

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
 IN COOPERATION WITH BONNEVILLE POWER ADMINISTRATION
 CLIMATOGRAPHY OF THE UNITED STATES NO. 20 -- 35

LATITUDE 44° 39' N
 LONGITUDE 121° 09' W
 ELEV. (GROUND) 2,244 Ft.

CLIMATOLOGICAL SUMMARY

STATION Madras, Oregon

MEANS AND EXTREMES FOR PERIOD 1932-1964

Month	Temperature (°F)							** Mean degree days	Precipitation Totals (Inches)							Mean number of days					Month			
	Means			Extremes					Mean	Greatest daily	Year	Snow, Sleet				Precip. .10 inch or more	Temperatures		90° and above	32° and below		32° and below	0° and below	
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest	Year					Mean	Maximum monthly	Year	Greatest daily		Year	Max.						Min.
(a)																								
Jan.	41.0	20.0	30.5	64	1939	-31	1962	1079	1.09	2.18	1943	5.9	24.0	1940	9.0	1954	4	0	6	26	3	Jan.		
Feb.	47.6	24.4	36.0	76	1932	-34	1933	837	0.92	1.38	1956	2.6	11.0	1938	6.0	1938	3	0	2	22	1	Feb.		
Mar.	54.2	25.8	40.0	79	1960+	-1	1955	775	0.80	0.65	1940	1.0	6.5	1960	6.0	1960	3	0	*	24	*	Mar.		
Apr.	62.7	29.4	46.1	91	1934	9	1951	570	0.64	0.63	1940	T	5.0	1936	4.0	1936	2	*	0	20	0	Apr.		
May	70.0	35.2	52.6	96	1934	11	1954	378	1.08	1.06	1956	T	T	1954+	T	1954+	4	1	0	13	0	May		
June	77.2	40.7	59.0	102	1948	20	1955	189	0.91	0.74	1944	T	T	1943	T	1943	3	4	0	4	0	June		
July	86.9	43.8	65.4	110	1938	27	1932	50	0.28	0.76	1947	0.0	0.0	0.0	0.0	1	13	0	1	0	July			
Aug.	85.4	41.9	63.7	106	1961	26	1937	78	0.29	0.66	1934	0.0	0.0	0.0	0.0	1	10	0	1	0	Aug.			
Sep.	78.2	36.8	57.5	101	1944	16	1932	237	0.52	1.30	1942	T	T	1934	0.0	0.0	2	4	0	8	0	Sep.		
Oct.	65.3	30.5	47.9	89	1963	0	1935	530	0.68	0.77	1943	T	2.8	1935	2.5	1935	2	*	*	19	*	Oct.		
Nov.	50.4	26.2	38.3	74	1953	-15	1955	807	1.29	1.05	1961	1.4	17.0	1955	6.0	1946	4	0	1	21	*	Nov.		
Dec.	43.3	24.3	33.8	66	1958+	-27	1932	970	1.29	1.45	1964	2.4	12.7	1955	5.0	1955	4	0	5	25	1	Dec.		
Year	63.5	31.6	47.6	110	July 1938	-34	Feb. 1933	6500	9.79	2.18	Jan. 1943	13.3	24.0	Jan. 1940	9.0	Jan. 1954	33	32	14	184	5	Year		

(a) Average length of record, years.

+ Also on earlier dates, months, or years.

T Trace, an amount too small to measure.

* Less than one half.

** Base 65°F

CLIMATE OF MADRAS, OREGON

Madras lies just outside the northwestern corner of the Great Basin. Normal air movement at this latitude is from the west. Since Madras is only 150 miles east of the Pacific Ocean, most air masses crossing this region are of marine origin. They have, however, been greatly modified before reaching here by their passage over both the Coast and Cascade ranges. The modification is particularly pronounced during the winter months when most of the storms and precipitation occur. At that time the ground is much colder than the ocean. Cooling of air from the ocean begins immediately after it touches land, due first to contact with the colder ground surface; and second, to the mechanics of being lifted up over the Coast Range and later over the Cascades. This lifting process cools air at from 3° to 5° Fahrenheit for each 1,000 feet increase in elevation. In cooling the air gives up a large proportion of its moisture as precipitation along the west slopes of the mountains. By the time it moves down the east slopes of the Cascades, and out over the central Oregon plateau, its water content has been significantly decreased while its capacity to hold moisture has increased. In the 30 to 35 miles from the crest of the Cascades to the Madras area, the normal precipitation drops from 60-65 inches a year to less than 10.

