

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU.

CALIFORNIA SECTION.

G. H. WILLSON, District Forecaster.

VOL. XX. SAN FRANCISCO, NOVEMBER, 1916. No. 11.

GENERAL SUMMARY.

November, 1916, was the third successive month with a mean temperature below the normal in California. The mean temperature, 48.0°, was 4.9° below the normal. It was the coldest November in the period of 20 years during which state-wide records have been kept. At both Eureka and Fresno it was the coldest November in a record covering 30 years, while at San Francisco it was the coldest since 1897. The average precipitation was 1.77 inches, or 1.04 inches less than the usual amount. Unlike the two preceding months, the southern half of the State received little or no precipitation, while moderately heavy rainfall occurred throughout the northern half. The sunshine received was somewhat in excess of the normal amount, while the winds were generally light. Cold northerly winds prevailed in the interior valleys, while along the coast the winds were prevailing west or southwest. Frosts occurred with extraordinary frequency in the agricultural portions of the State, Sacramento reporting frosts on 13 days and Fresno on 19 days.

The first decade of November was a period of cloudy and unsettled weather. The highest temperatures of the month occurred at most stations on the 1st or 2d. Between the 4th and 7th moderately heavy rains fell in the interior valleys, while the elevated portions of the Sierra Nevada Mountains received heavy snow. The second decade was clear and cold. The air was of unusual clearness, causing the sunshine to seem warm and pleasant for November, while the accelerated radiation at night caused unusually low minimum temperatures, with many destructive frosts. The cold was particularly severe on the mornings of the 12th to the 17th, when temperatures in the agricultural regions fell to 10° or more below the freezing point, while subzero temperatures were recorded at several of the mountain stations. The last decade of the month was cold, cloudy and unsettled, the second storm of the month occurring between the 25th and 28th. This storm brought general rains throughout the Sacramento Valley and moderately heavy snow in the high Sierra, while only light showers fell in the San Joaquin Valley, and little or no rain fell in southern California.

From an agricultural point of view the weather of November was generally unfavorable, principally because of the persistent cold and the frequent severe frosts. The damage sustained by citrus fruits varied in different parts of the State. In some regions the damage was negligible, while in others, notably in the lowlands of the San Joaquin Valley, the loss was considerable, injury having been sustained by young trees as well as by immature fruit. Fortunately, a considerable portion of the interior valley crop of citrus fruits was harvested before the severest frosts occurred. Olives were frozen and table grapes still remaining on the vines were almost entirely destroyed. Severe injury to garden vegetables occurred in all save a few sections, but this is not unusual for November. Celery in the delta district was mostly unhurt. While the rice harvest was delayed, neither the quality nor the quantity of the crop was affected. Potatoes were actually benefitted, as the cold weather chilled the ground sufficiently to enable growers to start digging potatoes for storage. The long continued drought in the extreme north portion of the State was effectually broken by the two general rains. However, a serious drought still persisted at the close of the month in the southern half of the State, where lack of moisture has contributed in no small measure to the harm caused by the cold weather.

A. H. P.

PRESSURE.

The monthly mean atmospheric pressure for the State, reduced to sea level, was 30.14 inches. The highest was 30.48 inches at Red Bluff on the 13th. The lowest was 29.78 inches at Red Bluff on the 4th. The range for the State was 0.70 inch.

TEMPERATURE.

The monthly mean temperature for the State was 48.0 degrees, which is 4.9 degrees below the normal.

The highest monthly mean was 62.4 degrees, at Sterling; and the lowest was 26.8 degrees, at Bridgeport.

The highest temperature, 99 degrees, occurred at Calexico on the 2d; and lowest, -12 degrees, occurred at Tamarack, on the 13th.

The range for the State was 111 degrees.

PRECIPITATION.

The average precipitation for the State was 1.77 inches, or 1.04 inches below the normal.

The greatest monthly amount was 11.19 inches, at Branscomb. 27 stations reported no precipitation.

The greatest amount in 24 hours was 5.20 inches at Branscomb, on the 25th.

