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Cold Regions Research &
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U.S. Army Engineer Research and Development Center, Hanover, New Hampshire

Publication of a Map Series on the Aquatic Resources for San Jacinto and Portions of the Santa Margarita Watersheds

The Riverside County Flood Control and Water Conservation District, in cooperation with the U.S. Environmental Protection Agency, 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 project is being undertaken as part of the Corps of Engineers' Special Area Management Plan (SAMP) for western Riverside County. A SAMP is a comprehensive aquatic resource planning effort in the context of Section 404 of the Clean Water Act. The ultimate goal of the SAMP is to provide a management tool that helps reach a balance between protection of aquatic resources and reasonable economic development. The U.S. Army Corps of Engineers (USACE), Los Angeles District is leading the development of the SAMP in western Riverside County.

Lichvar and Ericsson (2003), from the USACE Engineering and Research Development Center, Cold Regions Research and Engineering Laboratory (CRREL), recently published a report containing detailed maps showing the SAMP planning-level delineation of aquatic resources in western Riverside County. This map series, along with background reports (Lichvar et al. 2003), is available in interactive format at the following web site:

https://rsgis.crrel.usace.army.mil/vegmap/westriverside.watershedstart_pk

The web site allows users to view the maps according to their choice of a variety of vegetation and hydrologic features at a variety of scales. It is also searchable by, for example, zip code, place name, or vegetation type. The result is easy access to a wealth of information on the aquatic resources of these watersheds.

A planning-level delineation identifies those 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. A planning-level wetland delineation does not replace the need for a jurisdictional wetland delineation from the Corps of Engineers permitting program or the CDFG Section 1600 requirements. These maps display the baseline occurrence of aquatic resources that were observed in these watersheds during the study period (August 2001 to May 2002).

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Study Area

The San Jacinto River and portions of the Santa Margarita River watersheds together encompass approximately 36,1953 ha (894,405 acres) and are located 12 km (7.5 miles) southeast of the city of Riverside in Riverside County, California (Fig. 1). The cities of Temecula and Murrietta are located within the Santa Margarita watershed. The cities located within the San Jacinto watershed include Moreno Valley, Perris, 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. 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, subwatersheds draining from San Diego County into Riverside County were inventoried and mapped because they influence the riparian wetlands and flooding within Riverside County.

