WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

SOUTHERN CALIFORNIA STORMS AND FLOODS OF JANUARY-FEBRUARY 1993

THE STORMS AND RESULTING FLOODS

From January 6 to February 28, 1993, a series of storms produced 20 to 40 inches of rain over much of the southern California coastal and mountain areas and more than 52 inches at some stations in the San Bernardino Mountains. These storms, which coincided with a reappearance of weak "El Niño" conditions in the tropical regions of the Pacific Ocean, were driven by a regional atmospheric low-pressure system off the coast of northern California and Oregon. In southern California, precipitation intensified because a high-pressure area that extended over Alaska, the Gulf of Alaska, and the Western States concentrated this low-pressure system farther south than usual and held it in place just offshore, cutting off a series of storms from the general weather circulation. Tropical moisture was supplied to the arriving storms from the southern jetstream, which crossed the coast from the southwest at about the latitude of San Diego. Rainfall was further intensified by the influence of the east-west-trending Transverse Ranges, causing the heaviest precipitation in the San Gabriel and San Bernardino Mountains. Precipitation also was very heavy in the Laguna Mountains of San Diego County (fig. 1).

The first major peak streamflows occurred January 6–7 as a result of heavy rainfall on a fairly substantial snowpack that had accumulated in December 1992. The recurrence intervals (average interval of time in which a given peak flow will be equaled or exceeded once) of flows in the Mojave and Santa Ana River Basins were about 25 to 50 years. In the Victorville area, the Mojave River overtopped a levee, causing damage to a housing tract. This reach of the river channel had become heavily overgrown with vegetation as a result of the drought conditions of the past 6 years and the lack of channel-clearing high flows.

The rain continued, and a second major runoff peak occurred late on January 16 as the low-pressure system moved slightly south before moving to the east on January 18. The most severe flooding was in the Santa Margarita and San Luis Rey River Basins (fig. 2) in northern San Diego and southwestern Riverside Counties. In the 24-hour period beginning at 8 a.m. (Pacific standard time) on January 16, 6.80 inches of rain was recorded at the Santa Rosa Plateau weather station in the Santa Margarita watershed, and similar rainfall intensities were reported throughout the area.

A nearly identical storm pattern developed in early February as a stationary atmospheric low-pressure system centered off the Oregon coast again generated storms. Major storms and resultant runoff peaks occurred

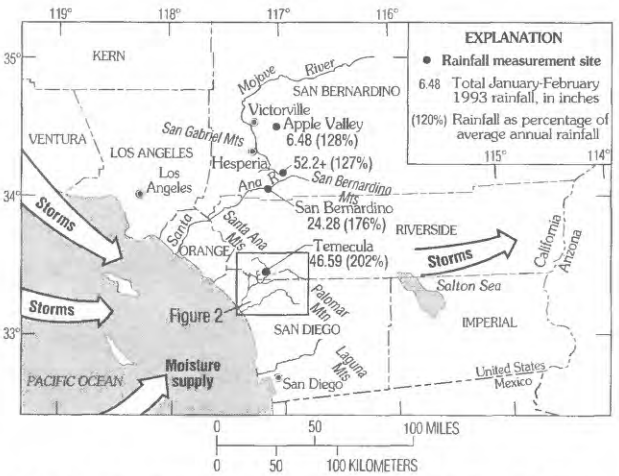

FIGURE 1. January-February rainfall at selected sites.

February 8 and from February 18 to 19. Although the peak streamflows were only in the 25- to 50-year recurrence interval range, significant local flooding occurred because of the saturated conditions in the watersheds due to the January storms. Major bank failures occurred along the Mojave River in the Silver Lakes area, about 10 miles north of Victorville, as a result of sustained high flow in the normally dry channel.

Rainfall intensity decreased significantly as the storms came onshore and moved from the southwest to the northeast (fig. 1). During this 2-month storm series,

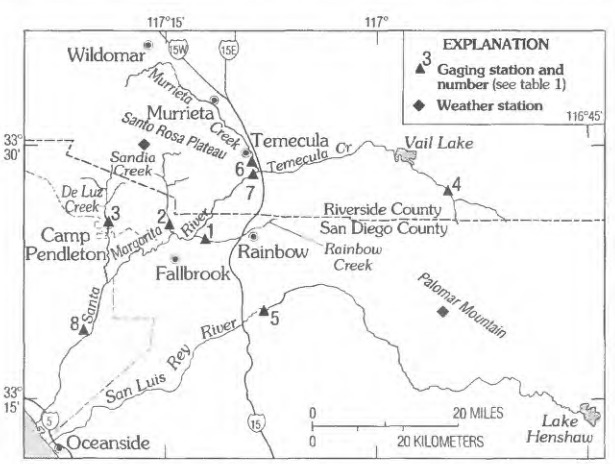

FIGURE 2. Location of streamflow-gaging and weather stations in the San Luis Rey and Santa Margarita River Basins.

more than 200 percent of the average annual rainfall fell on the mountains nearest the coast; farther inland, the north side of the San Bernardino Mountains received 127 percent.