RELATIVE HUMIDITY.—(Per Cent.)

| Stations. | 5 a. m. | 5 p. m. | Mean. |
|----------------------|---------|---------|-------|
| Eureka..... | 85 | 79 | 82 |
| Fresno..... | 81 | 45 | 63 |
| Los Angeles..... | 61 | 54 | 57 |
| Mount Tamalpais..... | 52 | 53 | 53 |
| Red Bluff..... | 66 | 40 | 53 |
| Sacramento..... | 80 | 43 | 62 |
| San Diego..... | 76 | 72 | 74 |
| San Francisco..... | 78 | 56 | 67 |
| San Jose..... | 83 | 49 | 66 |
| San Luis Obispo..... | 75 | 54 | 64 |

SUNSHINE AND CLOUDINESS.

| Stations. | Actual hours of sunshine. | Per cent of the possible. |
|----------------------|---------------------------|---------------------------|
| Eureka..... | 187 | 63 |
| Fresno..... | 242 | 79 |
| Los Angeles..... | 271 | 87 |
| Mount Tamalpais..... | 242 | 80 |
| Red Bluff..... | 212 | 71 |
| Sacramento..... | 200 | 66 |
| San Diego..... | 253 | 81 |
| San Francisco..... | 206 | 68 |
| San Jose..... | 232 | 76 |
| San Luis Obispo..... | 235 | 76 |

WIND MOVEMENT.—(Miles.)

| Stations. | Total movement for month. | Average hourly velocity. | Maximum velocity. | Direction. | Date. |
|----------------------|---------------------------|--------------------------|-------------------|------------|-------|
| Eureka..... | 4,275 | 5.9 | 33 | n. | 11 |
| Fresno..... | 3,163 | 4.4 | 26 | nw. | 4 |
| Independence..... | 4,166 | 5.8 | 32 | w. | 5 |
| Los Angeles..... | 3,765 | 5.2 | 19 | nw. | 7 |
| Mount Tamalpais..... | 14,223 | 19.5 | 60 | n. | 19 |
| Point Reyes..... | 12,182 | 16.9 | 34 | nw. | 18 |
| Red Bluff..... | 4,688 | 6.5 | 33 | nw. | 11 |
| Sacramento..... | 5,284 | 7.3 | 33 | nw. | 19 |
| San Diego..... | 3,380 | 4.7 | 19 | nw. | 5 |
| San Francisco..... | 4,508 | 6.3 | 27 | sw. | 2 |
| San Jose..... | 3,946 | 5.5 | 26 | n. | 12 |
| San Luis Obispo..... | 2,677 | 3.7 | 23 | n. | 28 |

The prevailing direction of the wind for the State was southwest.

Climatological Data for November, 1916.

Table with columns: Stations, Counties, Elevation, Length of record, Temperature (Mean, Departure from normal, Highest, Date, Lowest, Date, Greatest daily range), Precipitation (Total, Departure from normal, Greatest in 24 hours, Snowfall, etc.), Number of days (Clear, Partly cloudy, Cloudy), Prevailing direction of wind, and Observers.

Climatological Data for November, 1916.—Continued.

Table with columns: Stations, Counties, Elevation, Length of record, Temperature (Mean, Departure from normal, Highest, Date, Lowest, Date, Greatest daily range), Precipitation (Total, Departure from normal, Greatest in 24 hours, Snowfall), Number of days (Clear, Partly cloudy, Cloudy), Prevailing direction of wind, and Observers. The table lists data for numerous stations across California, including La Porte, Los Angeles, San Francisco, and many others.

Climatological Data for November, 1916.—Continued.

