for each of eight environmental variables by map unit for 20 map units having three or more samples. Shaded rows indicate map units occurring in the top 10 by area.

Table 5. Sample species summary for largest map units.

Unit name	Area (ha)	> 50% Inclusions	50%>Inclusions>25%	Total number of species observed
Trees/Woodland/ Forest, Native__*Quercus agrifolia*	1761	*Bromus* spp., *Toxicodendron diversilobum*, *Eriogonum fasciculatum*	*Salix lasiolepis*, *Brassica nigra*, *Platanus racemosa*	35
Shrub Native__*Baccharis salicifolia*	1165	*Brassica nigra*	*Tamarix ramossisma*, *Bromus* spp., *Salix lasiolepis*, *Populus fremontii*, *Artemisia ludoviciana*	40
Shrub Native__*Salix lasiolepis*	642	*Artemesia* spp., *Bromus* spp.	*Ambrosia psilostachya*, *Baccharis salicifolia*, *Brassica nigra*	49
Trees/Woodland/ Forest, Native__*Populus fremontii*	448	*Artemesia* spp., *Baccharis salicifolia*, *Salix lasiolepis*	*Brassica nigra*, *Bromus* spp., *Eriogonum fasciculatum*	44
Shrub Native__*Lepido-spartum squamatum*	348	*Brassica nigra*, *Bromus* spp., *Eriogonum fasciculatum*	*Avena barbata, Baccharis salicifolia, Gnaphalium californicum, Nicotiana glauca*	25
Trees/Woodland/ Forest, Native__*Salix lasiolepis*	334	*Bromus* spp., *Lactuca serriola*	*Melilotus indica*, *Polypogon monspeliensis*, *Vitis californica*, *Xanthium strumarium*, *Populus tremuloides*	16

As shown in Table 5, the largest area map unit with vegetation was Trees/Woodland/Forest, Native__*Quercus agrifolia*, with 1761 ha (4351 ac). Relative to other units, this map unit had high average species richness, with 35 different plant species observed. Table 6 provides additional data for the Trees/Woodland/Forest, Native__*Quercus agrifolia* map unit: total cover averaged 93%, with 45% attributed to non-native vegetation, predominately *Bromus* spp. and *Brassica nigra*. Furthermore, the unit was typically drier than others, as indicated by the drier rating (higher prevalence index [PI] value) for *Quercus agrifola* communities. The PI value is supported by the large percentage of sand and silt in the soil, indicating that the soil receives less surface flow in large events than other areas.

With 1165 ha (2880 ac) of coverage (Table 5), the Shrub Native__*Baccharis salicifolia* map units were the second most extensive vegetation community found throughout the watershed. Besides its occurrence as specific community type (Shrub Native__*Baccharis salicifolia*), *Baccharis salicifolia* frequently occurred in other community types. Overall, these units had lower average richness than other units and were wetter on average. Average total cover was 74%, with 33% non-natives (Table 6). Soils among *Baccharis salicifolia* communities were predominately sand and averaged highest among sampled communities for percent cobble.

There were two map units in which *Salix lasiolepis* predominated, Shrub Native__*Salix lasiolepis* and Trees/Woodland/Forest, Native__*Salix lasiolepis* (Table 5). The shrub type communities were the fourth largest map unit compared to the tree communities, which ranked tenth. Shrub communities had shorter, smaller diameter stems and younger individuals than the forest communities. Forest units had much higher total cover and non-native cover than shrub units. Average cover was 99% and exotic cover 72% for forest versus 85% total and 33% exotic for shrub units (Table 6). Among all sampled communities, Trees, Woodland/Forest, Native__*Salix lasiolepis* ranked very high in occurrence of exotic species, with only two other units having a higher average exotic species cover. Another difference between the shrub and tree map units was the distribution of substrate sizes. Forest units averaged lower percentages of sand and silt, but contained equivalent proportions of both, whereas the shrub units averaged over 50% sand, and only 26% silt, which is more typical of the active floodplain. Despite the differences between these units, their average PI values were the same, 3.08, which is about midway between all units. Therefore, these units tend to be drier, but not as dry as *Quercus agrifolia*.

Trees/Woodland/Forest, Native__*Populus fremontii* was similar to Shrub Native__*Salix lasiolepis* for all indices. Based on PI values, *Populus fremontii* communities were slightly drier than *Salix lasiolepis* communities. One unique feature of the Populus communities is the relatively smaller contribution of common non-native species. Among the largest community groups, Populus was the only one that did not contain non-natives in more than 50% of the samples.

Table 6. Summary of environmental variables by vegetated map units with three or more samples. Shaded units are among the top 10 by area.

Vegetation map unit	Sample size	PI Value	% Cobble	% Gravel	% Sand	% Silt	% Exotic	% Total cover	Mean species richness
Freshwater Marsh__*Typha* spp.	6	1.57	5	11	27	40	29	99	5
Grassland, Non-Native__*Bromus tectorum*	6	4.23	6	3	44	37	86	83	7
Herbaceous Native__Riparian Dry (Dry Species)	9	4.51	4	3	58	35	43	57	5
Herbaceous Native__Riparian Moist (Moist Species)	5	2.84	5	1	30	44	75	87	5
Herbaceous Non-Native__Common Weeds	11	4.04	3	7	44	32	68	86	6
Shrub Native__*Artemisia tridentata*	6	4.65	5	12	71	17	18	63	8
Shrub Native__*Atriplex canescens*	3	4.82	0	10	75	12	35	62	5
Shrub Native__*Baccharis salicifolia*	17	2.76	7	4	62	9	33	74	5
Shrub Native__*Eriodictyon crassifolium*	3	4.85	6	13	77	7	35	76	8
Shrub Native__*Eriogonum fasciculatum*	10	4.82	4	11	46	38	33	68	6
Shrub Native__*Lepidospartum squamatum*	7	4.76	5	4	57	37	30	59	7
Shrub Native__*Salix lasiolepis*	12	3.08	2	3	56	26	39	85	7
Shrub, Non-Native__*Nicotiana glauca*	4	3.39	0	23	88	23	54	79	6
Shrub, Non-Native__*Tamarix* spp.	4	2.94	3	23	24	40	61	70	5
Trees/Woodland/Forest, Native__*Platanus racemosa*	6	2.96	5	1	38	43	49	91	7
Trees/Woodland/Forest, Native__*Populus fremontii*	11	3.39	5	2	61	22	33	90	7
Trees/Woodland/Forest, Native__*Quercus agrifolia*	12	4.56	4	3	42	41	45	93	7
Trees/Woodland/Forest, Native__*Quercus chrysolepis*	3	3.91	3	13	73	13	33	87	6
Trees/Woodland/Forest, Native__*Salix goodingii*	7	2.51	5	11	66	23	33	100	7
Trees/Woodland/Forest, Native__*Salix lasiolepis*	4	3.08	6	1	36	38	72	99	6

Among the sampled communities, Shrub Native__*Lepidospartum squamatum* was one of the driest, surpassed only by *Atriplex canescens*, *Eriogonum fasciculatum* and *Eriodictyon crassifolium* communities. Total cover for *Lepi-*

dospartum communities was relatively low among sampled units and exotics accounted for greater than 50% of all cover on average. However, average richness was relatively high, somewhat mediating the high exotic cover. Average substrate size for *Lepidospartum* communities was similar to Shrub Native__*Salix lasiolepis* units, with sand predominating at 57% and silt contributing significantly at 37%. Juncus meadow__*Juncus mexicanus* was sixth on the list in terms of area, but only one sample was collected in this type owing to inability to gain access to property. These units and access issues are discussed below in the section dealing with map anomalies. The one sample taken indicates that this unit tends to have very low species richness (2), low PI value (wetter), no exotics with a high cover (100%), and very sandy soils (90%).

5.2 Description of Unvegetated Community Types

Three of the largest contributors to mapping area, accounting for 6269 ha (15,490 ac) of the study area, were the unvegetated units Water Body__Lake, Artificial Structure__Retention Basin, and Unvegetated__Dry Wash Channel. Overall, the lakes dominated the landscape and included large impoundments such as Lake Elsinore, Lake Perris, Canyon Lake, Diamond Valley Lake, Skinner Reservoir, Vail Lake, and Hemet Reservoir. Diamond Valley Lake was the largest freshwater lake in the study area and the newest, having been filled to capacity in 2001. Lake Elsinore, a naturally occurring sink for the San Jacinto Watershed, has been significantly modified for water control. Retention basins generally refer to artificially created depressions that collect water from a natural tributary system, but nearly half of the acreage included in this unit was attributed to a natural dry lake surface within the San Jacinto River floodplain. The large occurrence of unvegetated dry wash channels points to both the xeric climate and the large amount of regional development, which has resulted in the loss of vegetation cover.

5.3 Analysis of Field Verification Data

A total of 104 species in 168 sample points was used to determine the relationship between the vegetation and environmental variables. Although 213 species were originally identified in the sample points (Appendix G), only those with greater than 0.01% relative density were retained for further analysis.

Canonical Correspondence Analysis (CCA) (Fig. 5) suggested that soil moisture was the primary factor determining species composition and distribution patterns in riparian corridors (variable acronyms provided in Table 7). Indeed, species occurring in well-drained areas, attributable to the increased presence of cobbles and other large soil particles (i.e., *Leptospartum squarosum* and *Rhus* *ovata*), were found on the left side of the first axis. Likewise, species occurring in wetter areas and depressions that tended to receive frequent flows of decreased intensity (i.e., *Typha latifolia* and *Scirpus robustus*) were found on the right side of the first axis. The second ordination axis was separated primarily by intensity of flow. The upper portion of the ordination graph is populated by species occurring in conditions of dynamic flow patterns that move drift materials and deposit sand (i.e., *Platanus racemosa* and *Populus fremontii*). The lower portion of the second axis suggests a drier condition where there is less flow and an increase of anthropogenic modifications to the floodplain (i.e., *Brassica nigra* and *Centaurea melitensis*). Monte Carlo permutation analysis showed that all canonical axes were significant ($p > 0.05$).

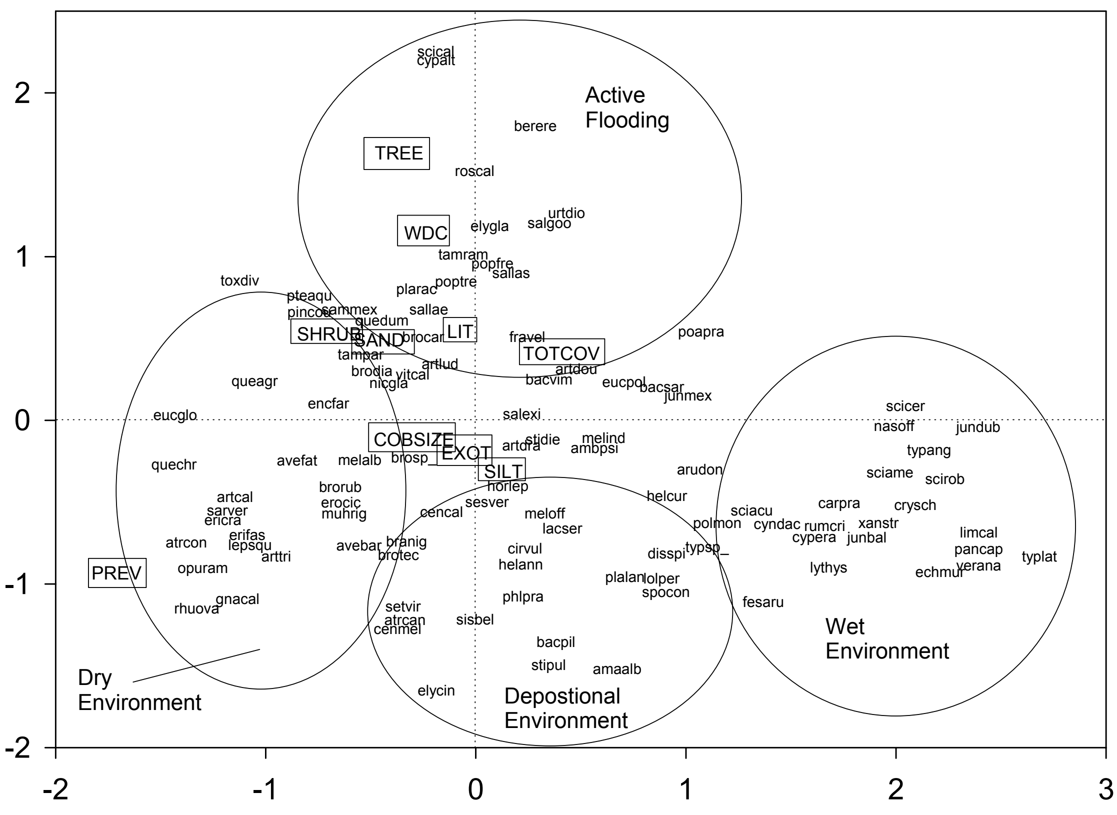

Figure 5. CCA ordination of select environmental variables using plant species occurrence frequencies. (The legend on following pages gives the full name associated with the abbreviations on the figure.)

Legend for Figure 5.