Madras, in common with all of Oregon, has a definite winter rainfall climate--55% of the annual total falls during the five months, November through March; only about 15% in the summer months, June-August. Most of the late spring, summer and early fall rains occur during thunderstorms. These storms last from a few minutes to usually not more than 2 or 3 hours, but some of the area's most intense rainfalls are associated with them. Table 1 shows computed short-period maximum rainfall intensities for selected recurrence intervals.

Table 1.
 Maximum Short-Period Rainfall Intensities of Given Return Periods 1/
 (Amounts shown in inches and tenths; return periods in years)

Return Period	Length of Time of Maximum Intensities								
	20 Min.	30 Min.	1 Hr.	2 Hr.	3 Hr.	6 Hr.	12 Hr.	18 Hr.	24 Hr.
2	0.3	0.4	0.4	0.6	0.8	1.0	1.3	1.4	1.5
5	0.4	0.4	0.6	0.8	0.9	1.3	1.6	1.7	1.8
10	0.5	0.5	0.7	0.8	1.1	1.4	1.8	2.0	2.1
25	0.5	0.7	0.8	1.0	1.3	1.7	2.0	2.2	2.4
50	0.6	0.8	0.9	1.2	1.5	1.8	2.3	2.5	2.7
100	0.7	0.9	1.1	1.4	1.7	2.0	2.5	2.7	3.0

Only about 15% of the annual precipitation falls as snow. Seldom does more than 2 or 3 inches of snow fall at one time, and this usually melts in a few days. Over a 30-year period there has been an average of only 13 days a year with 1 inch or more of snow on the ground. The average depth on those days is slightly less than

4 inches. The greatest depth ever recorded at Madras was 15 inches; however, in 75% of the 43 years for which records are available it never exceeded 8 inches, and in 50% it was not more than 6 inches.

Most winters an occasional push of Arctic air invades this area. Also cold air tends to form over the snow-covered slopes of the Cascades and under certain conditions will drift down slope into the adjacent valleys. As a result, a few days of relatively cold temperatures may be expected most winters. Rarely, however, does either abnormally cool or abnormally hot weather persist for more than 3 or 4 days at a time. The absolute range of temperatures since 1921 has been 40° below zero to 108 above. In 50% of that time the annual maximum was no higher than 102° and the annual minimum no colder than a -10°. Nights are generally cool here even in summer. Temperatures down to freezing (32°F.) may be expected any month in the year. In Tables 2a and 2b, below, are shown the statistical likelihood for temperatures of 28° and 24° after indicated dates in spring or before indicated dates in the fall.

Table 2a. Statistical Likelihood (In Percent) That Temperatures of 24° and 28° Will Occur In Spring After Dates Indicated

Tempt.	90%	80%	70%	60%	50%	40%	30%	20%	10%
24°	4/26	5/2	5/7	5/10	5/14	5/17	5/21	5/26	6/1
28°	5/14	5/20	5/25	5/29	6/1	6/5	6/9	6/13	6/19

Table 2b. Statistical Likelihood (In Percent) That Temperatures of 24° and 28° Will Occur In Fall Before Dates Indicated

Tempt.	10%	20%	30%	40%	50%	60%	70%	80%	90%
24°	9/9	9/16	9/21	9/26	9/30	10/4	10/9	10/14	10/22
28°	8/1	8/8	8/13	8/18	8/22	8/26	8/31	9/5	9/13

The distribution of daily maximum and minimum temperatures at Madras is shown on pages 2, 3 and 4 in Tables 4, 5 and 6. These are listed by Weather Bureau standard weeks and are based on a 30-year record. Since this is a slightly different period than that used in preparing the table of "Means and Extremes" above, there may be minor differences in some of the extreme values of the two tables.

