

HISTORIC STORMS

There have been many interesting storms in California such as the September 24, 1939 event at Indio when twice the mean annual rainfall (of 3 inches) occurred in six hours (Pyke 1975). The goal of my studies of rainfall frequency is to be able to describe and compare historic storms. The best way to do this seems to be by drawing maps with lines of equal return periods. Without regionalized studies it would not be easy to draw contour lines of return periods. Three historic storms are used to illustrate this concept.

The Columbus Day Storm of October 11 through 13, 1962 will be remembered for high winds as well as record breaking rains. Millions of trees were blown down all along the Coastal areas from Washington State to Northern California. In California heavy rainfalls covered an area from Oakland to Alturas. Lake Spaulding had 23.05 inches in 3 days, the highest three-day rainfall of their 79-year record. Marysville received 9.26 inches in three days. This storm did not spare the low elevation locations. One hundred and seventy-four stations reported the highest three-day rainfall totals ever recorded. Nineteen stations reported rainfalls in excess of 20 inches in three days. The heaviest amount for the three days was 25.78 inches reported at Forbestown in the Feather River Basin. Ben Lomond north of Santa Cruz reported the highest one day total with 14.10 inches. This storm came at the end of the normal summer drought when the ground was dry, or flooding would have been much worse. Lines of equal return period are shown on Map 3.

On January 4, 1982 the 15.2 inches of rain which fell at the Ben Lomond Landfill was the largest 24 hour rainfall recorded in the Central Coastal part of California. These heavy rains saturated the soil and caused a land slide in Love Creek about 200 yards to the northwest of the rain gage. Nine rain gages recorded 10 or more inches on January 4, 1982. Three of them were in the Kentfield-San Rafael portion of Marin County. The San Francisco Airport recorded 30% of its mean annual rainfall during this storm. Berkeley, with one hundred years of daily rain records, had 6.98 inches of rainfall, exceeding the previous record for one day of 4.75 inches, recorded in 1904. This was not one of the larger storms of California. It is important because it occurred in a heavily populated area. Twenty people were killed in landslides that resulted from the soaking from the storm. Four rainfall stations reported return periods of 1000 years or more. About 1,100 square miles in the area had rainfall exceeding the once-in-a-hundred year rainfall event, as shown on Map 4.

In 1986 half of the average annual rain fell in the 10 days between 11 and 20 February, 1986 over a large portion of the Central and Northern Sierra Nevada. At Mono Lake 95% of the annual average rainfall occurred in 10 days. At Bucks Lake in the Feather Basin 49.44 inches occurred, which is 71% of their average annual rainfall. This was a high elevation storm which affected mainly the Sierra from Yosemite in the south to the Feather River watershed. In the Coast Range, Calistoga had 29.61 inches in 10 days resulting in a storm which exceeded the 2,000 year event. Extensive flooding occurred along the Napa River and the adjacent Russian River. The previous 10-day-high rain at Calistoga was

20.00 inches in 1910. Four Trees, near Bucks Lake, had 17.6 inches on the February 17, 1986. This was the greatest 24-hour rainfall event ever recorded in the Central Valley. Lines of equal return period are shown on Map 5.

ONE-THOUSAND-YEAR STORMS

When a 1000-year event can be defined as a specific number of standard deviations (usually about 5) above the mean event it is easy to identify these events. The locations of seven 1000-year rainfalls is shown on Map 6. Some of the 1000-year rainfall events are plotted on Map 7.

REFERENCES

- California Department of Water Resources. 1976 Bulletin. 195, Rainfall Analysis for
Drainage Design. Volume I: "Short-Duration Precipitation Frequency Data";
Volume II: "Long-Duration Precipitation Frequency Data"; Volume III: "Intensity
Duration-Frequency Curves." Sacramento Office.

CALIFORNIA MEAN ANNUAL PRECIPITATION

(IN INCHES)

2.5	8.0	22.5	65.0
3.5	11.0	25.0	65.0
4.5	12.5	27.5	75.0
6.0	13.0	30.0	85.0
5.5	14.0	32.5	95.0
6.5	15.0	35.0	105.0
7.0	17.0	37.5	115.0
7.5	17.5	40.0	125.0
8.0	18.0	45.0	



0 25 50 75 100 KILOMETERS
0 25 50 75 100 MILES



Source: Rantz, B.E. 1969, 1972
U.S. Geological Survey