| Stations. | Counties. | Elevation, feet. | Length of record, years. | Temperature, in degrees Fahr. | | | | | | Precipitation, in inches. | | | | Number of days. | | | Prevailing direction of wind. | Observers. | | |
|--------------------|--------------|------------------|--------------------------|-------------------------------|----------------------------|----------|-------|---------|-------|---------------------------|--------|----------------------------|-----------------------|----------------------|--------------------------------|--------|-------------------------------|------------|----------------|----------------------------|
| | | | | Mean. | Departure from the normal. | Highest. | Date. | Lowest. | Date. | Greatest daily range. | Total. | Departure from the normal. | Greatest in 24 hours. | Snowfall (unmelted). | Precipitation of inch or more. | Clear. | | | Partly cloudy. | Cloudy. |
| Ukiah | Mendocino | 620 | 23 | 47.2 | -3.4 | 73 | †9 | 20 | †13 | 45 | 3.28 | -0.87 | 1.35 | 0 | 6 | 18 | 5 | 7 | nw. | Dr. George McCowen. |
| Vacaville | Solano | 175 | 28 | 52.3 | -3.1 | 78 | 10 | 22 | 14 | 44 | 1.42 | -1.44 | 0.62 | 0 | 5 | 25 | 2 | 3 | n. | J. E. Bassford. |
| Valyermo | Los Angeles | 3,750 | | | | | | | | | | | | | | | | | | U. S. Forest Service. |
| Visalia | Tulare | 334 | 29 | 48.6 | -5.0 | 68 | †1 | 27 | †14 | 36 | 0.90 | -0.85 | 0.00 | 0 | 0 | 26 | 1 | 3 | nw. | Santa Fe Co. |
| Walnut Creek | Contra Costa | 149 | 2 | 48.8 | | 70 | †2 | 23 | †4 | 39 | 0.78 | -1.90 | 0.47 | 0 | 3 | | | | | R. L. Nougaret. |
| Warner Springs | San Diego | 3,165 | 2 | 53.8 | | 91 | 1 | 27 | 22 | 50 | 0.16 | -0.50 | 0.16 | 0 | 1 | 26 | 2 | 2 | | J. A. Ream. |
| Wasco | Kern | 336 | 16 | 48.4 | -5.0 | 91 | 1 | 22 | 15 | 37 | 0.90 | | 0.00 | 0 | 0 | 25 | 0 | 5 | se. | Santa Fe Co. |
| Watsonville | Santa Cruz | 23 | 20 | 52.0 | -2.6 | 80 | 10 | 30 | †14 | 44 | 1.20 | -1.36 | 0.67 | 0 | 5 | 13 | 12 | 5 | w. | Spreckels Sugar Co. |
| Weaverville | Trinity | 2,162 | 4 | 41.3 | | 71 | 1 | 14 | †12 | 48 | 3.51 | -1.59 | 1.56 | 0 | 6 | 15 | 6 | 9 | | U. S. Forest Service. |
| Weitchpec | Humboldt | 1,700 | 6 | 43.7 | | 66 | 2 | 24 | †2 | 32 | 8.75 | | 3.14 | 0 | 9 | 20 | 3 | 7 | nw. | G. S. Garnett. |
| West Branch | Butte | 3,216 | 2 | 41.9 | | 68 | †1 | 17 | †2 | 40 | 8.98 | | 2.46 | 5.0 | 7 | 17 | 2 | 11 | s. | Pacific Gas & Electric Co. |
| Wheatland | Yuba | 84 | 29 | 48.8 | -3.8 | 73 | 2 | 26 | †14 | 35 | 1.70 | -0.75 | 1.31 | 0 | 4 | 18 | 7 | 5 | n. | Wm. Lombard. |
| Willows | Glenn | 136 | 37 | 50.2 | -4.6 | 79 | 10 | 25 | †5 | 43 | 0.71 | -1.25 | 0.36 | 0 | 2 | 22 | 2 | 6 | n. | F. E. Barnhouse. |
| Yorba Linda | Orange | 405 | 2 | 57.1 | | 86 | 8 | 34 | †19 | 45 | 0.06 | | 0.06 | 0 | 1 | 10 | 18 | 2 | | S. J. Walker. |
| Yosemite | Mariposa | 3,960 | 12 | 40.2 | | 69 | †1 | 18 | †13 | 43 | 0.38 | -2.45 | 0.20 | 4.0 | 2 | 19 | 8 | 3 | | Supt. National Park. |
| Yreka | Siskiyou | 2,625 | 27 | 35.8 | | 72 | 2 | 9 | 14 | 46 | 1.70 | | 0.57 | 0 | 6 | 13 | 5 | 12 | sw. | U. S. Forest Service. |
| Means and Extremes | | | | 48.0 | -4.9 | 99 | 2 | -12 | 13 | 73 | 1.77 | -1.04 | 5.20 | | 3 | 21 | 4 | 5 | sw. | |

The departures from the normal temperature and precipitation are computed only for such stations as have ten or more years of record, but all complete reports are used in determining section or division means.
 ** Temperature extremes are from observed readings of the dry bulb; means are computed from observed readings.
 † Also on other dates.
 T. Precipitation is less than 0.01 inch rain or melted snow.
 a, b, c, etc., indicate respectively, 1, 2, 3, etc., days missing from the record.