Relative humidity varies from a rather frequent 100% during the early morning hours, particularly in the late fall and winter, to occasionally less than 10% under certain summertime conditions. Highest relative humidities are usually associated with strong invasions of warm marine air. Lowest occur when dry high pressure settles over the Pacific Northwest in summer causing winds to blow down the east slopes of the Cascades and into central Oregon. While no official relative humidity values are available for Madras, observations have been made at Redmond, some 20-25 miles south in very similar terrain. Average values obtained at Redmond are presented in Table 3. These should

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Table 6. MEANS, STANDARD DEVIATIONS AND EXTREMES OF DAILY MAXIMUM AND MINIMUM TEMPERATURES BY WEEKS
(Based on 30-Year Period 1928 Through 1957)

Week No.	Beginning Date	Year	Mean Maximum (°F)	Standard Deviation (°F)	Highest of Record	Mean Minimum	Standard Deviation (°F)	Lowest of Record
1	Mar. 1	1928	51.8	8.1	75	24.0	8.3	-1
2	Mar. 8	1933	53.5	8.6	79	25.0	8.5	3
3	Mar. 15	1954	55.9	9.4	78	25.9	9.0	5
4	Mar. 22	1958	55.8	8.4	79	27.6	7.9	9
5	Mar. 29	1954	60.8	8.5	83	27.1	8.7	10
6	Apr. 5	1958	60.8	8.7	85	26.9	7.2	12
7	Apr. 12	1949	65.3	9.0	85	29.5	7.8	12
8	Apr. 19	1950	64.7	9.4	91	30.2	8.3	11
9	Apr. 26	1941	67.7	9.2	90	31.0	7.9	13
10	May 3	1941	70.9	9.8	88	31.9	7.7	15
11	May 10	1942	70.9	9.8	98	34.6	8.4	19
12	May 17	1942	71.7	10.0	98	35.5	7.4	18
13	May 24	1942	73.7	10.3	98	38.6	8.2	20
14	May 31	1944	75.4	9.3	98	37.8	7.5	20
15	June 7	1945	76.4	10.2	101	40.9	7.4	21
16	June 14	1946	74.7	9.1	99	40.7	7.5	22
17	June 21	1947	79.1	9.1	102	40.8	6.5	27
18	June 28	1948	82.1	9.6	105	41.8	6.7	29
19	July 5	1949	85.6	7.9	101	43.5	6.2	27
20	July 12	1951	88.5	7.9	108	44.0	6.5	29
21	July 19	1952	89.9	8.5	109	45.9	6.0	31
22	July 26	1952	87.7	8.6	109	45.5	7.1	29
23	Aug. 2	1953	87.2	7.8	102	42.7	6.5	28
24	Aug. 9	1954	87.5	7.5	105	42.0	6.3	27
25	Aug. 16	1955	86.9	7.1	102	41.1	6.5	28
26	Aug. 23	1957	82.9	8.9	101	40.8	7.2	26
27	Aug. 30	1958	85.1	9.2	101	39.6	6.3	26
28	Sept. 6	1958	80.0	9.2	101	37.6	6.5	26
29	Sept. 13	1959	78.0	9.6	96	36.6	6.6	18
30	Sept. 20	1960	75.9	9.7	99	34.0	7.1	15
31	Sept. 27	1961	71.9	8.5	99	32.7	8.1	17
32	Oct. 4	1962	69.1	9.4	88	32.7	8.1	15
33	Oct. 11	1963	66.5	7.4	86	30.2	8.8	12
34	Oct. 18	1964	65.1	8.8	86	28.0	9.2	9
35	Oct. 25	1965	59.3	8.6	80	25.7	10.5	0
36	Nov. 1	1966	55.3	8.2	74	25.7	11.1	-12
37	Nov. 8	1967	52.0	8.1	74	26.1	9.9	-6
38	Nov. 15	1968	47.6	8.9	71	23.8	10.4	-15
39	Nov. 22	1969	48.2	9.7	69	24.4	11.0	-2
40	Nov. 29	1970	45.9	9.8	68	25.5	9.9	-3
41	Dec. 6	1971	44.4	10.0	66	23.8	12.5	-20
42	Dec. 13	1972	41.6	10.9	62	21.7	12.3	-20
43	Dec. 20	1973	43.1	8.8	65	24.5	9.3	0
44	Dec. 27	1974	41.8	9.5	64	23.1	11.3	-20
45	Jan. 3	1975	40.5	10.4	61	20.4	12.1	-28
46	Jan. 10	1976	39.7	10.7	60	19.7	12.7	-31
47	Jan. 17	1977	38.1	12.9	63	17.5	16.2	-40
48	Jan. 24	1978	39.5	11.9	65	17.0	14.6	-34
49	Jan. 31	1979	41.4	10.6	69	20.8	13.9	-31
50	Feb. 7	1980	44.8	9.5	65	21.3	13.5	-34
51	Feb. 14	1981	46.4	8.0	74	22.1	11.0	-12
52	Feb. 21	1982	49.5	8.0	76	25.7	8.0	-7
53	Feb. 28	1983	51.1	6.3	64	26.5	7.7	12

