

# CRS Activity 320 - Historical Flood Information

*USACOE Calleguas Creek Watershed Feasibility Study, February 2003*

## 5. Precipitation and Runoff.

**5.1. Precipitation Records.** There are over 40 active precipitation stations in and near the Calleguas Creek Watershed. Of these stations, 19 have non-recording gages, 11 have recording gages, and 10 stations have both recording and non-recording gages. The longest record station in the study area is the "Port Hueneme – USGS station, which has a period of record dating from 1891 to the present. Station locations in and around the Calleguas Creek Watershed are shown on Figure 3, and pertinent data is given in Table 3.

**5.2. Streamflow Records.** Stream gaging stations have been operated at several points in the drainage area, with various periods of record from 1927 to date. Station locations in and around the Calleguas Creek Watershed are shown on Figure 3, and pertinent data is given in Table 4.

**5.3. Climatology And Meteorology.** The Calleguas Creek Watershed experiences a mild climate with a low variation in extreme temperatures. The summers are generally long and dry and the winters short and wet. Snow rarely occurs in the study area. Dry periods may be considerable, and extend over many months, or even years. The average annual temperature is around 60° Fahrenheit (F) in the Calleguas Creek Watershed with an average maximum of 70° to 80° F and an average minimum of about 40° F. Snow rarely occurs in this area. The prevailing winds are from the Pacific Ocean and are of light to moderate velocity. Mean annual precipitation ranges from 12 inches near the coast to over 20 inches in the Santa Susana Mountains. Isohyets of mean seasonal precipitation are shown on Figure 4. Nearly all precipitation occurs during the months of December through March.

5.3.1. Storms. Three types of storms produce precipitation in the Calleguas Creek Watershed:

5.3.1.1. General Winter Storms. General winter storms usually occur during the period from December through March. These storms usually originate over the Pacific Ocean as a result of the interaction between polar Pacific and tropical Pacific air masses and move eastward over the watershed. Often lasting several days, these storms reflect orographic influence and are accompanied by widespread precipitation.

5.3.1.2. Local Storms. Local storms can occur at any time of the year, either during general storms or as isolated phenomena. They occur rarely in the Calleguas Creek Watershed during the summer. Those that occur in the winter are generally associated with frontal systems. These storms cover comparatively small areas, but result in high intensity precipitation for durations of up to 6 hours.

5.3.1.3. General Summer Storms. General summer storms occur during the late summer or early fall months. These storms are usually associated with tropical cyclones and occur very infrequently. Because of this, and because these storms occur near the end of the dry season, they rarely result in any major flooding in the study area.

5.3.2. Storms And Floods Of Record. Little information is available concerning storms and floods in the Mugu Lagoon drainage area prior to 1918. Precipitation records indicate that moderate to heavy storms have occurred in the area in 1891, 1905, 1907, 1911, 1913, 1914, 1915, 1916, 1918, 1921, 1926, 1927, 1931, 1934, 1937, 1938, 1941, 1943, 1944, 1947, 1958, 1962, 1966, 1967, 1969, 1971, 1972, 1973, 1974, 1975, 1978, 1980, 1983, 1992, 1995, and 1998. Statements of local residents indicate that prior to 1918, major floods occurred in 1862, 1884, 1914, and 1916. Of these, the floods of 1862 and 1884 were probably the largest. A comparison of these floods with recorded flows is not possible, since historic floods are usually remembered by the damage caused rather than by an estimate of peak discharge. Brief descriptions of the storms and floods of 1918, 1938, 1943, 1969, 1978, 1980, and 1983 are given in subsequent paragraphs.

Storm and Flood of February 17-26, 1918. At Newbury Park (elevation 700 feet), the storm of February 17-26, 1918, produced a maximum 24-hour rainfall of 4.92 inches and a total storm rainfall of 9.73 inches. At Oxnard (elevation 51 feet), the maximum 24-hour rainfall was 2.67 inches and the total storm was 5.64 inches. No data are available regarding short-term rainfall intensities during this storm. However, 24-hour rainfall in excess of 2 inches was recorded at all stations in the area. No discharge estimates are available for points within the Calleguas Creek Watershed for this storm.

Storm and Flood of February 27-March 4, 1938. The effective duration of the storm of February 27-March 4, 1938, was 4 days, with two phases of high short-time intensities, the first occurring on February 28, and the second on March 2. The storm produced an average rainfall of 4.8 inches over the drainage area during the maximum 24-hours, and 8.3 inches for the total storm. A peak discharge of 4,100 ft<sup>3</sup>/s occurred on March 2, 1938 at the gaging station near Moorpark, which has a drainage area of 115 mi<sup>2</sup>. A peak discharge of 1,700 ft<sup>3</sup>/s occurred at the gaging station near Simi, which has a drainage area of 67 mi<sup>2</sup>.