Scientific name	Symbol	Scientific name	Symbol
Amaranthus albus	AMAALB	*Lolium perenne*	LOLPER
Ambrosia psilostachya	AMBPSI	*Lythrum hyssopifolia*	LYTHYS
Artemisia californica	ARTCAL	*Melilotus alba*	MELALB
Artemisia cana	ARTCAN	*Melilotus indica*	MELIND
Artemisia douglasiana	ARTDOU	*Melilotus officinalis*	MELOFF
Arundo donax	ARUDON	*Muhlenbergia rigens*	MUHRIG
Artemisia dracunculus	ARTDRA	*Nasturtium officinale*	NASOFF
Artemisia ludoviciana	ARTLUD	*Nicotiana glauca*	NICGLA
Artemisia tridentata	ARTTRI	*Opuntia ramosissima*	OPURAM
Atriplex confertifolia	ATRCON	*Panicum capillare*	PANCAP
Avena barbata	AVEBAR	*Phleum pratense*	PHLPRA
Avena fatua	AVEFAT	*Pinus coulteri*	PINCOU
Baccharis pilularis	BACPIL	*Plantago lanceolata*	PLALAN
Baccharis sarothroides	BACSAR	*Platanus racemosa*	PLARAC
Baccharis viminea	BACVIM	*Populus fremontii*	POPFRE
Berula erecta	BERERE	*Polypogon monspeliensis*	POLMON
Bromus carinatus	BROCAR	*Poa pratensis*	POAPRA
Bromus diandrus	BRODIA	*Populus tremula*	POPTRE
Brassica nigra	BRANIG	*Pteridium aquilinum*	PTEAQU
Bromus rubens	BRORUB	*Quercus agrifolia*	QUEAGR
Bromus sp.	BROSP_	*Quercus chrysolepis*	QUECHR
Bromus tectorum	BROTEC	*Quercus dumosa*	QUEDUM
Carex praegracilis	CARPRA	*Rhus ovata*	RHUOVA
Centaurea calcitrapa	CENCAL	*Rosa californica*	ROSCAL
Centaurea melitensis	CENMEL	*Rumex crispus*	RUMCRI
Cirsium vulgare	CIRVUL	*Salix exigua*	SALEXI
Crypsis schoenoides	CRYSCH	*Salix gooddingii*	SALGOO
Cyperus alternifolius	CYPALT	*Salix laevigata*	SALLAE
Cynodon dactylon	CYNDAC	*Salix lasiolepis*	SALLAS
Cyperus eragrostis	CYPERA	*Sambucus mexicana*	SAMMEX
Distichlis spicata	DISSPI	*Sarcobatus vermiculatus*	SARVER
Echinochloa muricata	ECHMUR	*Scirpus acutus*	SCIACU
Elymus cinereus	ELYCIN	*Scirpus americanus*	SCIAME
Elymus glaucus	ELYGLA	*Scirpus californicus*	SCICAL
Encelia farinosa	ENCFAR	*Scirpus cernuus*	SCICER
Erodium cicutarium	EROCIC	*Scirpus robustus*	SCIROB
Eriodictyon crassifolium	ERICRA	*Sesuvium verrucosum*	SESVER
Eriogonum fasciculatum	ERIFAS	*Setaria viridis*	SETVIR
Eucalyptus globulus	EUCGLO	*Sisyrinchium bellum*	SISBEL
Eucalyptus polyanthemos	EUCPOL	*Sporobolus contractus*	SPOCON
Festuca arundinacea	FESARU	*Stipa diegoensis*	STIDIE

Scientific name	Symbol	Scientific name	Symbol
Fraxinus velutina	FRAVEL	*Stipa pulchra*	STIPUL
Gnaphalium californicum	GNACAL	*Tamarix parviflora*	TAMPAR
Helianthus annuus	HELANN	*Tamarix ramosissima*	TAMRAM
Heliotropium curassavicum	HELCUR	*Toxicodendron diversilobum*	TIXDIV
Hordeum leporinum	HORLEP	*Typha angustifolia*	TYPANG
Juncus balticus	JUNBAL	*Typha latifolia*	TYPLAT
Juncus dubius	JUNDUB	*Typha* sp.	TYPSP_
Juncus mexicanus	JUNMEX	*Urtica dioica*	URTDIO
Lactuca serriola	LACSER	*Veronica anagallis*	VERANA
Lepidospartum squamatum	LEPSQU	*Vitis californica*	VITCAL
Limonium californicum	LIMCAL	*Xanthium strumarium*	XANSTR

Table 7. Environmental variables and corresponding acronyms used in CCA ordination.

Acronym	Environmental variable
TREE	% Tree cover
PREV	Prevalence index value (PI Value)
WDC	% Woody debris cover
LIT	% Litter
TOTCOV	% Total cover
SHRUB	% Shrub cover
SAND	% Sand
COBSIZE	Cobble size (cm)
SILT	% Silt
EXOT	% Other exotic

5.4 Hydrologic Settings and their Influence on the Regulatory Status of Units

Three main types of hydrologic flows that characterized the riparian corridors in this area are as follows: a flood flow over floodplain terraces, precipitation combined with over-bank flooding onto floodplain terraces, and groundwater discharge to seeps and springs. Field indicators for these three hydrology sources were assessed in the field for use in making jurisdictional decisions at various locations. Surface runoff and groundwater discharge to streambeds can provide for a perennial source of water in most years. In these types of settings with perennial flow, at least in the thalweg (low flow channel), the vegetated units typically always had positive indicators of all three parameters to meet the requirements of a jurisdictional wetland. However, the majority of riparian corridors did not have perennial water in the thalweg. Rather, the riparian corridors received intermittent flows during storm events.

We estimated that the bankfull and active floodplain geomorphic surfaces fill with water during storms that occur at intervals of less than 10 years. The remainder of the floodplain is estimated to flood at various stages, depending upon the storm severity until, in certain events, all of the floodplain is full. In larger events, intervals greater than 10 years, the WoUS and wetland primary hydrology indicators of drift and silt material are scattered across some or all of the floodplain. Therefore, we discovered that these indicators are not reliable for assessing jurisdictional wetland occurrence because they can be remnants of an infrequent but large event that scattered these indicators across most of the floodplain. Because of this issue, we relied on bed and bank features and geomorphic surfaces, combined with certain vegetation units, as field indicators for meeting regulatory criteria.

Over-bank flooding, local precipitation, and occasional groundwater discharge provide the hydrology for wetlands within the paleo channels and other depressional features located in the abandoned floodplain terrace. For those seasonally wet areas in the terrace that have less than a 50% likelihood of having ponded or saturated soils in the upper part for at least 17 days (5% of the 345- to 360-day growing season in the valley floor and foothill regions), and do not meet the hydrology requirements for jurisdictional wetlands, were considered regulated because they met the definition of non-wetland WoUS with an ordinary high water mark. Most of the paleo channels located in the terrace geomorphic surface retain water for short periods; however, they are frequently supplied with water from tributaries entering the floodplain and meet the requirements of OHW criteria. The larger and slightly depressed zones are typically covered by Southern Arroyo and Gooddings willows, which may retain water for longer periods. The soils in these depressional sites typically have higher silt content, so consequently they can pond water for extended periods. In these depressional settings in the terrace, the soils typically met both COE and NRCS field indicators used to meet the hydric soil criteria.

Intermittent and ephemeral channels (bluelines) were considered regulated based on OHW criteria. These features all had evidence of bed and bank or confined flow channels. Included in the blueline coverage were both connected and isolated channels. As a determination of isolated waters is beyond the scope of this study, all aquatic resources were included to provide a complete baseline of aquatic resources that occurred within this watershed at the time of the study. If a decision is needed on a particular water body's regulatory status, the Los Angeles District Regulatory office will make all final jurisdictional determinations.

5.5 Soils

A total of 37 samples contained redoximorphic field indicators, signifying hydric soils. Generally, only those soils with redoximorphic features could be classified as hydric soils. However, three samples had other field indicators of hydric soils that individual observers considered appropriate to use. Of the remaining 34 samples, four had sulfuric odor, four had reducing conditions, 32 had gleyed or low chroma colors, and one had organic streaking field indicators. These features are similar to those described by the USDA-NRCS as Indicator F3-Depleted Matrix (NCRS 1996).

5.6 Delineation Results: Aquatic Resources (including WoUS)

Aquatic resources mapped by vegetation unit and geomorphic surface within the San Jacinto and Santa Margarita watersheds totaled 16,043 ha (39,643 ac) and included 12,701 km (7892 miles) of intermittent and ephemeral streams. Table 8 shows a summary of vegetation map units by rating and geomorphic surfaces. The Section 404 jurisdictional ratings for all riparian vegetation map units by geomorphic surface are provided in Appendices H, I, J, and K.

Table 8. Regulated decisions for each geomorphic surface in the riparian wetland GIS coverage.

Geomorphic surface and rating	Number of vegetation types	Hectares or kilometers (acreage or miles)
Active floodplain	94	10,904 ha (26,944 ac)
Terrace		
Rating 1	3	4 ha (9 ac)
Rating 2	9	106 ha (262 ac)
Rating 3	5	79 ha (196 ac)
Rating 4	9	162 ha (401 ac)
Rating 5	7	33 ha (83 ac)
Rating 6	28	625 ha (1,543 ac)
Non-floodplain riparian		
Rating 1	8	137 ha (339 ac)
Rating 2	4	28 ha (68 ac)
Rating 3	11	621 ha (1,534 ac)
Rating 4	9	753 ha (1,860 ac)
Rating 5	6	19 ha (48 ac)
Rating 6	34	2,572 ha (6,357 ac)
Intermittent Streams (Rating 1)		12,701 km (7,892 mi)
Springs and Seeps (Rating 1)		152 sites
Total of regulated wetlands and WoUS		**16,043 ha (39,643 ac) and 12,701 km (7892 mi)**

Within the active floodplain, all 94 riparian map units found were considered jurisdictional (Rating 1), as these surfaces always met the hydrology criteria for WoUS. The most frequent and largest vegetation units found in the active floodplain are listed in Table 9.

Within the terrace, 351 ha (868 ac) were composed of 26 vegetation communities with wetland ratings (Rating of 1, 2, 3, and 4). Of 61 riparian vegetation types located on the terrace geomorphic surface, 35 had either a low probability of being a regulated wetland under Section 404 or were designated as uplands (Table 6). However, a low probability for Section 404 does not preclude regulation of the areas (polygons) under CDFG's 1600 program. The predominant vegetation unit on the terrace was Trees/Woodland/Forest, Native__*Quercus agrifolia*, accounting for 22% of the total area. The next closest vegetation unit is Trees/Woodland/Forest, Native__*Populus fremontii* accounting for less than 10% of tertiary vegetation (Appendix I).

Table 9. Largest and most frequent riparian vegetation types in the active floodplain.

Type	Frequency	Size (ha)/(ac)
Water Body__Lake	13	53,47/13,213
Shrub Native__*Baccharis salicifolia*	554	1005/2484
Artificial Structure__Retention Basin	124	466/1150
Unvegetated__Dry Wash Channel	317	369/912
Shrub Native__*Salix lasiolepis*	562	264/651

There were 1539 ha (3801 acres) among 32 riparian vegetation communities considered to be wetlands (Rating of 1, 2, 3, and 4) on non-floodplain surfaces (Table 8). In total, 72 vegetation units were mapped as non-floodplain riparian, 40 of which had a low probability of being regulated under Section 404, but may be regulated under CDFG 1600 program. The predominant riparian vegetation unit on the non-floodplain surfaces was Trees/Woodland/Forest, Native__*Quercus agrifolia*, accounting for 35% of the total area. The only other vegetation units contributing more than 5% to the area delineated are Juncus Meadow__*Juncus mexicanus* and Shrub Native__*Salix lasiolepis*, each accounting for just 8% of non-floodplain riparian vegetation area (Appendix J).

In addition to areas delineated, there were 152 springs and 12,701 km (7892 miles) of intermittent and ephemeral streams identified as WoUS within the two watersheds. Springs were found nearly exclusively in mountain areas or near fault lines. Intermittent and ephemeral streams were typically first and second order streams at higher elevations in the watersheds.

5.7 Distribution Patterns of Riparian Vegetation Types

Several distribution patterns of the riparian vegetation types were observed within the five major topographic relief zones within the study area. These general distribution patterns are shown in Figure 6. Examples of various vegetation units are shown in Table 10 along with brief comments. Nomenclature for riparian vegetation community types is provided in Appendix F.

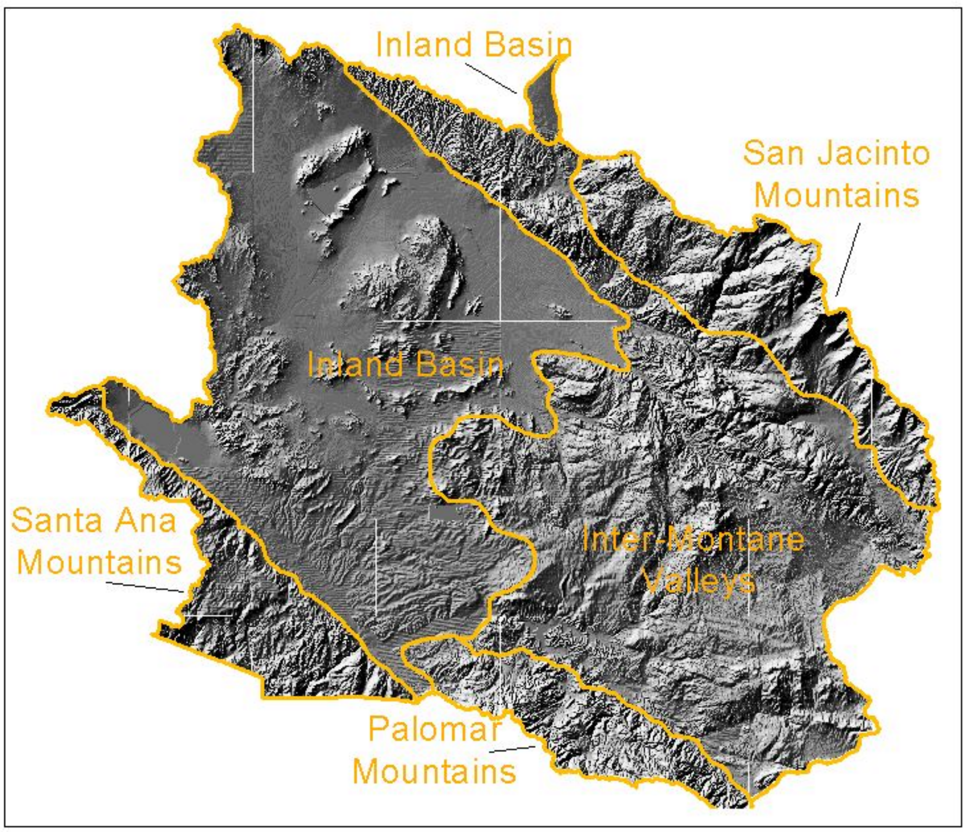

Figure 6. Topographic relief of San Jacinto and Santa Margarita watersheds Digital Elevation Model. The major topographic zones are delineated (USGS 1996).

Wetland vegetation distribution patterns within the western Riverside watersheds are driven by two major features outlined in Figure 6. These are human development and major landforms associated with topographic positions. Riparian vegetation units in mountainous reaches of the watershed (Palomar, San Jacinto, and Santa Ana Mountains) are less impacted by human development than those in lower reaches.

Table 10. Major landscape zones within the San Jacinto and Santa Margarita watershed.

Landscape zone	Common riparian vegetation species	Description
Inland Basins (IB)	*Baccharis salicifoia* *Salix lasiolepis* *Typha* spp. *Salix gooddingii*	The Inland Basins are characterized by gently sloping alluvium (430 m, 1411 ft) with isolated outcroppings up to 770 m(2526 ft). Temperatures are highest and precipitation lowest of all the identified zones. Land use is dominated by irrigation farming and a few isolated urban centers, of which the largest is Hemet.
Inter-Montane Valleys (I-MtnV)	*Salix lasiolepis* *Baccharis salicifolia* *Populus fremontii* *Eriogonum fasciculatum*	The Inter-Montane Valleys are characterized by a high dissected plain (1000 m, 3281 ft) with broad valleys. Temperatures are 3–6°C (5–10°F) lower than the inland basins and precipitation is slightly higher. Land use is evenly distributed between ranches and open space.
Palomar Mountains (PMtn)	*Quercus agrifolia* *Platanus racemosa* *Populus fremontii* *Pinus jeffreyi*	The Palomar Mountains within the study area are characterized by highly dissected hills up to 1750 m (5741 ft). Temperatures and precipitation can vary widely depending on elevation. Much of the zone is within the Cleveland National Forest and Pechanga Indian Reservation.
San Jacinto Mountains (SJMtn)	*Quercus agrifolia* *Platanus racemosa* *Quercus berberidifolia* *Alnus rhombifolia*	The San Jacinto Mountains are the highest (San Jacinto Peak, 3300 m, 10,827 ft) range within the study area. Temperatures are lowest and precipitation high, but vary according to elevation. Almost the entire zone is within the San Bernardino National Forest.
Santa Ana Mountains (SAMtn)	*Quercus agrifolia* *Platanus racemosa* *Baccharis salicifolia*	The Santa Ana Mountains within the study area are characterized by highly dissected hills up to 2550 m (8366 ft). Temperatures are somewhat moderated by a marine layer and precipitation is high. The northern extent of the zone is within the Cleveland National Forest. The southern portion is evenly distributed between agriculture and open space.