Table 7. ANNUAL EXTREME TEMPERATURES FOR EXPECTED RETURN PERIODS
This table was computed from the extreme highest and extreme lowest annual temperatures for a 35-year period, 1930-1964, inclusive. It presents a statistical estimate of the highest and lowest temperatures that may be expected every 2, 5, 10, 15, 20, 25 and 50 years.

Return Period (in years)	Highest Annual Maximum	Lowest Annual Minimum
2	102	-11
5	105	-22
10	107	-28
15	108	-31
20	109	-33
25	110	-34
50	111	-39

Statistics for the above were:
Maximum: Mean 102; Standard Deviation 4.0
Minimum: Mean -11; Standard Deviation 13.5

Table 8. AVERAGE TEMPERATURE (°F)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1932	32.6	33.0	42.2	45.8	51.3	60.2	62.2	63.5	56.8	49.1	42.6	40.0	47.0
1933	32.6	30.8	39.9	44.4	49.1	60.6	67.0	65.4	54.6	51.6	36.0	25.2	47.7
1934	37.7	38.8	47.0	53.5	57.4	61.2	66.4	67.9	58.5	51.5	43.4	34.6	51.5
1935	31.2	36.2	38.1	44.2	50.4	59.8	65.2	63.6	59.4	45.2	33.5	29.6	46.4
1936	34.7	25.2	40.4	50.4	56.5	63.1	66.0	64.0	55.4	48.1	31.7	34.8	47.4
1937	13.8	34.2	35.9	44.9	53.8	60.2	67.0	62.6	57.4	50.4	42.8	35.1	47.1
1938	32.8	32.5	38.9	46.3	51.2	60.2	68.0	63.1	60.4	46.6	34.9	30.2	47.5
1939	35.2	39.2	42.6	48.4	54.2	56.7	62.2	65.2	58.2	48.3	37.7	37.8	48.2
1940	27.1	32.6	44.0	47.0	54.6	60.9	65.4	65.1	50.7	50.7	34.6	32.2	48.2
1941	32.6	36.7	41.2	45.8	52.9	57.6	67.0	64.2	53.5	45.7	42.3	35.4	47.9
1942	20.0	35.4	39.0	44.6	49.7	56.0	67.2	65.2	58.1	48.2	38.4	36.7	46.5
1943	24.3	34.6	37.2	46.8	48.5	55.4	65.3	60.8	59.5	48.3	37.1	30.4	45.7
1944	29.0	33.5	35.3	43.0	56.2	56.7	64.8	61.8	58.4	50.0	37.4	29.4	46.0
1945	35.2	38.6	39.4	44.6	53.2	56.2	65.9	64.6	53.7	47.6	40.2	33.0	47.7
1946	34.3	37.6	41.3	46.2	52.6	58.0	65.4	64.4	55.9	44.6	36.6	35.9	47.7
1947	30.0	38.6	44.2	47.2	57.0	57.6	65.0	61.8	58.1	49.6	41.4	36.8	48.9
1948	33.0	32.7	37.6	42.8	50.2	62.0	62.4	61.5	55.0	44.3	38.7	29.4	45.8
1949	21.3	36.2	38.4	47.3	56.0	57.8	63.9	63.5	58.5	41.7	40.9	34.2	46.6
1951	32.5	36.2	37.0	45.7	51.9	59.2	65.0	62.1	57.2	46.5	36.6	29.6	46.7
1952	27.2	36.3	38.4	47.3	53.2	58.2	66.3	64.8	60.4	52.1	30.6	32.7	47.3
1953	43.5	38.2	41.0	44.4	50.5	53.5	64.5	64.0	60.5	48.0	44.0	37.9	49.1
1954	33.8	38.8	38.8	46.4	50.8	55.6	62.9	59.8	54.9	44.3	42.0	30.5	46.4
1955	30.5	31.8	35.4	41.2	49.7	50.8	61.9	62.3	56.8	48.7	35.5	33.0	46.3
1957	16.1	35.6	41.1	46.8	55.2	60.9	63.0	60.6	58.7	45.6	34.4	37.3	46.3
1958	35.2	42.2	37.9	45.1	58.5	62.1	68.1	68.4	57.2	47.6	40.0	38.3	50.0
1960	25.0	34.8	41.3	47.7	51.2	61.0	68.5	62.5	58.4	49.8	38.8	32.4	47.6
1961	37.8	43.5	44.4	46.7	51.4	64.0	66.8	60.5	54.1	47.1	40.5	34.4	49.5
1962	31.0	36.9	40.8	49.4	49.6	58.3	63.9	63.0	58.9	47.9	42.3	36.9	48.2
1963	27.7	43.0	47.9	43.9	54.0	57.4	61.6	64.1	63.7	50.8	41.3	33.2	48.4
1964	37.2	37.3	37.9	43.5	49.7	58.9	65.9	62.1	55.8	47.9	37.1	33.3	47.2