COMPARATIVE DATA FOR NOVEMBER.

MEAN MONTHLY TEMPERATURE FOR THE STATE.

| | | | |
|------|------|------|------|
| 1897 | 50.8 | 1907 | 52.7 |
| 1898 | 51.6 | 1908 | 52.9 |
| 1899 | 52.1 | 1909 | 50.7 |
| 1900 | 54.7 | 1910 | 52.8 |
| 1901 | 54.9 | 1911 | 51.1 |
| 1902 | 50.8 | 1912 | 52.2 |
| 1903 | 55.2 | 1913 | 52.2 |
| 1904 | 53.4 | 1914 | 54.2 |
| 1905 | 52.8 | 1915 | 50.8 |
| 1906 | 52.6 | 1916 | 48.0 |

AVERAGE PRECIPITATION FOR THE STATE.

| | | | |
|------|------|------|------|
| 1897 | 1.41 | 1907 | 0.28 |
| 1898 | 0.99 | 1908 | 1.85 |
| 1899 | 3.82 | 1909 | 4.52 |
| 1900 | 5.21 | 1910 | 1.91 |
| 1901 | 2.65 | 1911 | 1.00 |
| 1902 | 3.61 | 1912 | 2.85 |
| 1903 | 5.03 | 1913 | 5.00 |
| 1904 | 1.44 | 1914 | 0.80 |
| 1905 | 2.26 | 1915 | 1.96 |
| 1906 | 1.92 | 1916 | 1.77 |

DELAYED REPORTS.

| Stations. | Month. | Temperature. | | | | Total precipitation. |
|--------------|-----------|--------------|------|-------|------|----------------------|
| | | Mean | Max. | Date. | Min. |  | Date. |
| Georgetown | September | | | | | 0.50 |
| Pacoina | | | | | | 0.40 |
| Bonita | October | 59.5 | 85 | 25 | 40 | †27 |
| Camp Baldy | | | | | | 7.31 |
| Fort Ross | | | | | | 0.00 |
| Georgetown | | | | | | 3.25 |
| Hayfork | | 50.2 | 84 | 16 | 17 | 23 |
| Las Plumas | | 58.6 | 89 | 1 | 42 | 29 |
| Los Alamos | | | | | | 2.67 |
| Weils Meadow | | *47.0 | *72 | 26 | *25 | 3 |

DATES OF MISCELLANEOUS PHENOMENA.

Thunderstorms.—Camptonville (near), 6; Crescent City, 4; Hetch Hetchy, 25; Las Plumas, 6; Los Gatos, 4; Nevada City, North Bloomfield, 6; Redding, Santa Clara, 4; Weitchpec, 6.
Earthquakes.—Cahuilla, 26; Calexico, 2; Lone Pine, 9; Santa Cruz, Los Gatos, 3; Spreckels, 27.

Daily Temperature for November, 1916.

Table with columns for Stations, 1-31, and Mean. Rows list various California locations such as Alturas, Bakersfield, Barstow, etc., with their respective daily temperature ranges and monthly averages.

SNOWFALL IN THE MOUNTAINS.

On November 1, 1916, there was little or no snow on the ground in the mountains of California. The general storm which brought precipitation throughout the State between November 4th and 7th gave moderately heavy snow in the Sierra Nevada Mountains along the eastern border. From 15 to 20 inches of snow accumulated on the ground above the 5,000-foot level. In the mountains of southern California and throughout the Coast Ranges the temperatures were such that most of the precipitation accompanying this storm fell in the form of rain. Clear weather prevailed during the middle decade of the month, the warm sunshine causing the snow in the Sierra to melt rapidly, and it disappeared entirely, except at the very crest of the divide. A second general storm occurred between the 25th and 28th. Again the temperatures were above freezing in the mountains of the south portion of the State and in those along the coast, and again the precipitation was almost entirely in the form of rain. In the Sierra Nevada Mountains the temperatures were higher than those which accompanied the earlier storm, but were sufficiently low to cause the precipitation at the higher levels to occur in the form of snow. Below the 5,000-foot level the precipitation was in the form of rain, but at the very summit more than 15 inches of snow fell. For the month as a whole the snowfall was less than the usual amount in the mountains of southern California and in the Coast Ranges, but was somewhat above the normal in amount in the high Sierra. At the close of the month there was practically no snow on the ground in the mountains of California except above the 5,000-foot level in the Sierra, where 10 inches or more of rapidly melting snow still remained.