Within the higher elevations of the watersheds, the riparian vegetation types were associated with rocky to gravelly channel substrates. Upland chaparral vegetation types were common in the upper reaches because the intermittent stream channel areas are dry most of the time.

Subtle vegetative differences were evident among the three mountain zones of the Palomar, San Jacinto, and Santa Ana mountain ranges. Each zone was dominated by *Quercus agrifolia*, which had a wide distribution except at the very highest elevations. At their highest elevations, the Palomar and San Jacinto ranges were dominated by *Pinus jeffreyi* and *Alnus rhombifolia*, respectively. The lower Santa Ana Mountains maintained a dominance of *Quercus agrifolia* at all elevations.

Overall, as elevation decreased, the dominance of hydrophytic vegetation types increased. This pattern may be seen in Table 11, which shows the distribution of mapped wetlands by probability rating and topographic zone. Dominant hydrophytic vegetation types at lower elevations include *Platanus racemosa*, *Populus fremontii*, and *Baccharis salicifolia*. The Inter-Montane Valleys had abundant dominant hydrophytic vegetation communities within well-developed floodplains. In the adjacent hills, *Quercus agrifolia* and chaparral species were observed in poorly developed first and second order streams. Increased disturbance in the valleys as compared with the mountainous zones has resulted in chaparral species moving into disturbed floodplains.

Table 11. Frequency of wetland ratings within landscape zones.

Landscape zone	Amount of rated wetlands or WoUS (ha/ac)					
	1	2	3	4	5	6
Inland Basins (IB)	8699/ 21,495	47/115	270/ 667	161/ 399	24/59	308/ 760
Inter-Montane Valleys (I-MtnV)	2051/ 5069	76/189	227/ 560	541/ 1338	28/68	1071/ 2647
Palomar Mountains (PMtn)	159/64	0.4/1	20/50	79/196	0	980/ 2422
San Jacinto Mountains (SJMtn)	16/39	2/5	341	341/71	0.4/1	244/ 604
Santa Ana Mountains (SAMtn)	214/ 529	8/21	45/110	104/ 257	1/3	593/ 1465

The Inland Basins were characterized by highly modified hydrological schemes, with few indicators of tertiary floodplain surfaces. Land use patterns such as agriculture and urban influences have removed most of the drier vegetation communities commonly associated with these surfaces (Fig. 7). Hydrophytic species were confined to artificial channels and retention basins, which hold water more frequently than any other part of the watershed. The disturbance communities such as Southern Arroyo Willow riparian forest were typically located in areas below stormwater discharge points, or in association of agricultural field and urban development. Generally, most of the larger and wetter wetland areas were located in the lower parts of the watersheds where human influences are prevalent. Plant species compositions in these areas are mostly wetland plants.

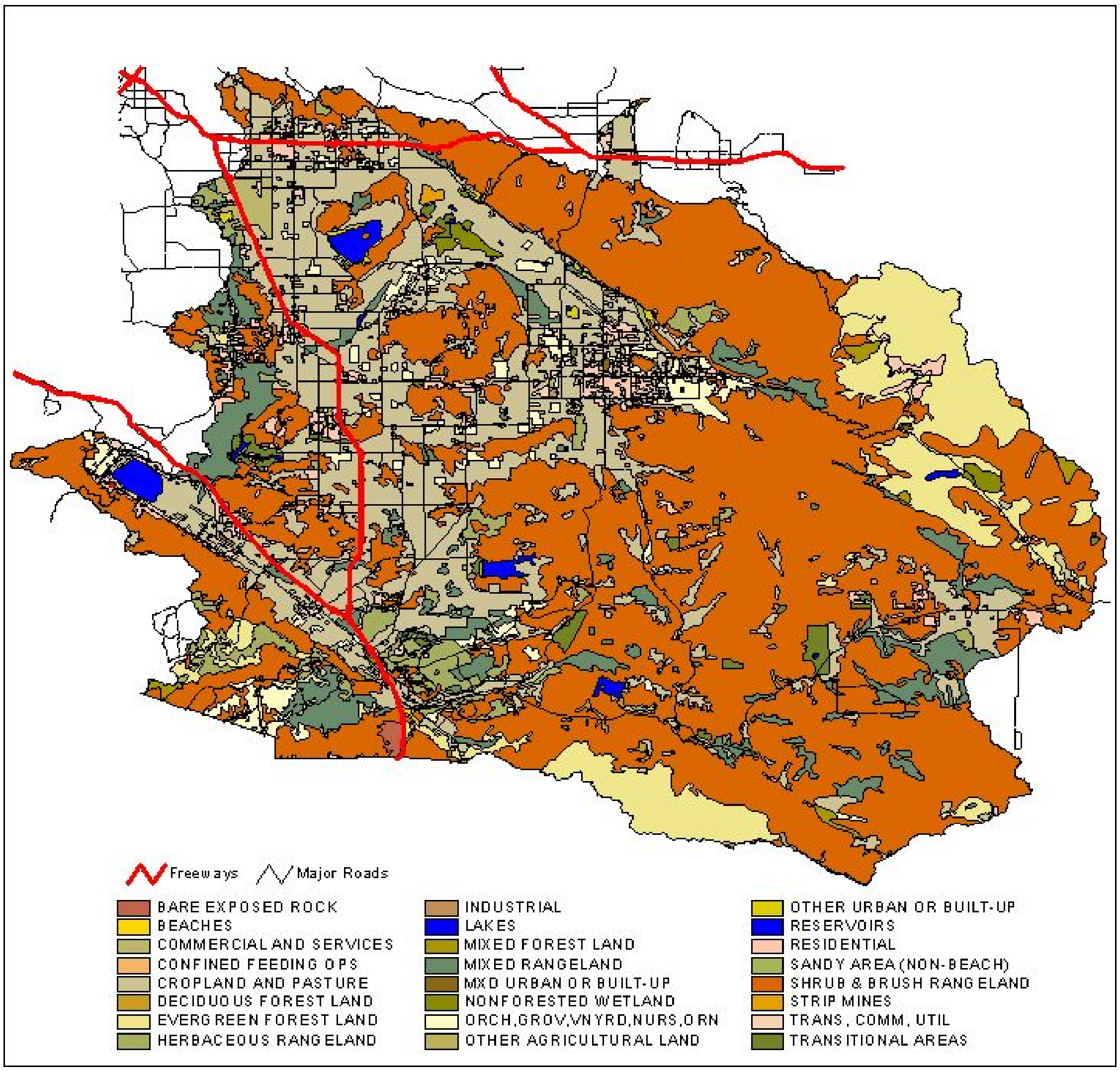

Figure 7. Land use patterns in San Jacinto and Santa Margarita watersheds (USGS 1997).

In most of the watershed, one of the several types of Willow units is the dominant vegetation type found on the terraces. These types were primarily located along the edges of the active floodplain or on the terrace. At some locations, the level of introduced species was decreased and the site was less disturbed; however, overall the Willow communities tended to adapt or respond to the human modification. In areas of the watershed with concrete-lined channels for flood control structures, Willow communities have been able to maintain themselves without a floodplain terrace.

Most of the freshwater marsh types, with occurrences of Tule (*Scirpus acutus*), Cattail (*Typha* spp.), and Spike Rush (*Eleocharis macrostachya*), were associated with human developed features. Each of these species is an indicator of disturbance, reflecting the altered wetland conditions, i.e., settling ponds, abandoned barrow pits, and margins of man made reservoirs, in which these freshwater marsh communities were located.

In general, the riparian vegetation within the abandoned floodplain terrace in the western Riverside watersheds was associated with modified channels or other human developed features. Owing to modifications in the watershed for enhanced runoff, flood control, and agriculture, the floodplain terraces have been isolated from the main channel or greatly reduced in their ability to act as a functional part of the floodplain. Historically, more of the terrace may have been considered wetland than has been currently determined. Typically, vegetation types such as mulefat are common within the active floodplain and parts of the terrace in southern California; however, within the western Riverside watersheds, occurrences of these communities have been reduced in frequency as a result of modifications in the floodplains.

There are several noteworthy contrasts between the current conditions of San Jacinto and Santa Margarita watersheds in the study area. The San Jacinto watershed is slightly larger than the Santa Margarita by 18% within our study area. Given this nearly equal size, the following contrast statements will be discussed as if they were equal in size. The Santa Margarita watershed has 4566 ha (11,284 ac) of terraces, while San Jacinto watershed has 277 ha (685 ac). This 83% greater occurrence of terraces in Santa Margarita watershed results from the loss of terraces in the more developed San Jacinto watershed. These losses in riparian vegetation associated floodplain terraces probably result from agricultural development, drainage improvements, and general increased urban development. This lack of available terrace positions is also reflected in a reduction of habitat types. The Santa Margarita, with its 361 ha (892 ac) of forested floodplains, has 79% more forested terraces than the San Jacinto with its 78 ha (193 ac). The shrub communities were more similar in comparison, with only a 30% difference. Because shrubby species like mulefat (*Baccaharis salifolius*) respond to both natural and human disturbances, disturbances, whether from storm events or channel modifications, allow it to maintain itself. Also, the occurrence of native and non-native dominated communities followed similar patterns. There was 87% higher occurrence of native to non-native communities in the Santa Margarita, while the San Jacinto had 62% native to non-native communities. The drop in native communities in the San Jacinto watershed also corresponds to the reduction in floodplain terraces and loss of floodplain forests.

5.8 Problematic Wetland Types

The following represents the units encountered in the watershed for which a determination of regulatory status was considered problematic or difficult, or which required particular attention.

5.8.1 Rush Meadows

Rush (*Juncus mexicanus*) meadows are common in floodplain terraces, sloped wetlands, and moist pastures in the mountains. The variation of the occurrence of delineation criteria within this unit is great. This type occurred both in locations where soils and hydrology indicators tested positive for wetlands, as well as in upland areas where the required wetland parameters were absent. In most of the montane floodplains in the San Jacinto Mountains, the channel had been down cut below its normal elevation, which has resulted in isolation of the floodplain terrace from less extreme flood events. The effective channelization within these montane areas may be attributed to altered land use patterns, such as grazing, development, and forestry practices.

Numerous areas were sampled for indication of wetland parameters. In most areas, soil samples indicated the presence of non-hydric soils: coarse sandy loam without any redoximorphic features, and typically with a Munsel color chart rating of 10YR 3/3. Indicators of hydrology were absent, which may be attributed to incised channels and the elimination of over-bank flooding. Furthermore, it is likely that the high density of *Juncus,* a rhizomatous facultative wetland species (FACW) (Reed 1988, 1996), occurred as a result of grazing pressure rather than the presence of high water tables or an ability to send roots deep into moist soil profiles. Many species of *Juncus* are known to be unpalatable for grazing and are typically avoided by livestock. Therefore, an increase in abundance may occur under grazing pressure. The extensive stands of this species likely represent the location of former montane meadow wetlands that now have been shifted to a monotypic *Juncus* FACW community.

Other observations made in this region indicated that surface water, from either occasional over-bank flooding or collection of storm water runoff, probably does pond in depressional areas adjacent to the active floodplain channel. The Juncus Meadow__*Juncus mexicanus* unit was assigned a regulatory probability rating of 4 (equal to Facultative Upland [FACU]), instead of a Rating of 2 or 3 (FACW or FAC equivalent) to reflect the absence of hydric soils and hydrology, and to recognize the occasional occurrence of ponded depressions scatted across the isolated abandoned floodplain terrace. The rating of 4 may indicate pockets of Juncus meadows that would meet the wetland criteria.

5.8.2 Seasonality of Hydrology

Use of hydrology indicators for wetlands and non-wetland WoUS required attentiveness to seasonal fluctuation of precipitation, groundwater, and discharge rates. Drought conditions prevailed while this planning level delineation was conducted. This required us to rely on evidence of hydrology that may have occurred several years prior to this effort. The use of standard primary indicators of hydrology, such as drift and sediment deposits, had to be used with caution. In many locations these hydrology indicators appeared to be several years old and exceeded the frequency criteria of every other year (or one out of two probability). Additionally, many of the riparian areas may not experience flooding or saturation for years. This results from the regional climatic conditions that do not correspond well with the criteria intended for the three-parameter type wetlands, which were developed for the mesic eastern United States.

To acknowledge fluctuations in hydrology, the ratings were developed to incorporate the highly variable systems. Typically, many of the vegetation units with a Rating of 4 or 5 (2–33% and 1–2% occurrences) include these problematic types. For example, *Juncus* Meadows was given a Rating of 4. This unit is highly variable, and in wetter years can have localized ponding that meets the hydrology criteria for a wetland. Another example is Grassland, non-native__*Lolium perenne*, which is an aggressive non-native grass that has the ability to survive short periods of ponded water in depressional landscapes. Also, Grassland, non-native__*Polypogon* ssp. was assigned a Rating of 4. This non-native grass typically is associated with level to shallow depressions in the landscape that received runoff water at infrequent intervals.

Fluctuations in surface hydrology with intermittent flows may allow for the probability of contaminants to concentrate in certain areas. Contaminate occurrences in these areas result from a drop of suspended loads to which various chemical compounds may be attached.

5.8.3 Modified Landscapes

Human development and modification of drainage ways is common in this watershed, especially in the northern portion. Various activities, including agriculture, road construction, and urban development, have resulted in impacts to the natural flow of hydrology, including the isolation of abandoned floodplain terraces from the active channels. As a result, the historical floodplain terraces no longer function as flood retention areas, and no longer provide other critical wetland functions.

In several locations, riparian corridors were interrupted by either urbanized or agricultural areas, whereby the channel had been filled, or the vegetation removed. For example, near the terminus of Domenigoni Parkway, east of Diamond Valley Lake Reservoir, a series of riparian channels formerly drained hundreds of acres of adjacent subwatersheds. The channels had been filled for agricultural use and the well-developed riparian corridors terminated. Samples from this area provided no indication that wetlands occurred here at the time of this study. However, it is expected that in certain types of storm events these drainages would discharge water onto the flats and supply water to create standing wet areas and possibly provide seasonal connections to other channels.

At the landscape scale of this effort, the hydrologic problem areas were not mapped as wetlands because the evidence available to indicate that they met regulatory criteria was inconclusive. However, with a more detailed assessment of the ecological setting, some areas could be considered problematic wetlands and fall within Section 404 regulation.