Storm and Flood of January 21-24, 1943. The storm of January 21-24, 1943 which was in many respects the most severe of record in southern California, resulted when a series of warm Pacific cyclones moving generally eastward from the area north of Hawaii and combined with an intense, cold storm moving down the west coast of North America from British Columbia. The deep low pressure center which consequently developed over northern California and Oregon generated unusually strong southerly and southwesterly winds over southern California

and produced very heavy precipitation over much of the area, with exceptionally large rainfall amounts in the mountain areas because of the powerful orographic uplift of these strong winds. Precipitation was continuous from about noon on January 21 into the morning of January 23, with two periods of very high intensity rainfall due, respectively, to the approach and subsequent recession of a cold front about midnight of January 21 and to the passage of a cold front about midnight of January 22. Rainfall generally tapered off on January 23 and 24, although certain mountain stations continued to receive substantial precipitation during these two days. Some record 24-hour rainfall totals were measured during this storm in the San Gabriel Mountains, including the State of California record of 26.12 inches in 24 hours at Hoegees. In the vicinity of the Calleguas Creek Watershed, approximately 8 inches of rainfall fell during this storm, but because this storm occurred after a dry period, there was no major flooding.

Storm and Flood of March 3-4, 1943. The local storm that occurred between 2200 hrs on March 3 and 0100 hrs on March 4, 1943 during three days of shower-type precipitation, resulted in short-period precipitation of near record breaking magnitude for the southern California coastal region. The storm apparently began over the southern part of Los Angeles and moved northeast at about 7 miles per hour toward the San Gabriel Mountains. Many automatic precipitation gages were in operation; as a result, the areal distribution of precipitation was well defined. The highest observed intensities were at the Sierra Madre-Carter (7-0-133B) precipitation station located in Sierra Madre, where maximum 15-, 30-, and 60-minute intensities of 5.5, 3.6, and 2.7 inches per hour, respectively, were recorded. Runoff was moderately heavy from local areas where high precipitation intensities occurred. However, no quantitative measurements of runoff are available for the vicinity of Sierra Madre where the highest precipitation intensities occurred. A peak discharge of 960 ft<sup>3</sup>/s was recorded for the 2.5 square mile drainage area of the Broadway storm drain in Pasadena (about 6 miles southwest of storm center). This flow represented the greatest peak discharge per square mile (384 ft<sup>3</sup>/s/mi<sup>2</sup>) observed during the storm. This storm did not produce significant runoff in the study area.

Storm and Flood of January 18-27, 1969. A series of storms that began on January 18 and continued through January 27 was caused by a strong flow into southern California of very warm, moist air originating over the tropical Pacific Ocean south and east of Hawaii. This series of storms was interrupted by a brief ridge of high pressure which moved through the area on January 22 and 23 and caused a short break in the rainfall. Except for this lull, heavy precipitation occurred during most of the period January 18-26 and was climaxed by an intense downpour on January 25. Nine-day totals ranged from 10-20 inches in the lowlands and from 25 to more than 50 inches over mountain areas of southern California. Along Calleguas Creek, a

peak discharge of 12,800 ft<sup>3</sup>/s was recorded at the CSUCI stream gage. The peak discharge for the Madera St. stream gage was 5,040 ft<sup>3</sup>/s.

Storm and Flood of February 22-25, 1969. The late February 1969 storm series was the climax of more than a month of extremely heavy, recurring rainfall in southern California. It occurred as a number of Pacific cyclones traveled southward off the west coast of the United States and then curved inland across California with copious quantities of moisture. Several cold fronts and other disturbances moved across southern California from February 22 through February 24, dropping moderately heavy amounts of precipitation. Early on February 25, a strong cold front moved slowly southeastward across southern California accompanied by strong low-level winds which, when lifted by the mountains, resulted in great quantities of orographic precipitation. As a result, rainfall was generally heavy everywhere and particularly heavy in the mountains. The February peak discharges on Calleguas Creek were slightly greater than those in January. The maximum peak discharge at the CSUCI stream gage was 16,300 ft<sup>3</sup>/s, while the Madera St. stream gage recorded 6,330 ft<sup>3</sup>/s, and the Moorpark stream gage recorded 6,500 ft<sup>3</sup>/s. The maximum peak discharge on Conejo Creek at the stream gage above Highway 101 was 5,300 ft<sup>3</sup>/s.