A. H. P.

COMPARATIVE SNOWFALL DATA FOR NOVEMBER.

(Amount on the Ground.)

| | FORDYCE DAM. | | | SUMMIT. | | | TAMARACK. | | |
|-----------|--------------|-------|------------|---------|-------|------------|-----------|-------|------------|
| | 1st. | 15th. | End of mo. | 1st. | 15th. | End of mo. | 1st. | 15th. | End of mo. |
| 1907..... | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 0 |
| 1908..... | 0 | 0 | 12 | 2 | 0 | 27 | 0 | 0 | 29 |
| 1909..... | 6 | 32 | 5 | 4 | 47 | 4 | 6 | 55 | 22 |
| 1910..... | 0 | 0 | 6 | 0 | 3 | 9 | 0 | 5 | 8 |
| 1911..... | 0 | 12 | 5 | 0 | 16 | 2 | 0 | 31 | 6 |
| 1912..... | 5 | 9 | 6 | 2 | 4 | T. | 1 | 17 | 3 |
| 1913..... | 0 | 15 | 34 | 0 | 15 | 32 | 0 | 11 | 36 |
| 1914..... | 0 | 0 | 9 | 0 | 0 | 12 | 0 | 0 | 11 |
| 1915..... | 0 | 7 | 9 | 0 | 8 | 6 | 0 | 4 | 3 |
| 1916..... | 0 | 10 | 9 | 0 | 10 | 20 | 0 | 4 | 7 |

Snowfall Data. [In inches.]