5.9 San Jacinto River Delineation Boundaries

5.9.1 Background

The San Jacinto mainstem was an area where the active floodplain boundary was not readily discernable in the field. In an effort to clarify the location of the active floodplain boundary, we gathered additional background information, including floodplain maps developed by Riverside County Flood Control and Water Conservation District. In addition to field observations, floodplain models for this area were evaluated to determine the boundary of the 10-year event, i.e., the active floodplain.

The following review of the floodplain models was used in combination with field efforts to resolve the active floodplain boundary. The report by Riverside County Flood Control and Water Conservation District (2000), hereafter called the *Riverside County Report*, provided a quantitative analysis of the effects of the

San Jacinto River Channel project on the floodplain for a range of storm events. The analysis was based on the work of WEST Consultants Inc. (2000), hereafter called the *WEST Report*. WEST consultants developed a 100-year rainfall-runoff hydrologic model (HEC-1) for the San Jacinto Watershed. Additionally, WEST developed a hydraulic model (HEC-RAS) of the San Jacinto River from with the upper Railroad Canyon at river mile 9.55 to Bridge Street at river mile 25.49, for a distance of 26 km (16 miles). The report covered existing conditions and project conditions, which included the proposed flow control structure at Ramona Expressway.

HEC-1 is a hydrologic model that estimates the rate at which water will enter a river channel as a result of rainfall and "routes" this runoff downstream. The model is called as a single event model, because it is primarily used to estimate the runoff from single storm events, and not for continuous simulation. HEC-1 models the runoff from each sub-basin of a watershed as the smallest unit that can be modeled. The *WEST Report* divided the San Jacinto Watershed into 17 sub-basins. The runoff from each sub-basin was estimated using the unit hydrograph approach; however, the report provided no description of how the unit hydrographs were generated. The model simulated the routing of flows in open channels using the modified Puls method. The modified Puls method requires that the storage-outflow characteristics of the channel be estimated; this was determined from the HEC-RAS analysis.

The 100-year return period discharge throughout the San Jacinto River watershed was estimated using the HEC-1 model of the watershed. Apparently, the *Riverside County Report* and *WEST Report* used the 100-year precipitation event applied over the watershed. However, neither of the reports discussed how the 100-year precipitation event was estimated or how the runoff parameters for each sub-basin were developed.

HEC-RAS is a one-dimensional steady flow hydraulic model used to estimate water surface elevations based on discharge, channel geometry, channel roughness, and other, relatively minor, effects. When the period of the peak discharge can be simulated by a steady flow, HEC-RAS can provide relatively accurate estimates of the maximum stages expected. The *WEST Report* stated that flow and stage data were unavailable to calibrate the model. However, the model results were compared to the stages estimated by the Corps of Engineers in a 1970 floodplain information report using HEC-2 with reasonable results.

A frequency analysis of the annual peak discharges at three gages located within the San Jacinto Watershed (Table 12) was provided in the *Riverside County Report*. The gages had relatively long periods of records, by normal standards in the U.S., ranging from 39 to 71 years. The frequency analysis was conducted using the HEC program Flood Frequency Analysis, HEC-FFA. The records at the three gage locations provided a guide to discharge frequency at these three locations. It is interesting to note that the gage at Railroad Canyon, which has 1455 km^2 (562 mi^2) of upstream drainage area, has a much smaller 100-year return period flow than the Cranston gage, which has a drainage area of only 365 km^2 (141 mi^2). The 100-year return period flow at the Railroad Canyon Bridge is approximately 410 m^3/s (14,500 ft^3/s) and at the Cranston gage is approximately 1050 m^3/s (37,000 ft^3/s). The cause of this decrease in flow is apparently two large ponding areas—Mystic Lake and Shallow Pond—which act to attenuate peak flows.

Table 12. USGS Gages.

Gage name	USGS Gage name	Gage number	Drainage area (km^2/mi^2)	Differences on USGS website from report
Railroad Canyon	San Jacinto R at RR Cyn Weir nr Elsinore, CA	11070375	3.68/ 1.455	*Riverside Report* states gage number as11070500, which is incorrect
Cranston Bridge	San Jacinto R nr San Jacinto	11069500	945/365	
Nuevo Road	Perris Valley Storm Dr at Nuevo Rd nr Perris, CA	11070270	627/242	
Comparison Gages				
Santa Margarita	Santa Margarita R nr Temecula CA	11044000	3944/ 1523	
Murrieta Creek	Murrieta C at Temecula CA	11043000	1489/575	

While the three gaged locations provide estimates of the annual peak discharge frequency at these three specific locations, additional analysis was done to estimate the peak discharge frequencies throughout the San Jacinto Watershed. First, the 100-year discharge rates and 100-year return period flows described in the *WEST Report* were compared to the frequency analysis performed at the gages. Next, the 100-year return period rainfall depth was reduced to produce the 2-, 5-, 10-, and 20-year flood discharge rates at the Cranston Bridge gage and the Nuevo Road gate. A separate ratio was applied to the 100-year return period rainfall depth to produce each of the return period discharges. Subsequently, these ratios of rainfall depth were applied to the entire watershed. In this way the 2-, 5-, 10-, and 20-year flood discharge rates for the entire watershed were estimated. The resulting discharges were checked at the "verification" gage (Railroad Canyon) with reasonable correlations.

5.9.2 Gage Data

The gages in the San Jacinto watershed listed in Table 12 above shared a number of interesting attributes. First, all three gages had a majority of days with zero flow over the period of record. Second, the flow events recorded at each gage were extremely "flashy," that is, the time to the peak discharge was often less than 2 days, and the return to the zero flow condition was equally rapid. Third, the flow duration record of the three gages was markedly different from the flow duration of the comparison gages located in nearby watersheds. The flow duration for each of the five gages was normalized by the drainage area and plotted in Figure 8.

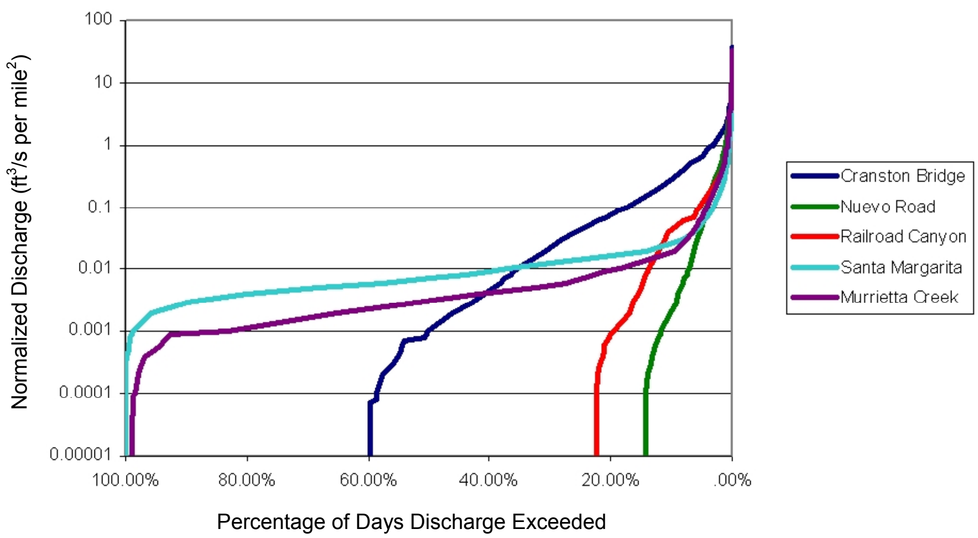

Figure 8. Flow duration for all gages.

Figure 9 displays an example of the actual daily average flows for the period of record for the Railroad Canyon gage. This time series plot indicates the "flashy" nature of the watershed. The peak flows were abrupt and short. Typically, there were long periods of low or zero flow between the peaks. The flow duration curve (Fig. 8) indicates the large percentage of days with zero flow.

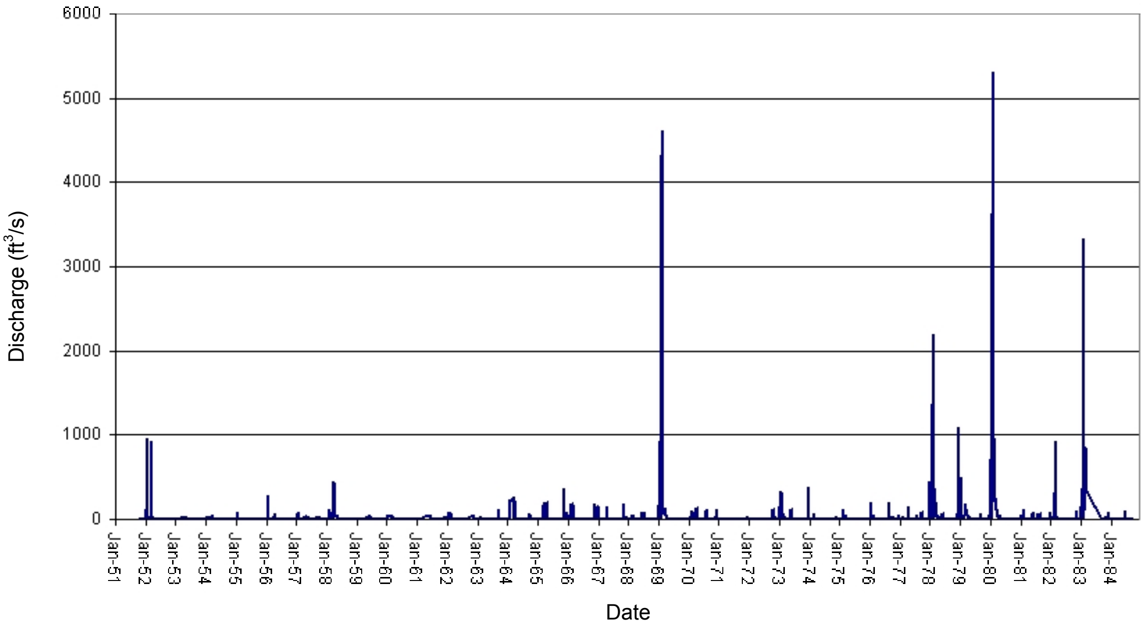

Figure 9. Daily average flow for the period of record at the Railroad Canyon gage.

5.9.3 Discussion and Conclusion

The *WEST Report* and the *Flood Control District Report* were both reasonable efforts to estimated flood events in the San Jacinto Watershed. The reports used a consistent, rational methodology to estimate the flood events in a basin in which data are scarce. However, the reports provided no discussion of the estimation of the 100-year return period rainfall depth, no report of the runoff parameters for each of the sub-basins, no observations of water surface elevations during flood events, nor did they provide verification of the flood routing procedure. The rainfall depth and runoff parameters may be discussed in a report not included in this review.

The review of the gage data and flood modeling results does not resolve the issue with physical evidence to position the limits of the active floodplain along the San Jacinto River. One possible reason for the insufficient evidence may be existing grazing and other agricultural practices in the area, which may have disturbed the surface features and erased the physical evidence. Additionally, the intermittent hydrological nature of the river itself may preclude the less adequate evidence of flooding, owing to its flashy nature, the 10-year interval of flood events, and the occurrence of floodwater for only a few days. The independent evaluation supported the outcome of the HEC models that no field verification of the boundary of the 10-year floodplain was possible within a reasonable time. Without field evidence that corresponds to the 10-year floodplain model boundary at this site, the active floodplain was considered a problematic area. As such, determining jurisdiction along sections of the San Jacinto River will be necessary to consider these results and increase the intensity of the further field investigations in conjunction with the Los Angeles District. Thus, the aquatic resource map and data set will depict the San Jacinto River active floodplain as a problematic area.

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APPENDIX A: GLOSSARY

Abandoned Floodplain Terraces

Abandoned floodplain terraces are located above the bankfull and active floodplain. These alluvial terraces are surfaces that were formed when the river flowed at higher water and deposition levels than present (Graf 1988). In this study area there were variously dated alluvial surfaces, both Pleistocene and Holocene in age. Mapping efforts were restricted to the Holocene surfaces. These Holocene terraces occasionally flood in western riparian systems as a result of flooding or flash floods (Osterkamp and Friedman 2000). These less infrequent flood events inundate most or all of the bottomland features, including dry alluvial terraces. Most parts of the abandoned floodplain terrace are considered to be within the 100-year flood return interval as recognized by the Federal Emergency Management Agency (FEMA) (1995).

Active Floodplain Channel

The active floodplain channel is reported by Riggs (1985) as representing a 10-year recurrence event. Riggs and Harenberg (1976) calibrated the active floodplain surface using 10-year flood events at gauged sites in Owybee County, Idaho. Rosgren (1996), referring to this surface as the flood prone area, provided an on-site technique to establish the elevation/width for calculation of the entrenchment ratio. This field technique identifies surfaces that he cites as being associated with a less than 50-year return flood interval. In western riparian areas, this surface is associated with less vegetation cover, recently deposited fluvial materials dominated by sandy surfaces, and high flow channels that frequently bisect the abandoned floodplain terrace.

Aquatic Resources

All waters and water habitats, including lakes, ponds, streams, rivers and adjoining riparian areas that they affect, marshes, vernal pools, seeps, flats, and other wetlands.

Bankfull Channel

That part of the fluvial system that corresponds to the discharge that at which the channel maintenance is the most active, that is, the discharge at which the work of moving sediment, forming or removing bars, and forming or changing bends and meanders is done, and generally doing work that results in the average morphologic charactersics of channels (Dunne and Leoplold, 1978).

Channel

A natural stream or river, or an artificial feature such as a ditch or canal, that exhibits features of bed and bank, and conveys water primarily unidirectional and downgradient.

Channel Type

Channel type refers to the Rosgen (1996) classification of streams, which is based on channel slope, sinuosity, entrenchment, width-to-depth ratios, and channel substrate.

Clean Water Act

The federal law that establishes standards and procedures for limiting the discharge of fill and pollutants into jurisdictional waters of the United States.

Delineation

A determination of the boundaries of a wetland or other aquatic resources.

Ephemeral

Ephemeral streams are defined as streams in which flow is attributable only to surface water runoff in response to precipitation.

Floodplain (also Flood plain)

The land adjacent to a stream or lake, built of alluvium and subject to repeated flooding.

Functional Assessment

The process by which the capacity of a wetland to perform a function is measured.

Geomorphic

A term referring to the shape of the land surface.

Geomorphic Unit

A delineated area within the fluvial corridor that shares similar hydrological events and morphological features. The map unit is named according to the lowest ranked level from the vegetation classification system used in the study.

Geographical Information System (GIS) and Geospatial Data

GIS is a computer information system that uses information that is spatially referenced to the Earth and allows the user to analyze and display these locational and spatial data. More specifically, GIS provides the capability to relate layers of different types of data for the same points. The spatially related data may be combined, analyzed, and mapped within a coordinate system. For example, the most common depiction of spatial information is a map, on which the location of any point could be given using latitude and longitude.

Hydrogeomorphic Wetland Class

A method of categorizing wetlands based on their hydrologic and geomorphic characteristics. There are five basic hydrogeomorphic classes, including riverine, depression, fringe, slope, and flat wetlands.