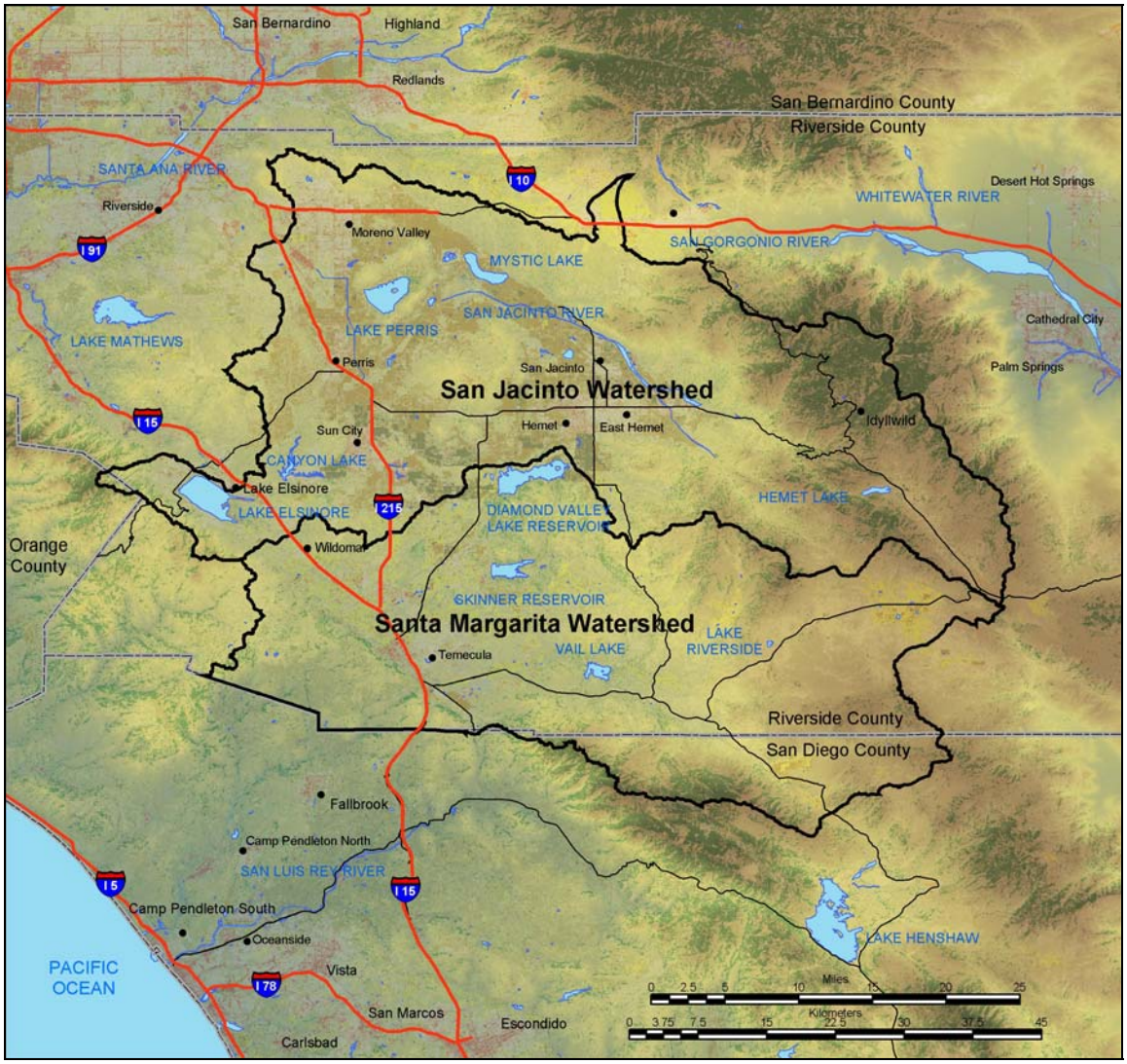


Figure 1. Location of San Jacinto and Santa Margarita Watersheds.

Methods

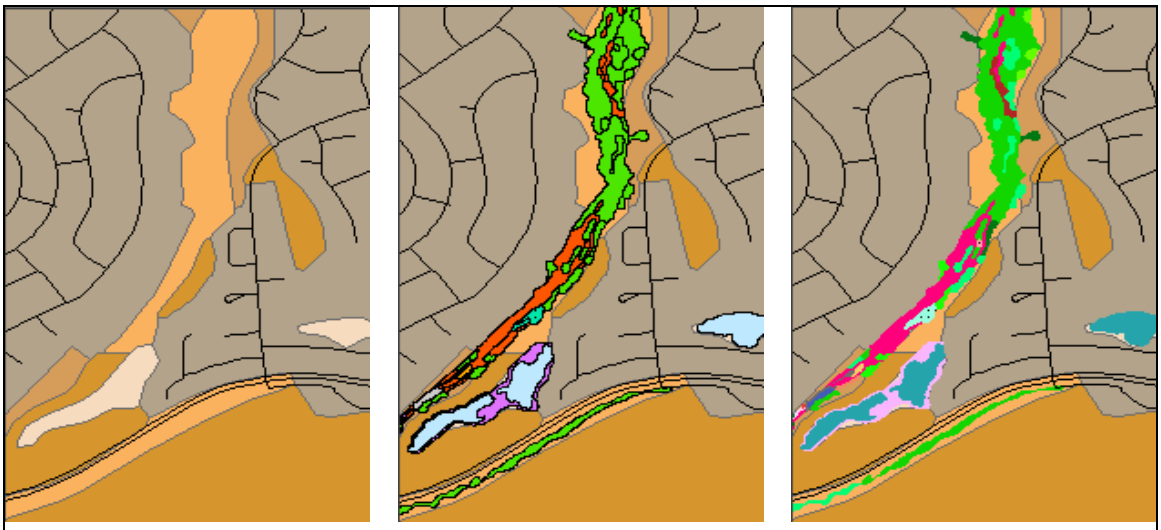
Mapping Protocols

Potential aquatic resources were initially identified by interpretation of color infra-red digital orthoquads (DOQ) imagery obtained from the USGS. Aquatic resources were delineated in the field using the DOQs within a customized geographic information system (GIS) on a pen tablet computer. All mapping was at a scale of 1:4800, with a minimum mapping unit size of approximately 405 m^2 (0.1 acres). Using the GIS in the field allowed for viewing of support spatial databases (i.e. roads, contours, parcel information, etc) to better identify all potential aquatic resources.

The first-order, ephemeral, and intermittent streams were initially identified and delineated by interpretation of the DOQs remotely. Ephemeral streams were verified for accuracy and precision using the field GIS as potential aquatic resources were delineated. Vegetation associated with washes that lacked floodplain terraces were assigned a hydrogeomorphic floodplain code of "Non-Floodplain Riparian."

Vegetation Classification

Vegetation map units were developed through a series of modifications to the California natural community classification by Holland (1986). In SAMP efforts in other watersheds in southern California, CRREL found that existing vegetation classifications lacked sensitivity for use in watershed-scale wetland delineations. To meet the needs of identifying wetlands, 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 native and non-native units. Figure 2 compares the level of detail associated with the Holland and the USACE growth and species-level classifications.



Holland Units | *Growth Form Units* | *Species–Association*
USACE Vegetation Units

Figure 2. Comparison of vegetation classifications.

Hydrogeomorphic Floodplain Classification

Hydrogeomorphic floodplain units were mapped for the purposes of indicating flood frequency for use in delineation. Typically floodplain terraces develop on second-order, third-order, and greater Strahler stream types (Strahler 1952). First-order streams typically lacked floodplain terraces because they are located on steeper slopes, have smaller drainage areas, and are confined to bedrock channels that limit their ability to create floodplain terraces.