The highest peak flows on the Mojave and Santa Ana Rivers (see hydrographs, fig. 3) occurred January 6–7 as a result of rapid melting of the accumulated snowpack. The three subsequent peaks were slightly lower, but nearly of the same magnitude. By comparison, the highest peak in De Luz Creek in the Santa Margarita River Basin occurred January 16; it was nearly an order of magnitude higher than the other three major peaks. Peak flows on January 16 exceeded a 100-year recurrence interval flood at several stream-gaging stations in the basin.

THE SANTA MARGARITA RIVER BASIN FLOOD--JANUARY 16, 1993

The January 16, 1993, flooding in the Santa Margarita River Basin resulted from intense rainfall that generally was localized over the upper reaches of the basin--principally in the Santa Rosa Plateau and Temecula areas, where the 6-hour rainfall data show the precipitation frequency (similar to recurrence interval for streamflows) to be 126 and 114 percent, respectively, of the 100-year precipitation-frequency values. This intense precipitation was on a watershed still saturated from the January 6–7 storm.

The most severe flooding during the January–February 1993 storms (see table 1) happened on January 16 in the Murrieta Creek floodplain at Temecula in Riverside County. At the Murrieta Creek streamflow-gaging station near Temecula (11043000), where flow overtopped the gage shelter, the stage was the peak for the 68 years of record and exceeded the previous (Feb. 21, 1980) record by more than 5 feet.

Peaks of record also were recorded on the Santa Margarita River near Temecula and on other, smaller streams in the basin. Extensive flooding occurred along the Santa Margarita River as it passes through Camp Pendleton, the U.S. Marine Corps Base near the mouth of the river. The floodwaters spread over the broad, flat floodplain on the base, depositing large quantities of sediment and debris. The Santa Margarita River gaging station at Ysidora (11046000) was damaged as the debris-choked river washed out the bridge. The estimated discharge (see table 1) of 45,000 cubic feet per second (ft^3/s) exceeded the peak discharge for the 68 years of record (33,600 ft^3/s on February 16, 1927) by 34 percent.

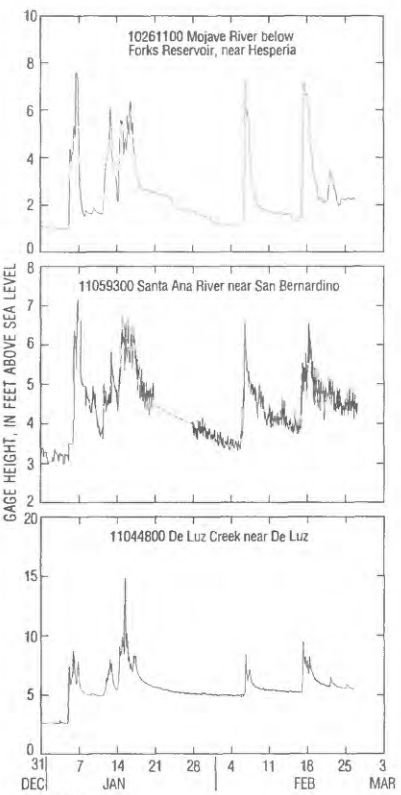

FIGURE 3. Gage height (stage) at selected stream-gaging stations.

Table 1. Preliminary flood-peak data for selected stations in the San Luis Rey and Santa Margarita River Basins, January 16, 1993

[ft^3/s, cubic feet per second; mi^2, square miles]

Gaging station and number (see fig. 2)	Drainage area (mi^2)	Peak discharge (ft^3/s)	Unit discharge ($[ft^3/s]/mi^2$)
1 Rainbow Creek near Fallbrook (11044250)	10.8	8,000	741
2 Sandia Creek near Fallbrook (11044350)	21.4	5,100	238
3 De Luz Creek near De Luz (11044800)	33.0	9,700	294
4 Temecula Creek near Aguanga (11042400)	131	8,100	62
5 San Luis Rey River near Pala (11039800)	[1]166	14,000	84
6 Murrieta Creek near Temecula (11043000)	[2]170	25,000	147
7 Santa Margarita River near Temecula (11044000)	[3]268	31,000	116
8 Santa Margarita River at Ysidora (11046000)	[2]351	[4]45,000	128

[1, 2, 3]Excludes drainage area upstream from reservoir ([1]Lake Henshaw, [2]Skinner Reservoir, [3]Vail Lake Reservoir) that did not spill.

[4]Preliminary estimate based on discharge/drainage area relations at other gaging stations in the basin.

SELECTED REFERENCE

Miller, J.F., Frederick, R.H., and Tracey, R.J., 1973 [1974], Precipitation-frequency atlas of the Western United States: Volume 11--California: U.S. Department of Commerce, National Oceanic and Atmospheric Administration Atlas 2, 71 p.

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