Table 9. TOTAL PRECIPITATION (INCHES)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1933	0.61	0.28	0.35	0.16	1.59	0.64	0.39	0.04	0.16	0.42	0.29	0.44	5.31
1934	0.74	0.25	0.39	0.92	0.94	0.69	0.12	0.70	0.27	0.87	1.43	1.85	8.70
1935	0.74	0.49	0.35	0.56	0.59	0.48	0.18	0.20	0.23	0.70	0.35	1.16	6.59
1936	1.82	0.66	0.23	0.58	0.84	0.63	0.63	0.33	0.53	0.57	0.58	0.43	6.97
1937	0.50	0.60	1.99	1.14	0.84	2.03	0.12	0.61	1.12	2.90	2.21	1.44	14.46
1938	0.60	2.45	1.37	1.44	0.36	0.72	0.44	0.69	0.68	0.54	0.42	0.42	9.71
1939	0.30	0.46	0.51	1.87	0.40	0.57	0.27	0.28	0.24	0.29	0.10	1.63	5.03
1940	2.07	1.63	1.51	1.87	0.17	0.14	0.33	0.00	1.69	0.78	0.75	0.58	11.52
1941	1.34	1.15	0.40	0.28	1.73	0.66	0.45	0.90	0.89	0.91	1.95	1.48	12.15
1942	1.47	1.08	0.16	0.22	1.24	1.18	0.18	0.13	1.35	0.18	3.44	1.68	12.11
1943	2.18	0.16	0.71	1.43	0.36	0.76	0.02	0.60	0.01	1.69	0.64	0.28	8.84
1944	0.30	0.58	0.14	0.68	0.60	1.11	0.09	0.01	0.35	0.58	1.22	0.59	6.05
1945	0.70	1.19	0.28	0.11	0.99	0.06	0.04	0.18	0.38	0.86	1.63	2.33	10.92
1946	0.80	0.33	1.06	0.07	0.76	0.98	0.11	0.58	0.91	1.06	1.22	0.17	8.05
1947	0.30	0.86	0.81	0.59	0.34	1.99	1.68	0.37	0.34	2.00	1.29	0.22	10.49
1948	1.34	1.28	1.32	1.24	2.30	2.21	0.43	0.56	1.33	0.16	1.27	1.80	15.24
1949	0.20	0.19	0.92	0.17	0.43	0.00	0.00	0.00	0.05	0.29	1.81	0.17	4.13
1951	1.32	1.18	0.41	0.17	1.46	0.43	0.41	0.00	0.02	0.77	1.80	1.70	9.68
1952	0.87	1.27	0.22	0.31	0.47	2.83	0.00	0.51	0.39	0.60	0.11	2.23	6.93
1953	2.11	1.32	0.62	0.62	1.08	1.10	0.00	1.17	T	0.48	2.04	1.62	12.16
1954	2.00	0.41	0.64	0.31	0.93	1.13	0.04	0.74	0.64	0.47	0.41	0.10	7.82
1955	0.27	0.21	0.40	1.31	0.42	0.48	0.17	0.00	0.68	0.56	1.80	0.50	9.79
1956	2.67	1.65	0.36	0.12	2.23	1.39	0.38	0.10	1.23	0.31	3.49	10.76	16.76
1957	0.49	0.87	2.32	0.97	1.71	0.52	0.85	0.19	0.94	0.73	2.13	12.84	1