The highest temperature recorded was 108° at Healdsburg on the 31st. This was 4° higher than the highest recorded during May, 1911, but 13° lower than the temperature recorded at a number of stations in California during May, 1910. The lowest temperature was 8° at Tamarack on the 7th, or 3° lower than the lowest temperature during May, 1911, which occurred at the same place.

PRECIPITATION.

While the precipitation for the season has been much below the normal, the precipitation for the month of May was about 60 per cent greater than the normal. It was much greater than that of May, 1911, 1910, and 1909, and slightly greater than that of 1908.

The following table gives the average and departure from the normal for each May from 1897 to 1912, inclusive:

Year.	Mean.	Departure.	Year.	Mean.	Departure.
	Inches.	*Inches.*		*Inches.*	*Inches.*
1897	0.18	−1.04	1905	2.18	+0.96
1898	1.56	+0.34	1906	3.19	+1.97
1899	0.73	−0.49	1907	0.57	−0.65
1900	1.39	+0.17	1908	1.63	+0.41
1901	1.03	−0.19	1909	0.23	−0.99
1902	0.84	−0.38	1910	0.18	−1.04
1903	0.14	−1.08	1911	0.72	−0.50
1904	0.22	−1.00	1912	1.92	+0.70

The greatest monthly rainfall was 7.01 inches at Fordyce Dam, and there was no rainfall at five stations. The greatest 24-hour rainfall was 3.27 inches at Weitchpec, Humboldt County.

Snowfall.—May was a month of light snowfall. The outlook for water was only fair at the beginning of the month, but was somewhat improved by the rains and light snow. At Blue Canyon and other points in the Sierra below 5,000 feet elevation 4 to 6 inches of moist snow fell on May 22.

Summit.—The following table shows the depth of snow on the ground at Summit on given dates in May during the period 1907 to 1912:

	May 1.	May 15.	May 31.
	Inches.	*Inches.*	*Inches.*
1907	115	121	71
1908	20	42	16
1909	119	66	33
1910	13	12	3
1911	94	65	37
1912	36	13	6

SUNSHINE.

The following table gives the hours of sunshine and percentages of the possible:

Station.	Hours.	Percentage of possible.	Station.	Hours.	Percentage of possible.
Eureka	185	41	Sacramento	273	61
Fresno	374	85	San Diego	225	52
Los Angeles	289	67	San Francisco	310	70
Mount Tamalpais	275	62	San Jose	346	79
Red Bluff	320	72	San Luis Obispo	234	54

A peculiar feature of the sunshine during May, 1912, was the comparatively small amount at Mount Tamalpais. Usually during the month of May the sunshine exceeds 70 per cent of the possible. This May the sunshine was only 62 per cent, while at San Francisco, where the sunshine is usually below 60 per cent, this May reached 70 per cent. There was less sunshine in the valleys than usual.

NOTES ON THE RIVERS OF THE SACRAMENTO AND LOWER SAN JOAQUIN WATERSHEDS DURING MAY, 1912.

By N. R. Taylor, Local Forecaster.

Sacramento watershed.—While the rivers of this watershed were below the May normal generally they averaged from 1 foot to nearly 4 feet above that of April, and were higher than during any of the preceding 11 months, a condition that has probably never before occurred in the Sacramento Valley.

A slight swell, which was a continuation of the rise that was in progress during the last days in April, occurred in the Sacramento River during the first few days of May, and another rise occurred during the last decade of the month which culminated, at most points, in the highest stages of the month. At Sacramento city the highest stage, 16.7 feet, on the 30th and 31st, is the highest at this point for the season of 1911–12.

In the Feather-Yuba and American River watersheds there were no rises much in excess of 1 foot, and all streams averaged much below the usual stages for the month.

There was little departure from the usual May rainfall in the floor of the valley. The snowfall in the mountains was below that which usually falls, and the accumulated amounts of snow in the high Sierras dwindled rapidly during the last days of the month, but at no time were the effects of snow water noticeable in any of the main streams of the Sacramento drainage basin.