Storms and Floods of February 28-March 5, 1978. The storms and floods of February 28-March 5, 1978, were preceded by a series of storms in early February 1978. The later storms of February 1978 were a series of moderate-intensity storms rather than a single large storm. In the days preceding the storms, a large high-latitude block formed over the Bering Sea and Alaska. This block produced a very stable long-wave pattern, allowing the storm track to remain at low altitudes for several days. By March 3, the upper-level block had been displaced northwestward into the Bering Sea and replaced by a low over Alaska. A surface front, which proved to be the last one of the series, moved into southern California on the morning of March 4 and was accompanied by heavy rain, thunderstorms, and gale force winds. The maximum peak discharge on Calleguas Creek at the CSUCI stream gage was 18,700 ft<sup>3</sup>/s, 7,730 ft<sup>3</sup>/s at the Madera St. stream gage, 8,600 ft<sup>3</sup>/s at the Moorpark stream gage, and 9,970 ft<sup>3</sup>/s at the stream gage above Highway 101 all on March 4. The maximum peak discharge on Conejo Creek at the stream gage above Highway 101 was 9,830 ft<sup>3</sup>/s.

Storm and Flood of February 13-22, 1980. A series of varying intensity fronts coming from the west soaked southern California with eight days of nearly continuous rain. The meteorological situation leading to the series of rainstorms was the result of a block that formed over British Columbia, causing a more southerly storm track. This blocking pattern allowed for a series of six storms to move through southern California during February 13-22. The strongest front passed the area midday on Saturday February 16, producing the second highest peak discharge of record on Calleguas Creek of 25,300 ft<sup>3</sup>/s at the CSUCI stream gage, 9,310 ft<sup>3</sup>/s at the Madera

St. stream gage, and 14,000 ft<sup>3</sup>/s at the stream gage above Highway 101. This storm caused a breach of the west levee of Calleguas Creek below Hueneme Road, with an estimated total of 24,000 acre-ft of water flowing through the breach before it was repaired. The maximum peak discharge on Conejo Creek at the stream gage above Highway 101 was 11,800 ft<sup>3</sup>/s.

Storm and Flood of February 25-March 3, 1983. During the first part of 1983, there were several stormy periods but none in scope or duration to the storm that began February 25 and lasted through March 3. A strong flow of moist air from the southwest began producing precipitation on February 25 as the first in a series of frontal systems moved through California. This storm was characterized by two periods of moderate to heavy precipitation. With the ground wet from a January storm, heavy precipitation produced high flows in most creeks in southern California. On Calleguas Creek, at the CSUCI stream gage, Madera St. stream gage, and the stream gage above Highway 101, the peak discharges of record occurred, 26,600 ft<sup>3</sup>/s, 10,570 ft<sup>3</sup>/s and 17,200 ft<sup>3</sup>/s, respectively. As in 1980, the Calleguas Creek levee was breached. The maximum peak discharge on Conejo Creek at the stream gage above Highway 101 was 14,000 ft<sup>3</sup>/s.

Storm and Flood of February 10-15, 1992. On February 10, 1992, Southern California was hit by a major storm, which caused widespread damage and threatened the lives of many people, eventually claiming two in river torrents, and another two in a mud slide. The storm lasted through the 15<sup>th</sup> of February, leaving flood control structures damaged, full of debris, and vulnerable to future storms. Of primary concern in Ventura County was erosion of channels and removal of debris following flood flows. The greatest 24-hour precipitation totals were in the Santa Monica Mountains southwest to southeast of Woodland Hills, and from there northeast through the eastern Conejo and western San Fernando Valleys to the Big Tujunga Creek drainage of the San Gabriel mountains. Orographically favored locales received the heaviest rainfall on the 10<sup>th</sup> of February. The seven-day depths in Ventura County ranged from 6 to 13 inches, which represented about 60-65 percent of the mean annual rainfall. The peak flow on February 12th at the Calleguas Creek above Highway 101 gage was 12,560 ft<sup>3</sup>/s and 14,700 ft<sup>3</sup>/s at the Calleguas Creek at CSUCI gage. On February 10, Calleguas Creek overflowed downstream from the confluence with Conejo Creek (near Camarillo State Hospital) from a discharge less than 10,000 ft<sup>3</sup>/s. The capacity was limited by debris, brush, and tress. The channel carried a larger flow on February 12<sup>th</sup> after being flushed out by the flood on the 10<sup>th</sup>. Although the peak flow in Calleguas Creek was estimated to be about a 10-year event, approximately one million cubic yards of sediment was deposited in the channel system. Conejo Creek contributed much of the sediment, as it was running higher than Calleguas Creek at the confluence of the two streams. On Calleguas Creek, the Lewis Street bridge abutments were undermined and required stone placement on them to prevent further damage.