In this study the two floodplain map units identified in the field were the active and abandoned floodplain terraces (Fig. 3). The active floodplain, in this study, contains the bankfull and the adjacent active floodplain terrace that contains features associated with frequent flooding. These features include high-flow channels, unvegetated surfaces, bed and bank, and a break in slope. The abandoned floodplain terrace is above the active floodplain and contains features associated with infrequent flooding and seasonally wet areas. Potentially regulated hydrologic features in this terrace are driven by infrequent overbank flooding, local precipitation, and occasional groundwater discharge within paleo channels and other depressional features. Often there is a distinct change of vegetation community from the active to the abandoned floodplain. The cross section in Figure 3 represents the ideal floodplain development, but in some instances one or more terraces may be lacking because of human influence, local soil conditions and geomorphology, or local precipitation patterns.

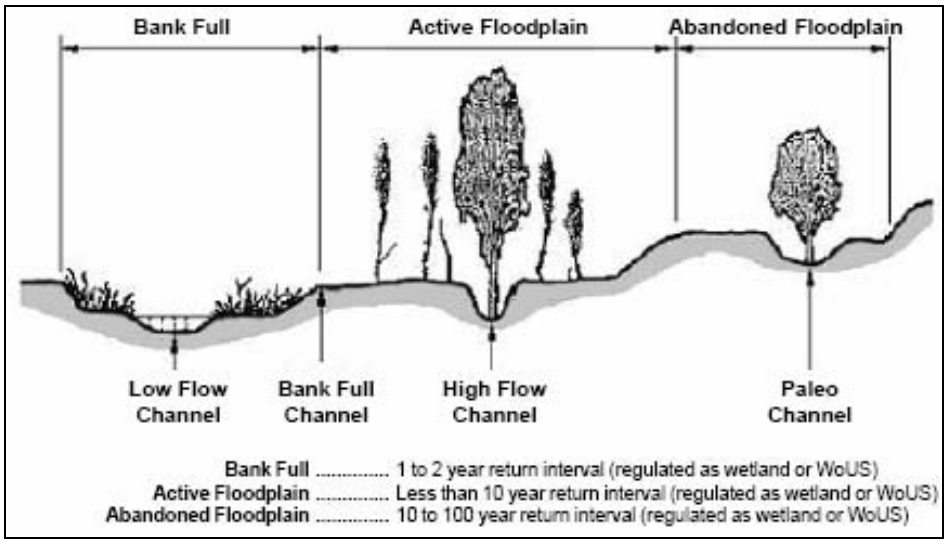


Figure 3. Hydrogeomorphic floodplain units.

Delineation Technique

The modification of standard delineation sampling protocols and the development of wetland probability ratings for Section 404 regulatory purposes 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 “Waters of the United States” (WoUS) at 33 CFR 328 were

modified for use at the watershed scale. To delineate at this scale, riparian corridors were mapped for hydrogeomorphic surfaces representing a combined bankfull and active floodplain and a separate abandoned floodplain terrace (Fig. 3), which were later interpreted for return-interval requirements under Section 404. Individual vegetation units at the species–association level were sampled at 169 sites to develop a characterization of the indicators for both wetlands and other WoUS. By combining field sampling results for wetland occurrences within various mapped vegetation types with the flood frequency information obtained from the geomorphic surface map, probability ratings intended for regulatory purposes were developed to accommodate all variations. Six categories of wetland or WoUS ratings were assigned to each of the riparian vegetation units, with ratings ranging from always regulated to upland or not regulated (Table 1).

Table 1. Wetland / 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 <2% of the time (primarily uplands)
6	Unregulated upland

The probability ratings used in the report can be interpreted in two ways:

- A rating describes the probability of whether a map unit may be regulated, based on the presence of wetland or Ordinary High Water indicators that meet the criteria for these regulated types of aquatic resources, and
- A rating describes the reliability of predicting whether a unit is regulated across the watershed, as represented by the frequency statements associated with each rating.

For example, cattail swamps always have the field indicators present to meet the criteria necessary to be considered a wetland, and they are consistent for those features at all sites across the watershed. A map unit with a high probability of having positive wetland indicators present and high level of predictability at all sites receives a rating of 1. However, for mulefat (*Baccharis salicifolia*), a species with facultative wetland status that occurs in various landscape positions with and without wetland indicators, the reliability factor is less. In abandoned floodplain terraces of the San Margarita and San Jacinto watersheds, we found mulefat in both wetland and upland sites. Our ability to predict its probability of being regulated is almost 50:50. Therefore, we assigned it a rating of 3, which predicts that it would be considered regulated 33–66% of the time. That rating implies that the map units require further site-specific investigations to determine if a particular site would be considered regulated. If a visit is done at a particular mulefat site and it is decided that the specific location isn't regulated, it can be deleted from the files; if the specific site is determined to be regulated, then the time needed to correct any boundaries of the wetland should be highly reduced. So precision

in the watershed-scale delineation method comes in several forms: 1) whether the potential regulated sites for planning purpose have been located, 2) whether the outline and attributes of the site are described correctly, and 3) whether the rating represents a reliable level of accuracy in predicting the likelihood that a site is regulated.

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Copies are available at:
http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/TN04-4.pdf.