Lower San Joaquin watershed.—The rivers of this watershed, like those of the Sacramento, were much higher than during the preceeding month. They were, however, below the May normal, especially the San Joaquin itself, below the mouth of the Stanislaus. There was a general rise in progress during the last few days of the month, due to melting snows in the southern Sierras.

NOTES ON THE STREAMS OF THE UPPER SAN JOAQUIN WATERSHED.

By W. E. Bonnett, Local Forecaster.

With the coming of the warmer weather of May, the streams of this district rose considerably, but there was nowhere any approach to flood conditions. The average monthly stages in the Merced at Merced Falls and in the San Joaquin at Friant were very slightly higher than the average stages for May, 1908, which were the lowest for the six years' record for this month. In the Kings at Piedra and in the San Joaquin at Firebaugh, the average stages were even lower than those of May, 1908.

The month closed with some very warm days, and the highest stages at all points were reached on the 30th or 31st, but the fall that has taken place during the first week of June coincident with some very warm weather would indicate that the highest stages for this season have already been reached and that the summer decline has begun.

In the season of 1907–8, which was a dry one followed by very low summer water in the streams, the snowfall occurred mainly during the midwinter months, and probably was of such a character as to yield a better sustained flow than is to be hoped for this year. Furthermore, May, 1908, was a very cool month, and this had its effect in retarding the melting of mountain snows and making

the stages of streams lower than those of the current month. All indications point to a considerable shortage of water by the middle of summer.

STUDIES IN FROST PROTECTION—EFFECT OF MIXING THE AIR.

By A. G. McAdie.

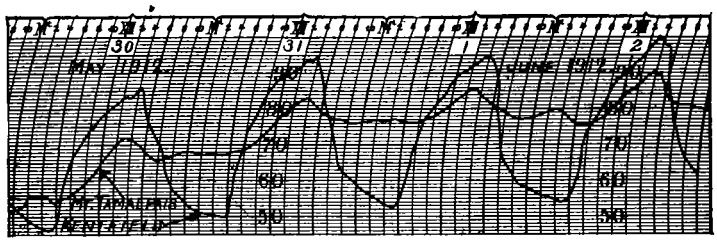
In the Monthly Weather Review for January, 1912, the writer calls attention to a marked illustration of temperature fluctuation at Kentfield, Cal., the base station of the Mount Tamalpais Observatory, during the frost period of December 11 to 14, 1911.

It was shown that as a result of thorough intermixing of the air strata there was a marked warming of the lower air at a time when under ordinary conditions and absence of circulation severe frosts would have occurred.

During the last two days of May, 1912, and the first two of June a warm spell occurred in California. Some of the temperatures were the highest recorded for nearly a year. This warm spell offered an interesting opportunity to compare temperature fluctuations at the two stations. The lower station, Kentfield, is 65 feet above sea level and 2,530 feet below the summit of the mountain.

It will be noted from the illustration that coincident with the passage of the sun west of the mountain crest, that is, about 4 p. m., the lower station is in shadow and the temperature falls for a period of 6 hours at an approximate rate of 5° per hour. It may be noted that this is a period of comparative stillness in the valley, except for light ascensional currents. It seems likely that the warm air is displaced upward by a slow-moving stratum of surface air, which finds its way indirectly into the valley from the sea. This layer, however, is very thin, as is shown by the fact that the temperature rises abruptly after sunrise, and apparently there was little draining of the air down the mountain side.

It is interesting to compare the gains and losses of heat at the base station with that at the summit. There were approximately 600 hour degrees lost at the lower station during the night hours in excess of the amount lost during the same period at the upper station. During the hours



Comparative temperatures, Kentfield, Marin County, Cal., and Mount Tamalpais, from midnight May 30 to June 2, 1912, inclusive.

of bright sunlight the lower station shows an excess of approximately 500 hour degrees.

The comparison is interesting as showing that with proper ventilation and thorough mixing, the extreme temperatures experienced in the valley near the ground could have been avoided and a temperature record more like that experienced at the summit obtained.