Intermittent Stream

Intermittent streams are defined as streams in which groundwater maintained base flow occurs intermittently at different times of the year.

Jurisdictional Wetlands

Areas that meet the soil, vegetation, and hydrologic criteria described in the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987).

Natural Community Conservation Plan (NCCP)

A program of the Department of Fish and Game (State) that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. The NCCP process identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. The primary objective of the NCCP program is the conservation of natural communities at the ecosystem scale while accommodating compatible land uses.

Ordinary High Water (OHW)

That line along the riparian corridor that is established by fluctuations of water and indicated by physical features that are persistent to the exhibit that and ordinary high water mark develops. The jurisdictional limits of Waters of the United States are identified using indicators of OHW.

Perennial Stream

Perennial streams are defined as streams in which base flow is maintained year round by groundwater.

Riparian Vegetation

That vegetation that follows along the stream corridors associated with either active floodplains or groundwater associated with confined discharge areas. Typically dominated by several willow and wetland herbaceous species.

Stream Order

First order streams (i.e., the smallest mapped streams, or stream branches, without tributaries) discharge into second order streams (i.e., branches of streams receiving discharges from only first order streams). Lower order streams may discharge directly into a third order stream (i.e., larger branches of a stream receiving first and second order tributaries). In general, as stream orders increase, the width of the bankfull channel increases, and the size of the area supporting riparian vegetation increases.

Stream Type

Stream type refers to the Rosgen (1996) classification of streams that is based on channel slope, sinuosity, entrenchment, width to depth ratios, and channel substrate.

Section 404 Permit

The permit issued by the Corps under Section 404 of the *Clean Water Act* for authorizing the discharge of dredged or fill material into waters of the United States, including wetlands; also known as Corps permit, fill permit, Department of the Army permit, DA permit, individual permit, 404 permit.

Thalweg

The line characterizing the lowest, or deepest, points along the length of a channel or stream bed or valley.

Valley Type

Valley type refers to the Rosgen (1996) classification of valleys, which is based on valley slope, width, and shape.

Vegetation (Plant) Community

Vegetation communities are stands of similar overstory species. Either a single species can dominate the stand or a mixture of species can. These communities are described based upon the most dominant species using either ocular or plot data.

Vegetation Unit

A delineated area that shares similar kinds of vegetation. The map unit is named according to the lowest ranked level from the vegetation classification system used in the study.

Waters of the United States (WoUS)

Water bodies that are regulated under Section 404 of the *Clean Water Act*. It is the broadest category of regulated water bodies and includes wetlands along with non-wetland habitats, such as streams, rivers, lakes, ponds, bays, and oceans.

Watershed

A geographical area that drains to a major water body such as a river, lake, or creek, which is usually the water body for which the basin is named.

Wetland

Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

APPENDIX B: VEGETATION COMMUNITY CLASSIFICATION

Alkali Marsh__Alkali Marsh
Alkali Marsh__*Distichlis spicata*
Alkali Marsh__*Typha* spp.

Artificial Structure__Aquaduct
Artificial Structure__Constructed Wetlands
Artificial Structure__Disturbed Sites
Artificial Structure__Flood Control Structure
Artificial Structure__Lined Pond/Fountain
Artificial Structure__Pond
Artificial Structure__Retention Basin
Artificial Structure__Sewage Pond

Chaparral__*Adenostoma sparsifolium*
Chaparral__*Arctostaphylos pungens*
Chaparral__*Arctostaphylos* spp.
Chaparral__*Baccharis sarathroides*
Chaparral__*Ceanothus tomentosus*
Chaparral__*Quercus berberidifolia*
Chaparral__*Rhus integrefolia*
Chaparral__*Rhus ovata*
Chaparral__*Rhus trilobata*

Freshwater Marsh__*Azolla filiculoides*
Freshwater Marsh__Disturbed Wetland
Freshwater Marsh__*Eleocharis* spp.
Freshwater Marsh__*Juncus effussus*
Freshwater Marsh__*Juncus mexicanus*
Freshwater Marsh__*Scirpus acutus*
Freshwater Marsh__*Scirpus americanus*
Freshwater Marsh__*Scirpus microcarpus*
Freshwater Marsh__*Typha* spp.

Grassland, Native__*Leymus triticoides*
Grassland, Native__*Muhlenbergia rigens*
Grassland, Native__*Polypogon* spp.
Grassland, Native__*Sporobolus* spp.
Grassland, Native__*Stipa pulchra*
Grassland, Non-Native__*Agropyron repens*
Grassland, Non-Native__*Avena barbata*
Grassland, Non-Native__*Avena fatua*
Grassland, Non-Native__*Bromus diandrus*
Grassland, Non-Native__*Bromus rubens*
Grassland, Non-Native__*Bromus tectorum*
Grassland, Non-Native__*Cynodon plectostachyus*
Grassland, Non-Native__*Echinochloa muricata*
Grassland, Non-Native__*Hordeum leporinum*
Grassland, Non-Native__*Lolium perenne*

Herbaceous Native__Riparian Dry (Dry Species)
Herbaceous Native__Riparian Moist (Moist Species)
Herbaceous Native__Riparian Wet (Wet Species)
Herbaceous Non-Native__Agricultural Weeds
Herbaceous Non-Native__Common Weeds

Juncus Meadow__*Juncus effusus*
Juncus Meadow__*Juncus mexicanus*

Montane Forest__*Abies concolor*
Montane Forest__*Pinus coulteri*
Montane Forest__*Pinus jeffreyi*
Montane Forest__*Pinus ponderosa*
Montane Forest__*Pseudotsuga macrocarpa*

Shrub Native_*Salix* spp.
Shrub Native__*Artemisia nova*
Shrub Native__*Artemisia tridentata*
Shrub Native__*Atriplex californica*
Shrub Native__*Atriplex canescens*
Shrub Native__*Baccharis pilularis*
Shrub Native__*Baccharis salicifolia*
Shrub Native__*Bebbia juncea*
Shrub Native__*Brickellia californica*
Shrub Native__*Chilopsis linearis*
Shrub Native__*Encelia farinosa*
Shrub Native__*Eriodictyon crassifolium*
Shrub Native__*Eriogonum fasciculatum*
Shrub Native__*Eriogonum wrightii*
Shrub Native__*Gutierrezia sarothrae*
Shrub Native__*Isocoma menziesii*
Shrub Native__*Juniperus californica*
Shrub Native__*Lepidospartum squamatum*
Shrub Native__*Salix exigua*
Shrub Native__*Salix goodingii*
Shrub Native__*Salix laevigata*
Shrub Native__*Salix lasiolepis*
Shrub Native__*Salix melanopsis*
Shrub Native__*Salvia mellifera*
Shrub Native__*Sambucus mexicana*
Shrub Native__*Senecio flaccidus*

Shrub, Non-Native__*Nicotiana glauca*
Shrub, Non-Native__*Olea europea*
Shrub, Non-Native__*Tamarix* spp.

Trees/Woodland/Forest, Native__*Alnus rhombifolia*
Trees/Woodland/Forest, Native__*Fraxinus dipetala*
Trees/Woodland/Forest, Native__*Fraxinus velutina*
Trees/Woodland/Forest, Native__*Platanus racemosa*
Trees/Woodland/Forest, Native__*Populus balsamifera*
Trees/Woodland/Forest, Native__*Populus fremontii*
Trees/Woodland/Forest, Native__*Quercus agrifolia*
Trees/Woodland/Forest, Native__*Quercus chrysolepis*
Trees/Woodland/Forest, Native__*Quercus engelmannii*
Trees/Woodland/Forest, Native__*Quercus kelloggii*
Trees/Woodland/Forest, Native__*Salix exigua*
Trees/Woodland/Forest, Native__*Salix goodingii*
Trees/Woodland/Forest, Native__*Salix laevigata*
Trees/Woodland/Forest, Native__*Salix lasiolepis*
Trees/Woodland/Forest, Native__*Salix* spp.
Trees/Woodland/Forest, Native__*Washingtonia filifera*
Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.
Trees/Woodland/Forest, Non-Native__*Schinus molle*

Unvegetated__Dry Wash Channel
Unvegetated__Lakeshore

Water Body__Freshwater Pond
Water Body__Lake
Water Body__Pond
Water Body__River
Water Body__Spring

APPENDIX C: SAMPLE POINT 101

Project Name: Westriverside Watershed	Date: 03/04/2002	Time:
Sample Point Number: 101	County: Riverside	State: CA
Investigators: Lichvar et al	Roll No:	Photo No:
Yes Do Normal Circumstances exist on the site?	UTM zone: 11	Datum: NAD83
No Is the site significantly disturbed (Atypical Situation)?	North: 3713754	
No Is the site a potential Problem Area?	West: 485093	

VEGETATION

No.	Species	Strata	Indicator Status	Percent Cover	Dominant Species
1	CONIUM MACULATUM	Herb	FACW	5.00	Yes
2	BRASSICA NIGRA	Herb	UPL	5.00	Yes
3	ARTEMISIA DOUGLASIANA	Herb	FACW	5.00	Yes
4	SAMBUCUS MEXICANA	Shrub	FAC	30.00	Yes
5	SALIX LASIOLEPIS	Shrub	FACW	5.00	No
6	QUERCUS AGRIFOLIA	Tree	UPL	60.00	Yes

Total Number of Species: 6 Total Dominants: 5
Percent of Dominants that are Wetland Species: 50/20: 60.00 FAC(minus)- applied: 60.00
Prevalence Index: 4.05 FAC Neutral: Yes

HYDROLOGY

Recorded Data:
- ____ Stream, Lake, or Tide Gauge
- ____ Aerial Photographs
- X Other
- ____ No Recorded Data Available

Field Observations:
- Depth of Surface Water: ________ (in.)
- Depth to Free Water in Pit: ________ (in.)
- Depth to Saturated Soil: ________ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water-Stained Leaves
- ____ Local Soil Survey Data
- X FAC-Neutral Test
- ____ Other (Explain in Remarks)

SOILS

Map Unit Name:
(Series and Phase):
Taxonomy (Subgroup):

Drainage Class:
Field Observations
Confirm Mapped Type? No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Texture, Concretions, Structure	Redox Feature Abundance/Contrast	Redox Feature Colors(Munsell Moist)
0-10	A	10 yrYR3/3	Loamy sand		

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

NRCS Field Indicators: ___

WETLAND DETERMINATION

Yes Hydrophytic Vegetation Present?
Yes Wetland Hydrology Present?
No Hydric Soils Present?
No Is this Sampling Point Within a Wetland?
No Is this Sampling Point a Waters of the US?

REMARKS

Old drift line - no recent flooding.

Wetland

____ Yes
X No

WoUS

____ Yes
X No

6 Species Richness
4.05 Prevalence Index

Categorical Variables

Veg code

__ Alder Riparian Forest__Alnus rhombifolia
__ Brackish Marsh__Paspalum notatum
__ Brackish Marsh__Typha spp.
__ Brackish Marsh__Xanthium stumarium
__ Central (Lucien) Coastal Scrub__Baccharis pilularis
__ Chaparral__Adenostoma fasciculatum
__ Chaparral__Adenostona sparsifolium
__ Chaparral__Arctostaphylos sp.
__ Chaparral__Baccharis sarothroides
__ Chaparral__Quercus berberidifolia
__ Chaparral__Rhus integrefolia
__ Chaparral__Rhus ovata
__ Chaparral__Rhus trilobata
__ Chaparral__Salvia mellifera
__ Disturbed__Arundo donax
__ Disturbed__Baccharis salicifolia
__ Disturbed__Disturbed Grazed
__ Disturbed__Empty Pond or Lake Bottom
__ Disturbed__General Agriculture
__ Disturbed__Helianthus spp.
__ Disturbed__Melilotus alba
__ Disturbed__Oleaceae olea
__ Disturbed__Quercus agrifolia
__ Disturbed__Sphaeralcea ambigua
__ Disturbed__Typha spp.
__ Disturbed__Xanthium stumarium
__ Dry Wash/Channel__Non-Vegetated
__ Elderberry Savanna__Sambucus mexicana
__ Eucalyptus Woodland__Eucalyptus spp.
__ Freshwater Marsh__Ambrosia psilostachya
__ Freshwater Marsh__Azolla filiculoides
__ Freshwater Marsh__Carex spp.
__ Freshwater Marsh__Cirsium vulgare
__ Freshwater Marsh__Cyperus acuminatus
__ Freshwater Marsh__Cyperus odoratus
__ Freshwater Marsh__Distichlis spicata
__ Freshwater Marsh__Echinoclhoa muricata
__ Freshwater Marsh__Eleocharis sp.
__ Freshwater Marsh__Festuca californica
__ Freshwater Marsh__Isocoma menziesii
__ Freshwater Marsh__Juncus effussus
__ Freshwater Marsh__Juncus mexicanus
__ Freshwater Marsh__Scirpus acutus
__ Freshwater Marsh__Scirpus americanus
__ Freshwater Marsh__Scirpus cernuus
__ Freshwater Marsh__Scirpus microcarpus
__ Freshwater Marsh__Scirpus robustus
__ Freshwater Marsh__Typha spp.
__ Freshwater Marsh__Veronica anagalis-aquatic
__ Man Made Structures__Agricultural or Artificial Pond
__ Man Made Structures__Basin (catchment or overflow)
__ Man Made Structures__Concrete Flood Channel
__ Man Made Structures__Lined Pond/Fountain
__ Man Made Structures__Salix goodingii Flood Channel

Quantitative Variables

20	Woody Debris Cover %
60	Tree Cover %
35	Shrub Cover %
100	Total Cover %
33	Other Exotic %
80	Litter %
50	Silt %
40	Sand %
0	Gravel %
__	Gravel Size (cm)
0	Cobble %
__	Cobble Size (cm)
6	Species Richness
__	PI value

APPENDIX D: SAMPLE POINT 88

SOILS

Map Unit Name: Drainage Class:
(Series and Phase): Field Observations
Taxonomy (Subgroup): Confirm Mapped Type? No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Texture, Concretions, Structure	Redox Feature Abundance/Contrast	Redox Feature Colors(Munsell Moist)

Hydric Soil Indicators:
- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

NRCS Field Indicators: ___

WETLAND DETERMINATION

No Hydrophytic Vegetation Present?
No Wetland Hydrology Present?
No Hydric Soils Present?
No Is this Sampling Point Within a Wetland?
Yes Is this Sampling Point a Waters of the US?