| WATERSHED, COUNTY, STATION. | Elevation, feet. | Total snow-fall. | Compr'd with normal. | Am't on ground 15th. | Am't on ground end mo. |
|--|------------------|------------------|----------------------|----------------------|------------------------|
| Klamath Watershed. | | | | | |
| <i>Siskiyou County.</i> | | | | | |
| Yreka..... | 2,625 | 0 | ..... | 0 | 0 |
| <i>Trinity County.</i> | | | | | |
| Hayfork..... | 2,300 | 0 | ..... | 0 | 0 |
| Ruth..... | 2,925 | 2 | ..... | 0 | 0 |
| <i>Humboldt County.</i> | | | | | |
| Weitchpec..... | 1,700 | 0 | - 1 | 0 | 0 |
| Mountain Lakes. | | | | | |
| <i>Modoc County.</i> | | | | | |
| Cedarville..... | 4,675 | 3 | - 3 | 0 | 0 |
| Fort Bidwell..... | 4,375 | 10 | ..... | 3 | 0 |
| <i>Lassen County.</i> | | | | | |
| Eagle Lake..... | 5,000 | ..... | ..... | ..... | ..... |
| Madeline..... | 5,270 | 5 | + 1 | 0 | 0 |
| Susanville..... | 4,175 | ..... | ..... | ..... | ..... |
| <i>Nevada County.</i> | | | | | |
| Boca..... | 5,531 | 7 | 0 | 0 | 0 |
| Truckee..... | 5,817 | 11 | 0 | 0 | 0 |
| <i>Mono County.</i> | | | | | |
| Bridgeport..... | 6,500 | 2 | ..... | 0 | 0 |
| <i>Placer County.</i> | | | | | |
| Tahoe..... | 6,230 | 12 | ..... | 4 | 0 |
| <i>Inyo County.</i> | | | | | |
| Bishop Creek..... | 8,500 | 6 | - 4 | 0 | 0 |
| Lone Pine..... | 3,728 | 0 | ..... | 0 | 0 |
| Wells Meadow..... | 5,280 | 0 | ..... | 0 | 0 |
| Sacramento Watershed. | | | | | |
| <i>Siskiyou County.</i> | | | | | |
| Dunsmuir..... | 2,285 | 2 | 0 | 0 | 0 |
| McCloud..... | 3,270 | 7 | + 3 | 0 | 0 |
| Sisson..... | 3,555 | 2 | - 2 | 0 | 0 |
| <i>Modoc County.</i> | | | | | |
| Alturas..... | 4,400 | 4 | + 1 | 0 | 0 |
| <i>Shasta County.</i> | | | | | |
| Burney..... | 3,300 | 0 | - 2 | 0 | 0 |
| <i>Plumas County.</i> | | | | | |
| Bucks..... | 5,515 | 35 | +33 | 19 | 4 |
| Canon Dam..... | 4,570 | 0 | ..... | 0 | 0 |
| Chester..... | 4,550 | 0 | 0 | 0 | 0 |
| Clover Valley..... | 5,700 | 3 | - 4 | 0 | 0 |
| La Porte..... | 5,000 | 14 | - 1 | 0 | 0 |
| Portola..... | 4,832 | 3 | ..... | 0 | 0 |
| Quincy..... | 3,400 | 5 | + 2 | 0 | 0 |
| <i>Butte County.</i> | | | | | |
| De Sabla..... | 2,500 | 0 | 0 | 0 | 0 |
| Inskip..... | 4,975 | 14 | + 7 | 5 | 0 |
| Stirling City..... | 3,525 | 6 | + 5 | 0 | 0 |
| West Branch..... | 3,216 | 5 | + 4 | 0 | 0 |
| <i>Yuba County.</i> | | | | | |
| Camptonville..... | 3,500 | 2 | + 1 | 0 | 0 |
| <i>Sierra County.</i> | | | | | |
| Downieville..... | 3,150 | 1 | 0 | 0 | 0 |
| Sierra City..... | 4,300 | 10 | + 6 | 0 | 0 |
| Sierraville..... | 5,000 | 6 | + 2 | 0 | 0 |
| Table Rock..... | 5,980 | 26 | + 1 | 8 | 3 |
| <i>Nevada County.</i> | | | | | |
| Deer Creek..... | 3,700 | 18 | +15 | 0 | 0 |
| Fordyce Dam..... | 6,500 | 40 | + 7 | 10 | 9 |
| Lake Spaulding..... | 4,600 | 21 | +11 | 3 | 0 |
| <i>Placer County.</i> | | | | | |
| Blue Canon..... | 4,695 | 20 | +11 | 0 | 0 |
| Emigrant Gap..... | 5,230 | 22 | + 9 | 0 | 0 |
| Summit..... | 7,017 | 36 | + 2 | 10 | 20 |
| San Joaquin Watershed. | | | | | |
| <i>Alpine County.</i> | | | | | |
| Tamarack..... | 8,000 | 31 | -22 | 4 | 7 |
| <i>Tuolumne County.</i> | | | | | |
| Center Ranger Station..... | 3,850 | 5 | ..... | 0 | 0 |
| Hetch Hetchy..... | 3,665 | ..... | ..... | 0 | 0 |
| Lake Eleanor..... | 4,700 | 12 | + 4 | 0 | 0 |
| <i>Mariposa County.</i> | | | | | |
| Yosemite..... | 3,945 | 4 | 0 | 0 | 0 |
| <i>Fresno County.</i> | | | | | |
| Cascada..... | 4,900 | 9 | ..... | 0 | 0 |
| Huntington Lake..... | 6,950 | 16 | ..... | 2 | 0 |
| Stevenson Creek..... | 4,250 | 4 | ..... | 0 | 0 |
| <i>Tulare County.</i> | | | | | |
| Hot Springs..... | 3,300 | 0 | 0 | 0 | 0 |
| Springville..... | 4,000 | 2 | - 2 | 0 | 0 |
| Mountains of Southern California. | | | | | |
| Bear Valley Dam..... | 6,700 | 2 | - 5 | 0 | 0 |
| Converse Nursery..... | 6,000 | 0 | ..... | 0 | 0 |
| Squirrel Inn..... | 5,280 | 0 | - 2 | 0 | 0 |
| Seven Oaks..... | 5,000 | 0 | - 1 | 0 | 0 |
| Nellie..... | 5,350 | 0 | ..... | 0 | 0 |
| Julian..... | 4,222 | 0 | ..... | 0 | 0 |
| Valyermo..... | 3,750 | ..... | ..... | ..... | ..... |