Storms and Floods of January and March, 1995. Moist El Nino storms laden with tropical moisture occurred over Southern California during January and March of 1995. From January 3<sup>rd</sup> to the 10<sup>th</sup>, Southern California experienced a major storm event with high concentration of rainfall occurring. There were 11 deaths attributed to this storm and \$1.34 billion in damages. This storm was the largest localized storm of record for the southern Los Angeles County and exceeded all National Weather Service predictions. Rainfall started on the 3<sup>rd</sup> with isolated high intensity rainfall occurring. On January 6<sup>th</sup> and 7<sup>th</sup>, there was very high intensity rainfall in the Camarillo area. On the 9<sup>th</sup> and 10<sup>th</sup> the majority of the county experienced high peak flows. Rainfall intensities in some locations were equivalent or greater than 100-year frequency precipitation. Significant local flooding occurred as a result of channels and local storm drains being overtaxed. On March 10, a cooler winter storm brought significant amounts of precipitation with damaging results due to the saturated soil conditions. The peak flow recorded on Calleguas Creek at the stream gage above Highway 101 was 9,120 ft<sup>3</sup>/s and at the CCSUCI gage, it was 14,900 ft<sup>3</sup>/s.

Storm and Flood of February 1998. In the "El Nino" winter season of 1997-1998, severe Pacific storms brought heavy rains to much of coastal Southern California. Widespread flooding occurred with these storms producing extensive property damage and several fatalities. California had the wettest February on record. In terms of precipitation, across California and the southwest, four weeks of nearly continuous storminess resulted in widespread flooding, mudslides, and agriculture disruptions. Late in the month a shift in the weather pattern brought some of that storminess out of the southwest and into the northern plains. February precipitation records were set at 19 stations in California. Santa Barbara, CA received an incredible monthly total of 21.74 inches, breaking the old record of 17.33 set in 1962 and establishing a record for any month. Records for that location date back to 1867. Oxnard, Simi Valley, and Lompoc received 17.80, 17.20, and 12.86 inches, respectively. After a near record drought—only a quarter inch of rain measured at Point Mugu between 1 February and 1 November 1997—soil moisture in the basin was very low. However, by the 23<sup>rd</sup> of February the area had received almost 23 inches of rain, with almost 15 inches of it in the preceding three weeks. Therefore, the soil was saturated. With the onset of heavy rains, streams swelled to peak levels within a few hours after the heaviest rain episode. The maximum flow in Calleguas Creek as recorded at the California State University Channel Islands was 21,600 ft<sup>3</sup>/s, which caused overtopping of the bridges at Pacific Coast Highway.

### ***2010 Ventura County Hazard Mitigation Plan***

Storm and Flood of January 7 - 11, 2005. In January 2005, winter storms brought heavy rains to the region. The Ventura River reached a maximum stage of 17.5 feet and maximum discharge of 152,560 cfs. High water flows, scouring, and washouts in the Ventura River damaged several

water wells and exposed water lines owned by the Ojai Valley Sanitary District. Severe erosion occurred along both embankments of the Ventura River. The Calleguas Creek topped its banks near the state hospital in Camarillo. Damage from the January 2005 storms totaled more than \$200 million.

Storm and Flood of January 18-22, 2010. In January 2010, a series of powerful winter storms swept over Central and Southern California. Heavy rain, gusty winds, and heavy snow were witnessed in Ventura County. Rainfall totals ranged from 4-8 inches over coastal areas to 8-16 inches in the foothills and mountains. Flash flood watches were issued in areas of Ventura County that were damaged by wildfires in 2008. The January 2010 storm was initially anticipated to be similar in size to the January 2005 storm. However, actual rain totals showed that this storm was not as severe. According to the VCWPD, the watershed levels during the January 2010 storm were nowhere near the levels reached in 2005.

### National Flood Insurance Program Paid Policy Losses

Simi Valley, CA

Storm/Flood Event			Non-Storm/Flood Event	
Begin	End	Losses	Date	Loss
02/28/1978	03/05/1978	\$ -		
02/13/1980	02/22/1980	\$ 5,600		
02/25/1983	03/03/1983	\$ 1,175		
			03/19/1991	\$ 1,128
02/10/1992	02/15/1992	\$ -	12/27/1992	\$ 1,644
			04/20/1993	\$ 1,765
01/03/1995	01/10/1995	\$ 4,388		
03/10/1995		\$ -		
02/01/1998	02/24/1998	\$ 32,246		
04/04/1998	04/11/1998	\$ 2,821		
			01/11/2001	\$ 7,155
			10/20/2004	\$ 15,992
			12/28/2004	\$ 3,997
01/07/2005	01/11/2005	\$ 21,588		
Jan. 2010		\$ -		
Total		\$ 67,818		\$ 31,681