REMARKS

Wetland
____ Yes
X No

WoUS
X Yes
____ No

0 Species Richness
0.00 Prevalence Index

__ Man Made Structures__Salix goodingii Tank
__ Man Made Structures__Sewage Pond
__ Man Made Structures__Spring
__ Man Made Structures__Tank
__ Man Made Structures__Typha spp. Flood Channel
__ Meadow__Carex spp.
__ Meadow__Juncus mexicanus
__ Montane Forest__Abies concolor
__ Montane Forest__Cupressus sp.
__ Montane Forest__Pinus coulteri
__ Montane Forest__Pinus ponderosa
__ Mule Fat Scrub__Baccharis salicifolia
__ Native Grassland__Leymus triticoides
__ Native Grassland__Muhlenbergia rigens
__ Native Grassland__Polypogon spp
__ Native Grassland__Sporobolus spp
__ Non-Native Grassland__Avena barbata
__ Non-Native Grassland__Bromus diandrus
__ Non-Native Grassland__Cynodon plectostachyus
__ Non-Native Grassland__Echinoclhoa muricata
__ Non-Native Grassland__Lolium perenne
__ Non-Native Vegetation__Amaranthus albus
__ Non-Native Vegetation__Brassica nigra
__ Non-Native Vegetation__Centaurea miletensis
__ Non-Native Vegetation__Nicotiana glauca
__ Non-Native Vegetation__Rumex crispus
__ Non-Native Vegetation__Salsola tragus
__ Non-Native Vegetation__Schinus molle
__ Non-Native Vegetation__Veronica anagalis-aquatica
__ Non-Woody Herb__Multiple Species
__ Oak Forest__Quercus agrifolia
__ Oak Forest__Quercus chrysolepis
__ Oak Riparian Forest__Quercus agrifolia
__ Oak Riparian Forest__Quercus engelmannii
__ Oak Woodland__Quercus agrifolia
__ Oak Woodland__Quercus engelmannii
__ Riparian Herb__Brickellia californica
__ Riparian Herb__Gnaphalium californicum
__ Riparian Herb__Mixed Herbaceous spp.
__ Riparian Herb__Ranunculus sp.
__ Riparian Herb__Rudbeckia sp.
__ Riparian Woodland__Fraxinus velutina
__ Sage Scrub__Artemisia nova
__ Sage Scrub__Artemisia tridentata
__ Sage Scrub__Atriplex californica
__ Sage Scrub__Atriplex canescens
__ Sage Scrub__Bebbia juncea
__ Sage Scrub__Eriodictyon crassifolium
__ Sage Scrub__Eriogonum fasciculatum
__ Sage Scrub__Lepidospartum squamatum
__ Sage Scrub__Salvia mellifera
__ Sage Scrub__Senecio flaccidus
__ Salt Marsh__Distichlis spicata
__ Southern Cottonwood-Willow Riparian Forest__Populus balsamifera
__ Southern Cottonwood-Willow Riparian Forest__Populus fremontii
__ Southern Sycamore-Alder Riparian Woodland__Platanus racemosa
[X] Southern Willow Riparian Forest__Salix goodingii

APPENDIX E: RATINGS FOR NON-FLOODPLAIN AND FLOODPLAIN RIPARIAN VEGETATION

Common Name	Non-Floodplain Riparian Rating	Floodplain Riparian Rating
Alkali Marsh__*Distichlis spicata*	0	5
Artificial Structure__Disturbed Sites	5	6
Artificial Structure__Flood Control Structure	6	5
Artificial Structure__Lined Pond/Fountain	2	0
Artificial Structure__Retention Basin	1	1
Artificial Structure__Sewage Pond	1	0
Chaparral__*Adenostoma sparsifolium*	6	6
Chaparral__*Arctostaphylos* spp.	0	6
Chaparral__*Quercus berberidifolia*	6	0
Chaparral__*Rhus integrefolia*	6	6
Chaparral__*Rhus ovata*	6	6
Chaparral__*Rhus trilobata*	5	5
Freshwater Marsh__Disturbed Wetland	3	0
Freshwater Marsh__*Eleocharis* spp.	2	2
Freshwater Marsh__*Juncus effussus*	2	2
Freshwater Marsh__*Juncus mexicanus*	4	0
Freshwater Marsh__*Scirpus acutus*	1	0
Freshwater Marsh__*Typha* spp.	1	1
Grassland, Native__*Leymus triticoides*	6	0
Grassland, Native__*Muhlenbergia rigens*	6	5
Grassland, Native__*Polypogon* spp.	4	4
Grassland, Native__*Sporobolus* spp.	4	0
Grassland, Native__*Agropyron repens*	0	5
Grassland, Non-Native__*Avena barbata*	6	6
Grassland, Non-Native__*Avena fatua*	0	6
Grassland, Non-Native__*Bromus diandrus*	0	6
Grassland, Non-Native__*Bromus rubens*	6	0
Grassland, Non-Native__*Bromus tectorum*	6	6
Grassland, Non-Native__*Echinochloa muricata*	6	0
Grassland, Non-Native__*Hordeum leporinum*	5	5
Grassland, Non-Native__*Lolium perenne*	0	3

Common Name	**Non-Floodplain Riparian Rating**	**Floodplain Riparian Rating**
Herbaceous Native__Riparian Dry (Dry Species)	6	6
Herbaceous Native__Riparian Moist (Moist Species)	2	2
Herbaceous Non-Native__Agricultural Weeds	6	6
Herbaceous Non-Native__Common Weeds	6	6
Juncus Meadow__*Juncus mexicanus*	4	3
Man Made Structures__Disturbed Sites	5	0
Montane Forest__*Abies concolor*	6	0
Montane Forest__*Pinus coulteri*	6	0
Montane Forest__*Pinus jeffreyi*	6	0
Montane Forest__*Pinus ponderosa*	6	6
Montane Forest__*Pseudotsuga macrocarpa*	6	0
Shrub Native_*Salix* spp.	3	2
Shrub Native__*Artemisia tridentata*	6	6
Shrub Native__*Atriplex canescens*	0	6
Shrub Native__*Baccharis pilularis*	5	5
Shrub Native__*Baccharis salicifolia*	4	3
Shrub Native__*Brickellia californica*	0	6
Shrub Native__*Chilopsis linearis*	0	3
Shrub Native__*Eriodictyon crassifolium*	6	6
Shrub Native__*Eriogonum fasciculatum*	6	6
Shrub Native__*Eriogonum wrightii*	0	6
Shrub Native__*Isocoma menziesii*	0	6
Shrub Native__*Juniperus californica*	6	0
Shrub Native__*Lepidospartum squamatum*	6	6
Shrub Native__*Salix exigua*	3	2
Shrub Native__*Salix goodingii*	3	2
Shrub Native__*Salix laevigata*	3	4
Shrub Native__*Salix lasiolepis*	3	2
Shrub Native__*Salix melanopsis*	0	4
Shrub Native__*Sambucus mexicana*	6	6
Shrub, Non-Native__*Nicotiana glauca*	6	6
Shrub, Non-Native__*Olea europea*	6	0
Shrub, Non-Native__*Tamarix* spp.	5	4
Trees/Woodland/Forest, Native__*Alnus rhombifolia*	3	4

Common Name	Non-Floodplain Riparian Rating	Floodplain Riparian Rating
Trees/Woodland/Forest, Native__*Fraxinus dipetala*	5	0
Trees/Woodland/Forest, Native__*Fraxinus velutina*	4	4
Trees/Woodland/Forest, Native__*Platanus racemosa*	4	4
Trees/Woodland/Forest, Native__*Populus balsamifera*	5	3
Trees/Woodland/Forest, Native__*Populus fremontii*	4	4
Trees/Woodland/Forest, Native__*Quercus agrifolia*	6	6
Trees/Woodland/Forest, Native__*Quercus chrysolepis*	6	5
Trees/Woodland/Forest, Native__*Quercus engelmannii*	6	6
Trees/Woodland/Forest, Native__*Quercus kelloggii*	6	0
Trees/Woodland/Forest, Native__*Salix exigua*	3	0
Trees/Woodland/Forest, Native__*Salix goodingii*	3	2
Trees/Woodland/Forest, Native__*Salix laevigata*	4	4
Trees/Woodland/Forest, Native__*Salix lasiolepis*	3	2
Trees/Woodland/Forest, Native__*Salix* spp.	3	0
Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.	6	6
Trees/Woodland/Forest, Non-Native__*Schinus molle*	6	6
Unvegetated__Dry Wash Channel	1	1
Water Body__Freshwater Pond	1	1
Water Body__Pond	1	1
Water Body__Spring	1	1

0 Indicates that it doesn’t occur in this setting.

APPENDIX F: COMPLETE LIST OF MAP UNITS USED IN THE STUDY WITH COUNT AND AREA TOTALS

Vegetation unit	Count	Acres	Hectare
Alkali Marsh__Alkali Marsh	1	0.3	0.1
Alkali Marsh__*Distichlis spicata*	13	25.3	10.2
Alkali Marsh__*Typha* spp.	2	0.1	0.0
Artificial Structure__Aquaduct	26	146.2	59.2
Artificial Structure__Constructed Wetlands	11	235.1	95.1
Artificial Structure__Disturbed Sites	174	290.7	117.6
Artificial Structure__Flood Control Structure	20	11.4	4.6
Artificial Structure__Lined Pond/Fountain	50	85.3	34.5
Artificial Structure__Pond	35	127.5	51.6
Artificial Structure__Retention Basin	182	1326.7	536.9
Artificial Structure__Sewage Pond	56	345.0	139.6
Chaparral__*Adenostoma sparsifolium*	7	3.3	1.3
Chaparral__*Arctostaphylos pungens*	2	0.1	0.1
Chaparral__*Arctostaphylos* spp.	1	1.5	0.6
Chaparral__*Baccharis sarathroides*	2	0.1	0.0
Chaparral__*Ceanothus tomentosus*	2	0.1	0.0
Chaparral__*Quercus berberidifolia*	86	228.7	92.6
Chaparral__*Rhus integrefolia*	7	19.4	7.9
Chaparral__*Rhus ovata*	29	12.6	5.1
Chaparral__*Rhus trilobata*	2	0.2	0.1
Freshwater Marsh__*Azolla filiculoides*	2	18.2	7.4
Freshwater Marsh__Disturbed Wetland	20	106.5	43.1
Freshwater Marsh__*Eleocharis* spp.	37	24.3	9.8
Freshwater Marsh__*Juncus effussus*	6	6.7	2.7
Freshwater Marsh__*Juncus mexicanus*	3	1.1	0.5
Freshwater Marsh__*Scirpus acutus*	74	111.9	45.3
Freshwater Marsh__*Scirpus americanus*	4	2.0	0.8
Freshwater Marsh__*Scirpus microcarpus*	2	1.5	0.6
Freshwater Marsh__*Typha* spp.	536	513.8	207.9
Grassland, Native__*Leymus triticoides*	4	0.7	0.3
Grassland, Native__*Muhlenbergia rigens*	21	39.8	16.1
Grassland, Native__*Polypogon* spp.	21	62.2	25.2
Grassland, Native__*Sporobolus* spp.	5	22.1	9.0
Grassland, Native__*Stipa pulchra*	1	0.7	0.3
Grassland, Non-Native__*Agropyron repens*	1	4.0	1.6
Grassland, Non-Native__*Avena barbata*	14	5.0	2.0
Grassland, Non-Native__*Avena fatua*	2	0.2	0.1
Grassland, Non-Native__*Bromus diandrus*	4	66.2	26.8
Grassland, Non-Native__*Bromus rubens*	2	0.4	0.2

Vegetation unit	Count	Acres	Hectare
Grassland, Non-Native__*Bromus tectorum*	156	758.6	307.0
Grassland, Non-Native__*Cynodon plectostachyus*	2	0.8	0.3
Grassland, Non-Native__*Echinochloa muricata*	2	1.4	0.6
Grassland, Non-Native__*Hordeum leporinum*	4	21.6	8.8
Grassland, Non-Native__*Lolium perenne*	9	15.8	6.4
Herbaceous Native__Riparian Dry (Dry Species)	323	793.8	321.3
Herbaceous Native__Riparian Moist (Moist Species)	34	18.0	7.3
Herbaceous Native__Riparian Wet (Wet Species)	1	0.8	0.3
Herbaceous Non-Native__Agricultural Weeds	46	371.8	150.5
Herbaceous Non-Native__Common Weeds	237	493.1	199.6
Juncus Meadow__*Juncus effusus*	1	0.2	0.1
Juncus Meadow__*Juncus mexicanus*	48	1120.1	453.3
Montane Forest__*Abies concolor*	19	238.2	96.4
Montane Forest__*Pinus coulteri*	1	0.9	0.4
Montane Forest__*Pinus jeffreyi*	24	395.7	160.1
Montane Forest__*Pinus ponderosa*	10	5.5	2.2
Montane Forest__*Pseudotsuga macrocarpa*	5	202.0	81.8
Shrub Native__*Artemisia nova*	1	0.1	0.0
Shrub Native__*Artemisia tridentata*	105	281.2	113.8
Shrub Native__*Atriplex californica*	1	0.7	0.3
Shrub Native__*Atriplex canescens*	16	91.5	37.0
Shrub Native__*Baccharis pilularis*	24	8.6	3.5
Shrub Native__*Baccharis salicifolia*	1282	2880.0	1165.5
Shrub Native__*Bebbia juncea*	1	0.4	0.1
Shrub Native__*Brickellia californica*	22	50.5	20.5
Shrub Native__*Chilopsis linearis*	4	22.5	9.1
Shrub Native__*Encelia farinosa*	1	1.0	0.4
Shrub Native__*Eriodictyon crassifolium*	29	89.7	36.3
Shrub Native__*Eriogonum fasciculatum*	193	288.4	116.7
Shrub Native__*Eriogonum wrightii*	4	0.2	0.1
Shrub Native__*Gutierrezia sarothrae*	1	6.9	2.8
Shrub Native__*Isocoma menziesii*	4	7.6	3.1
Shrub Native__*Juniperus californica*	4	3.7	1.5
Shrub Native__*Lepidospartum squamatum*	121	859.7	347.9
Shrub Native__*Salix exigua*	53	33.0	13.4
Shrub Native__*Salix goodingii*	75	90.5	36.6
Shrub Native__*Salix laevigata*	90	50.8	20.6
Shrub Native__*Salix lasiolepis*	1518	1585.6	641.7
Shrub Native__*Salix melanopsis*	1	0.1	0.0
Shrub Native__*Salix* spp.	67	127.3	51.5
Shrub Native__*Salvia mellifera*	2	0.6	0.3
Shrub Native__*Sambucus mexicana*	26	13.2	5.3

Vegetation unit	Count	Acres	Hectare
Shrub Native__*Senecio flaccidus*	1	0.3	0.1
Shrub, Non-Native__*Nicotiana glauca*	27	18.0	7.3
Shrub, Non-Native__*Olea europea*	3	1.1	0.5
Shrub, Non-Native__*Tamarix* spp.	224	510.6	206.6
Trees/Woodland/Forest, Native__*Alnus rhombifolia*	39	203.4	82.3
Trees/Woodland/Forest, Native__*Fraxinus dipetala*	1	0.2	0.1
Trees/Woodland/Forest, Native__*Fraxinus velutina*	4	0.4	0.2
Trees/Woodland/Forest, Native__*Platanus racemosa*	714	678.3	274.5
Trees/Woodland/Forest, Native__*Populus balsamifera*	7	15.6	6.3
Trees/Woodland/Forest, Native__*Populus fremontii*	709	1107.5	448.2
Trees/Woodland/Forest, Native__*Quercus agrifolia*	2347	4350.6	1760.6
Trees/Woodland/Forest, Native__*Quercus chrysolepis*	194	634.8	256.9
Trees/Woodland/Forest, Native__*Quercus engelmannii*	49	25.2	10.2
Trees/Woodland/Forest, Native__*Quercus kelloggii*	22	549.1	222.2
Trees/Woodland/Forest, Native__*Salix exigua*	3	2.6	1.1
Trees/Woodland/Forest, Native__*Salix goodingii*	402	608.0	246.0
Trees/Woodland/Forest, Native__*Salix laevigata*	147	114.4	46.3
Trees/Woodland/Forest, Native__*Salix lasiolepis*	662	825.0	333.9
Trees/Woodland/Forest, Native__*Salix* spp.	20	42.0	17.0
Trees/Woodland/Forest, Native__*Washingtonia filifera*	1	0.9	0.4
Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.	216	157.1	63.6
Trees/Woodland/Forest, Non-Native__*Schinus molle*	14	3.0	1.2
Unvegetated__Dry Wash Channel	340	950.3	384.6
Unvegetated__Lakeshore	11	20.7	8.4
Water Body__Freshwater Pond	109	257.6	104.2
Water Body__Lake	13	13213.0	5347.1
Water Body__Pond	254	563.2	227.9
Water Body__River	34	11.8	4.8
Water Body__Spring	1	0.1	0.1

APPENDIX G: PLANT SPECIES RECORD DURING SAMPLING

Abronia villosa	*Cyperus odoratus*
Adenostoma fasciculatum	*Datura stramonium*
Adenostoma sparsifolium	*Distichlis spicata*
Agropyron intermedium var. *Trichophorum*	*Dudleya cymosa*
Alnus rhombifolia	*Echinochloa crusgalli*
Amaranthus albus	*Echinochloa muricata*
Amaranthus blitoides	*Elymus cinereus*
Amaranthus californicus	*Elymus glaucus*
Amorpha fruticosa	*Encelia farinosa*
Amsinckia menziesii	*Epilobium* sp.
Ambrosia psilostachya	*Erodium botrys*
Amsinckia tessellata	*Erodium cicutarium*
Anemopsis californica	*Eriophyllum confertiflorum*
Artemisia californica	*Eriodictyon crassifolium*
Artemisia douglasiana	*Erodium cusic*
Arundo donax	*Eriogonum fasciculatum*
Artemisia dracunculus	*Eriogonum inflatum*
Arctostaphylos glauca	*Erigeron* sp.
Artemisia ludoviciana	*Eucalyptus globulus*
Artemisia sp.	*Eucalyptus polyanthemos*
Artemisia tridentata	*Eucalyptus* sp.
Artemisia tridentata ssp. *Parishii*	*Festuca arundinacea*
Astragalus lentiginosus	*Fraxinus velutina*
Astragalus sp.	*Galium aparine*
Aster subspicatus	*Galium triflorum*
Atriplex canescens	*Geranium molle*
Atriplex confertifolia	*Gilia leptalea*
Atriplex ludoviciana	*Gnaphalium beneolens*
Avena barbata	*Gnaphalium californicum*
Avena fatua	*Gnaphalium canescens*
Baccharis pilularis	*Gutierrezia sarothrae*
Baccharis sarothroides	*Helianthus annuus*
Barbarea verna	*Heliotropium curassavicum*
Baccharis viminea	*Heliotropium curassavicum var. Oculatum*
Berula erecta	*Heterotheca grandiflora*
Brickellia californica	*Hordeum leporinum*

Bromus carinatus	*Iris missouriensis*
Bromus diandrus	*Juncus balticus*
Bromus mollis	*Juncus dubius*
Brassica nigra	*Juncus mexicanus*
Bromus rubens	*Juncus* sp.
Bromus sp.	*Lactuca serriola*
Bromus tectorum	Lepidium densiflorum
Carex barbarae	*Lepidium latifolium*
Calystegia longipes	*Lemna minor*
Carex praegracilis	*Lepidium nitidum*
Centaurea calcitrapa	*Lepidospartum squamatum*
Ceanothus crassifolius	*Limonium californicum*
Ceanothus cuneatus	*Lotus corniculatus*
Ceanothus greggii	*Lolium perenne*
Centaurea maculosa	*Lotus scoparius*
Centaurea melitensis	*Lonicera subspicata*
Ceanothus verrucosus	*Lupinus bicolor*
Cirsium sp.	*Lythrum hyssopifolia*
Cirsium vulgare	*Matricaria matricarioides*
Claytonia parviflora	*Marah macrocarpus*
Claytonia perfoliata	*Marrubium vulgare*
Conium maculatum	*Melilotus alba*
Croton californicus	*Melilotus indica*
Cryptantha intermedia	*Melilotus officinalis*
Crypsis schoenoides	*Medicago polymorpha*
Cyperus alternifolius	*Mentha spicata*
Cynodon dactylon	*Mimulus aurantiacus*
Cyperus eragrostis	*Muhlenbergia rigens*
Cytisus multiflorus	*Nasturtium officinale*
Nicotiana glauca	*Salix laevigata*
Opuntia bigelovii	*Salix lasiolepis*
Opuntia littoralis	*Salvia mellifera*
Opuntia phaeacantha var. *Discata*	*Sambucus mexicana*
Opuntia polyacantha var. *Rufispina*	*Sarcobatus vermiculatus*
Opuntia ramosissima	*Scirpus acutus*
Opuntia sp.	*Scirpus americanus*
Orthocarpus luteus	*Schismus barbatus*
Panicum acuminatum	*Scirpus californicus*

Panicum capillare	*Scrophularia californica*
Panicum dichotomiflorum	*Scirpus cernuus*
Paspalum dilatatum	*Scirpus robustus*
Penstemon sp.	Sesuvium verrucosum
Phleum pratense	*Setaria viridis*
Phacelia sp.	*Sisymbrium altissimum*
Pinus coulteri	*Sisyrinchium bellum*
Plantago lanceolata	*Sitanion hystrix*
Plantago major	*Sonchus oleraceus*
Platanus racemosa	*Solanum parishii*
Populus fremontii	*Sporobolus airoides*
Polystichum imbricans	*Sporobolus contractus*
Polygonum lapathifolium	*Stachys ajugoides*
Polypogon monspeliensis	*Stipa diegoensis*
Poa pratensis	*Stipa pulchra*
Populus tremula	*Tamarix parviflora*
Pteridium aquilinum	*Tamarix ramosissima*
Quercus agrifolia	*Tamarix* sp.
Quercus chrysolepis	*Toxicodendron diversilobum*
Quercus dumosa	*Trifolium repens*
Rhus integrifolia	*Typha angustifolia*
Rhus ovata	*Typha latifolia*
Rosa acalca	*Typha* sp.
Rosa californica	*Urtica dioica*
Rudbeckia californica	*Veronica americana*
Rumex crispus	*Veronica anagallis-aquatica*
Rumex salicifolius	*Veronica peregrina*
Salvia apiana	*Vicia americana*
Salvia columbariae	*Vitis californica*
Sanicula crassicaulis	*Vicia cracca*
Salix exigua	*Vulpia myuros*
Salix gooddingii	*Xanthium strumarium*
Salsola kali	

APPENDIX H: VEGETATION MAP UNITS SAMPLED IN STUDY

Vegetation community	**# of Samples**
Alkali Marsh__*Distichlis spicata*	1
Artificial Structure__Disturbed Sites	1
Chaparral__*Rhus ovata*	2
Freshwater Marsh__Disturbed Wetland	1
Freshwater Marsh__*Scirpus americanus*	1
Freshwater Marsh__*Scirpus microcarpus*	1
Freshwater Marsh__*Typha* spp.	6
Grassland, Non-Native__*Bromus diandrus*	1
Grassland, Non-Native__*Bromus tectorum*	6
Grassland, Non-Native__*Echinochloa muricata*	1
Herbaceous Native__Riparian Dry (Dry Species)	9
Herbaceous Native__Riparian Moist (Moist Species)	5
Herbaceous Native__Riparian Wet (Wet Species)	1
Herbaceous Non-Native__Agricultural Weeds	2
Herbaceous Non-Native__Common Weeds	11
Juncus Meadow__*Juncus mexicanus*	1
Montane Forest__*Pinus ponderosa*	1
Shrub Native_*Salix* spp.	1
Shrub Native__*Artemisia tridentata*	6
Shrub Native__*Atriplex canescens*	3
Shrub Native__*Baccharis pilularis*	1
Shrub Native__*Baccharis salicifolia*	17
Shrub Native__*Eriodictyon crassifolium*	3
Shrub Native__*Eriogonum fasciculatum*	10
Shrub Native__*Lepidospartum squamatum*	7
Shrub Native__*Salix exigua*	1
Shrub Native__*Salix goodingii*	1
Shrub Native__*Salix lasiolepis*	12
Shrub, Non-Native__*Nicotiana glauca*	4
Shrub, Non-Native__*Tamarix* spp.	4
Trees/Woodland/Forest, Native__*Fraxinus velutina*	1
Trees/Woodland/Forest, Native__*Platanus racemosa*	6
Trees/Woodland/Forest, Native__*Populus fremontii*	11
Trees/Woodland/Forest, Native__*Quercus agrifolia*	12
Trees/Woodland/Forest, Native__*Quercus chrysolepis*	3
Trees/Woodland/Forest, Native__*Salix goodingii*	7
Trees/Woodland/Forest, Native__*Salix lasiolepis*	4
Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.	1
Unvegetated__Dry Wash Channel	1

APPENDIX I: FREQUENCY AND AREA OF RIPARIAN VEGETATION COMMUNITY TYPES ON THE TERRACE GEOMORPHIC SURFACE

Wetland rating	Riparian vegetation community type	Frequency	Acres	Hectares
Rating 1	Artificial Structure__Retention Basin	3	3.9740	1.6080
	Freshwater Marsh__*Typha* spp.	2	0.5450	0.2200
	Unvegetated__Dry Wash Channel	8	4.3380	1.7550
Rating 2	Freshwater Marsh__*Eleocharis* spp.	2	1.8000	0.7280
	Freshwater Marsh__*Juncus effussus*	1	0.7110	0.2880
	Herbaceous Native__Riparian Moist (Moist Species)	7	7.6830	3.1090
	Shrub Native_*Salix* spp.	3	1.5100	0.6110
	Shrub Native__*Salix exigua*	7	1.7630	0.7130
	Shrub Native__*Salix goodingii*	2	0.1120	0.0460
	Shrub Native__*Salix lasiolepis*	114	93.3770	37.7850
	Trees/Woodland/Forest, Native__*Salix goodingii*	35	57.3450	23.2070
	Trees/Woodland/Forest, Native__*Salix lasiolepis*	73	98.0640	39.6870
Rating 3	Grassland, Non-Native__*Lolium perenne*	6	6.1670	2.4950
	Juncus Meadow__*Juncus mexicanus*	3	13.7720	5.5730
	Shrub Native__*Baccharis salicifolia*	155	156.7040	63.4170
	Shrub Native__*Chilopsis linearis*	3	18.4710	7.4750
	Trees/Woodland/Forest, Native__*Populus balsamifera*	1	0.4340	0.1760
Rating 4	Grassland, Native__*Polypogon* spp.	1	1.6260	0.6580
	Shrub Native__*Salix laevigata*	1	0.3670	0.1480
	Shrub Native__*Salix melanopsis*	1	0.0630	0.0250
	Shrub, Non-Native__*Tamarix* spp.	38	37.5790	15.2090
	Trees/Woodland/Forest, Native__*Alnus rhombifolia*	1	0.8500	0.3440
	Trees/Woodland/Forest, Native__*Fraxinus velutina*	2	0.0380	0.0150
	Trees/Woodland/Forest, Native__*Platanus racemosa*	106	111.1900	45.0000
	Trees/Woodland/Forest, Native__*Populus fremontii*	183	246.4650	99.7450
	Trees/Woodland/Forest, Native__*Salix laevigata*	8	2.4290	0.9830
Rating 5	Alkali Marsh__*Distichlis spicata*	6	7.3490	2.9750
	Artificial Structure__Flood Control Structure	2	0.8410	0.3400
	Grassland, Native__*Muhlenbergia rigens*	3	33.6120	13.6020
	Grassland, Non-Native__*Agropyron repens*	1	3.9550	1.6000
	Grassland, Non-Native__*Hordeum leporinum*	1	17.7640	7.1890
	Shrub Native__*Baccharis pilularis*	16	4.8590	1.9640
	Trees/Woodland/Forest, Native__*Quercus chrysolepis*	18	14.1370	5.7180

Wetland rating	Riparian vegetation community type	Frequency	Acres	Hectares
Rating 6	Artificial Structure__Disturbed Sites	55	51.8360	20.9760
	Chaparral__*Adenostoma sparsifolium*	3	0.4490	0.1810
	Chaparral__*Arctostaphylos* spp.	1	1.5350	0.6210
	Chaparral__*Rhus integrefolia*	3	0.6250	0.2530
	Chaparral__*Rhus ovata*	2	0.3650	0.1480
	Chaparral__*Rhus trilobata*	1	0.0820	0.0330
	Grassland, Non-Native__*Avena barbata*	8	0.8170	0.3290
	Grassland, Non-Native__*Avena fatua*	2	0.1860	0.0750
	Grassland, Non-Native__*Bromus diandrus*	3	0.5830	0.2350
	Grassland, Non-Native__*Bromus tectorum*	38	42.8300	17.3310
	Herbaceous Native__Riparian Dry (Dry Species)	79	112.8770	45.6810
	Herbaceous Non-Native__Agricultural Weeds	18	51.0850	20.6750
	Herbaceous Non-Native__Common Weeds	79	81.3200	32.9090
	Montane Forest__*Pinus ponderosa*	5	0.8530	0.3440
	Shrub Native__*Artemisia tridentata*	76	181.6150	73.4950
	Shrub Native__*Atriplex canescens*	13	72.7650	29.4470
	Shrub Native__*Brickellia californica*	10	22.2880	9.0190
	Shrub Native__*Eriodictyon crassifolium*	16	48.0230	19.4330
	Shrub Native__*Eriogonum fasciculatum*	96	131.0570	53.0390
	Shrub Native__*Eriogonum wrightii*	3	0.1550	0.0630
	Shrub Native__*Isocoma menziesii*	2	7.0310	2.8450
	Shrub Native__*Lepidospartum squamatum*	54	176.8890	71.5860
	Shrub Native__*Sambucus mexicana*	2	1.1190	0.4520
	Shrub, Non-Native__*Nicotiana glauca*	4	2.8980	1.1720
	Trees/Woodland/Forest, Native__*Quercus agrifolia*	418	540.8230	218.8630
	Trees/Woodland/Forest, Native__*Quercus engelmannii*	5	4.5260	1.8320
	Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.	17	8.0570	3.2620
	Trees/Woodland/Forest, Non-Native__*Schinus molle*	2	0.5730	0.2320

APPENDIX J: FREQUENCY AND AREA OF RIPARIAN VEGETATION COMMUNITY TYPES ON NON-FLOODPLAIN SURFACES

Wetland rating	Non-riparian vegetation community type	Frequency	Acres	Hectares
Rating 1	Artificial Structure__Retention Basin	55	172.2960	69.7270
	Artificial Structure__Sewage Pond	1	25.0010	10.1180
	Freshwater Marsh__*Scirpus acutus*	11	4.5090	1.8230
	Freshwater Marsh__*Typha* spp.	82	94.5690	38.2690
	Unvegetated__Dry Wash Channel	15	33.8520	13.6980
	Water Body__Freshwater Pond	8	4.7810	1.9350
	Water Body__Pond	4	4.3470	1.7590
	Water Body__Spring	1	0.1330	0.0540
Rating 2	Artificial Structure__Lined Pond/Fountain	33	60.8660	24.6290
	Freshwater Marsh__*Eleocharis* spp.	2	0.0970	0.0390
	Freshwater Marsh__*Juncus effussus*	4	3.4370	1.3900
	Herbaceous Native__Riparian Moist (Moist Species)	7	4.0590	1.6420
Rating 3	Freshwater Marsh__Disturbed Wetland	4	48.4200	19.5950
	Shrub Native_*Salix* spp.	43	31.0910	12.5800
	Shrub Native__*Salix exigua*	15	3.9300	1.5880
	Shrub Native__*Salix goodingii*	33	18.7530	7.5910
	Shrub Native__*Salix laevigata*	41	13.8970	5.6250
	Shrub Native__*Salix lasiolepis*	842	840.8170	340.2610
	Trees/Woodland/Forest, Native__*Alnus rhombifolia*	13	128.0290	51.8120
	Trees/Woodland/Forest, Native__*Salix exigua*	2	2.2820	0.9240
	Trees/Woodland/Forest, Native__*Salix goodingii*	183	231.1560	93.5410
	Trees/Woodland/Forest, Native__*Salix lasiolepis*	265	207.4080	83.9340
	Trees/Woodland/Forest, Native__*Salix* spp.	10	7.9970	3.2370
Rating 4	Freshwater Marsh__*Juncus mexicanus*	1	0.0700	0.0280
	Grassland, Native__*Polypogon* spp.	12	56.2940	22.7820
	Grassland, Native__*Sporobolus* spp.	4	21.9180	8.8710
	Juncus Meadow__*Juncus mexicanus*	27	850.9960	344.3870
	Shrub Native__*Baccharis salicifolia*	573	239.6330	96.9750
	Trees/Woodland/Forest, Native__*Fraxinus velutina*	2	0.4060	0.1650
	Trees/Woodland/Forest, Native__*Platanus racemosa*	362	378.2830	153.0750
	Trees/Woodland/Forest, Native__*Populus fremontii*	204	242.3130	98.0620
	Trees/Woodland/Forest, Native__*Salix laevigata*	92	70.5440	28.5430

Wetland rating	Non-riparian vegetation community type	Frequency	Acres	Hectares
Rating 5	Artificial Structure__Disturbed Sites	27	22.2690	9.0120
	Grassland, Non-Native__*Hordeum leporinum*	2	3.0700	1.2430
	Shrub Native__*Baccharis pilularis*	1	0.1100	0.0440
	Shrub, Non-Native__*Tamarix* spp.	52	21.5210	8.7080
	Trees/Woodland/Forest, Native__*Fraxinus dipetala*	1	0.1590	0.0640
	Trees/Woodland/Forest, Native__*Populus balsamifera*	3	0.9520	0.3860
Rating 6	Artificial Structure__Flood Control Structure	2	2.4850	1.0060
	Chaparral__*Adenostoma sparsifolium*	3	1.9780	0.8000
	Chaparral__*Quercus berberidifolia*	80	207.1930	83.8490
	Chaparral__*Rhus integrefolia*	4	18.7830	7.6010
	Chaparral__*Rhus ovata*	27	12.2200	4.9440
	Chaparral__*Rhus trilobata*	1	0.0950	0.0380
	Grassland, Native__*Leymus triticoides*	3	0.6460	0.2610
	Grassland, Native__*Muhlenbergia rigens*	13	5.3190	2.1510
	Grassland, Non-Native__*Avena barbata*	3	0.1890	0.0760
	Grassland, Non-Native__*Bromus rubens*	2	0.3730	0.1510
	Grassland, Non-Native__*Bromus tectorum*	39	34.6280	14.0130
	Grassland, Non-Native__*Echinochloa muricata*	1	0.8330	0.3370
	Herbaceous Native__Riparian Dry (Dry Species)	90	97.5850	39.4920
	Herbaceous Non-Native__Agricultural Weeds	6	55.9810	22.6550
	Herbaceous Non-Native__Common Weeds	40	20.9490	8.4780
	Montane Forest__*Abies concolor*	19	238.1660	96.3850
	Montane Forest__*Pinus coulteri*	1	0.8850	0.3580
	Montane Forest__*Pinus jeffreyi*	24	395.6670	160.1210
	Montane Forest__*Pinus ponderosa*	4	4.2260	1.7090
	Montane Forest__*Pseudotsuga macrocarpa*	5	202.0190	81.7550
	Shrub Native__*Artemisia tridentata*	10	35.9580	14.5520
	Shrub Native__*Eriodictyon crassifolium*	2	0.1440	0.0580
	Shrub Native__*Eriogonum fasciculatum*	35	40.1860	16.2610
	Shrub Native__*Juniperus californica*	4	3.6750	1.4870
	Shrub Native__*Lepidospartum squamatum*	8	18.7630	7.5930
	Shrub Native__*Sambucus mexicana*	19	7.6570	3.0990
	Shrub, Non-Native__*Nicotiana glauca*	19	4.9850	2.0180
	Shrub, Non-Native__*Olea europea*	2	0.8880	0.3590
	Trees/Woodland/Forest, Native__*Quercus agrifolia*	1695	3646.9300	1475.8470
	Trees/Woodland/Forest, Native__*Quercus chrysolepis*	171	607.7430	245.9450
	Trees/Woodland/Forest, Native__*Quercus engelmannii*	41	20.3040	8.2160

Wetland rating	Non-riparian vegetation community type	Frequency	Acres	Hectares
	Trees/Woodland/Forest, Native__*Quercus kelloggii*	22	549.0640	222.2010
	Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.	152	118.4220	47.9250
	Trees/Woodland/Forest, Non-Native__*Schinus molle*	10	1.6450	0.6640

APPENDIX K: FREQUENCY AND AREA OF RIPARIAN VEGETATION COMMUNITY TYPES ON THE ACTIVE FLOODPLAIN GEOMORPHIC SURFACE

Riparian vegetation community type	Frequency	Acres	Hectares
Alkali Marsh__Alkali Marsh	1	0.2740	0.1110
Alkali Marsh__*Distichlis spicata*	7	17.9260	7.2560
Alkali Marsh__*Typha* spp.	2	0.0730	0.0300
Artificial Structure__Aquaduct	26	146.2150	59.1690
Artificial Structure__Constructed Wetlands	11	235.1010	95.1410
Artificial Structure__Disturbed Sites	92	216.5650	87.6420
Artificial Structure__Flood Control Structure	16	8.0600	3.2590
Artificial Structure__Lined Pond/Fountain	17	24.4440	9.8930
Artificial Structure__Pond	35	127.5150	51.6030
Artificial Structure__Retention Basin	124	1150.3870	465.5480
Artificial Structure__Sewage Pond	55	319.9740	129.4930
Chaparral__*Adenostoma sparsifolium*	1	0.8940	0.3620
Chaparral__*Arctostaphylos pungens*	2	0.1470	0.0590
Chaparral__*Baccharis sarathroides*	2	0.1190	0.0480
Chaparral__*Ceanothus tomentosus*	2	0.0960	0.0390
Chaparral__*Quercus berberidifolia*	6	21.5280	8.7110
Freshwater Marsh__*Azolla filiculoides*	2	18.2240	7.3750
Freshwater Marsh__Disturbed Wetland	16	58.1050	23.5130
Freshwater Marsh__*Eleocharis* spp.	33	22.3760	9.0540
Freshwater Marsh__*Juncus effussus*	1	2.5930	1.0490
Freshwater Marsh__*Juncus mexicanus*	2	1.0660	0.4320
Freshwater Marsh__*Scirpus acutus*	63	107.3830	43.4540
Freshwater Marsh__*Scirpus americanus*	4	1.9670	0.7960
Freshwater Marsh__*Scirpus microcarpus*	2	1.4720	0.5960
Freshwater Marsh__*Typha* spp.	452	418.7120	169.4420
Grassland, Native__*Leymus triticoides*	1	0.0650	0.0260
Grassland, Native__*Muhlenbergia rigens*	5	0.8900	0.3600
Grassland, Native__*Polypogon* spp.	8	4.2890	1.7360
Grassland, Native__*Sporobolus* spp.	1	0.1940	0.0790
Grassland, Native__*Stipa pulchra*	1	0.6870	0.2780
Grassland, Non-Native__*Avena barbata*	3	4.0250	1.6290
Grassland, Non-Native__*Bromus diandrus*	1	65.6180	26.5550
Grassland, Non-Native__*Bromus tectorum*	79	681.1910	275.6690

Riparian vegetation community type	**Frequency**	**Acres**	**Hectares**
Grassland, Non-Native__*Cynodon plectostachyus*	2	0.7660	0.3100
Grassland, Non-Native__*Echinochloa muricata*	1	0.5920	0.2400
Grassland, Non-Native__*Hordeum leporinum*	1	0.8010	0.3240
Grassland, Non-Native__*Lolium perenne*	3	9.5980	3.8850
Herbaceous Native__Riparian Dry (Dry Species)	153	582.2040	235.6120
Herbaceous Native__Riparian Moist (Moist Species)	20	6.2550	2.5310
Herbaceous Native__Riparian Wet (Wet Species)	1	0.8340	0.3380
Herbaceous Non-Native__Agricultural Weeds	22	264.7410	107.1380
Herbaceous Non-Native__Common Weeds	118	390.8360	158.1690
Juncus Meadow__*Juncus effusus*	1	0.1920	0.0780
Juncus Meadow__*Juncus mexicanus*	18	255.3810	103.3490
Montane Forest__*Pinus ponderosa*	1	0.4540	0.1840
Shrub Native_*Salix* spp.	21	94.7020	38.3240
Shrub Native__*Artemisia nova*	1	0.0580	0.0230
Shrub Native__*Artemisia tridentata*	19	63.6240	25.7500
Shrub Native__*Atriplex californica*	1	0.6880	0.2780
Shrub Native__*Atriplex canescens*	3	18.7830	7.6020
Shrub Native__*Baccharis pilularis*	7	3.6250	1.4660
Shrub Native__*Baccharis salicifolia*	554	2483.6910	1005.1230
Shrub Native__*Bebbia juncea*	1	0.3550	0.1440
Shrub Native__*Brickellia californica*	12	28.2610	11.4390
Shrub Native__*Chilopsis linearis*	1	4.0360	1.6340
Shrub Native__*Encelia farinosa*	1	0.9850	0.3990
Shrub Native__*Eriodictyon crassifolium*	11	41.5380	16.8110
Shrub Native__*Eriogonum fasciculatum*	62	117.1260	47.4000
Shrub Native__*Eriogonum wrightii*	1	0.0860	0.0350
Shrub Native__*Gutierrezia sarothrae*	1	6.9360	2.8070
Shrub Native__*Isocoma menziesii*	2	0.5830	0.2360
Shrub Native__*Lepidospartum squamatum*	59	664.0480	268.7310
Shrub Native__*Salix exigua*	31	27.3270	11.0620
Shrub Native__*Salix goodingii*	40	71.6650	29.0010
Shrub Native__*Salix laevigata*	48	36.5420	14.7890
Shrub Native__*Salix lasiolepis*	562	651.4000	263.6090
Shrub Native__*Salvia mellifera*	2	0.6220	0.2520
Shrub Native__*Sambucus mexicana*	5	4.4320	1.7940
Shrub Native__*Senecio flaccidus*	1	0.2810	0.1140
Shrub, Non-Native__*Nicotiana glauca*	4	10.1410	4.1040

Riparian vegetation community type	Frequency	Acres	Hectares
Shrub, Non-Native__*Olea europea*	1	0.2540	0.1030
Shrub, Non-Native__*Tamarix* spp.	134	451.4590	182.6940
Trees/Woodland/Forest, Native__*Alnus rhombifolia*	25	74.5150	30.1550
Trees/Woodland/Forest, Native__*Platanus racemosa*	246	188.8350	76.4210
Trees/Woodland/Forest, Native__*Populus balsamifera*	3	14.2450	5.7650
Trees/Woodland/Forest, Native__*Populus fremontii*	322	618.6850	250.3630
Trees/Woodland/Forest, Native__*Quercus agrifolia*	233	162.3080	65.6740
Trees/Woodland/Forest, Native__*Quercus chrysolepis*	5	12.9470	5.2400
Trees/Woodland/Forest, Native__*Quercus engelmannii*	3	0.3520	0.1430
Trees/Woodland/Forest, Native__*Salix exigua*	1	0.3120	0.1260
Trees/Woodland/Forest, Native__*Salix goodingii*	184	319.4900	129.2900
Trees/Woodland/Forest, Native__*Salix laevigata*	47	41.4550	16.7790
Trees/Woodland/Forest, Native__*Salix lasiolepis*	324	519.5530	210.2520
Trees/Woodland/Forest, Native__*Salix* spp.	10	33.9980	13.7590
Trees/Woodland/Forest, Native__*Washingtonia filifera*	1	0.9250	0.3740
Trees/Woodland/Forest, Non-Native__*Eucalyptus* spp.	47	30.5960	12.3840
Trees/Woodland/Forest, Non-Native__*Schinus molle*	2	0.8310	0.3360
Unvegetated__Dry Wash Channel	317	912.1190	369.1230
Unvegetated__Lakeshore	11	20.7420	8.3920
Water Body__Freshwater Pond	101	252.7920	102.2970
Water Body__Lake	13	13212.9970	5347.1350
Water Body__Pond	250	558.8480	226.1470
Water Body__River	34	11.7940	4.7720
	1	1.1620	0.4700

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14. ABSTRACT
A planning level delineation of aquatic resources was performed within the San Jacinto River and portions of Santa Margarita River Watersheds in Riverside County, California. This was the identification of areas that meet both the jurisdictional requirements under Section 404 of the *Clean Water Act* and the California Department of Fish and Game (CDFG) Section 1600 Code at a watershed scale. Although the delineation is highly accurate at the planning level, it is not specific to any one site. Thus, a planning level wetland delineation does not replace the need for a jurisdictional wetland delineation from the Corps of Engineers (COE) permitting program, or the CDFG Section 1600 requirements. As such, this report describes the baseline occurrence of aquatic resources that were observed in these watersheds at the time of the study during the period between August 2001 and May 2002. A total of 16,043 ha (39,643 ac) of aquatic resources in the riparian areas, and 12,701 km (7892 miles) of intermittent streams were delineated as Waters of the United States within both watersheds.

15. SUBJECT TERMS
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