

especially if its oscillations in diameter decreased, planets formed would be smaller. The subject matter of this paragraph is offered very tentatively, and the

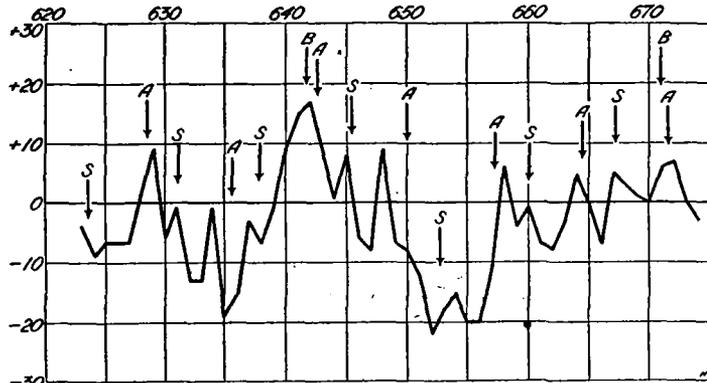


FIGURE 3.—Correlation periodogram of 10-day means of sunspots with 11-year variation eliminated. The arrows "A" and "S" are identical with those in Figure 2. The "B" arrows point where the Venus-Earth term should show maxima

writer has seriously considered whether its possibilities are great enough to include it in a paper whose body is so much more definite.

A by-product of this investigation is to show that monthly or semimonthly means, used to compute a corre-

lation periodogram, will in this manner locate the dates of sun-spot maxima and minima more accurately than do the methods now used. There is no single point to stand out and catch the eye, and the result depends upon a consideration of every variation in shape during the cycle.

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LOW RELATIVE HUMIDITY IN OREGON

551.571 (795)

By CHARLES I. DAGUE

[Fire-Weather Warning Service, Portland, Oreg., April 1, 1929]

Relative humidity, in recent years, has become most generally recognized on the Pacific slope, and over many other forested regions as well, as the best and most important index of the inflammability of forest materials. It has provided a simple fundamental basis for determining when fires will burn most readily, when they may be brought under control most easily, or when they will not burn at all. There are other important factors for rating forest-fire hazards such as strong winds, steep slopes, and intense heat from burning materials, but fires will soon die down and remain in a smoldering stage, or go out altogether if the relative humidity becomes high, regardless of wind, slope, or heat.

Past history of forest fires shows that the largest and most destructive fires have occurred, almost without exception, within a group of one to three days during a time when the relative humidity was low, regardless of whether or not the season as a whole was wet or dry. Present-day experiences with forest fires merely lend support to the fact that extreme forest-fire hazards are always the result of low relative humidity. Now it is these days, or groups of days, with low relative humidity that forest-fire protective organizations wish to anticipate so that they may more fully prepare their organizations to cope with any fire situation which may present itself on these days.

The importance of relative humidity as a controlling factor of forest-fire hazard is also indicated in the fact that the Logging Underwriting & Inspection Association writes a special policy containing a humidity warranty for logging risks whereby a logging operator is granted substantially reduced rates on the premium of his policy by agreeing to suspend all logging operations for any period that the relative humidity is 30 per cent or lower.

Since the special fire-weather warning service of the Weather Bureau was established in Oregon late in the

season of 1924, fire-weather forecasts and warnings, embodying forecasts of relative humidity, winds, temperature, and thunderstorms, when thunderstorms are probable, have been issued twice daily, both morning and evening, throughout the greater portion of each season. The Weather Bureau, however, as long ago as 1913, began its fire-weather warning service on the Pacific coast by issuing forecasts that were known as fire-wind forecasts. Fire-weather forecasts, as they are known to-day, are available daily to the various forest-fire protective organizations, the logging operators, and to the public, by radio, the newspapers, and the printed weather map. Special fire-weather warnings of approaching spells of moderately low, low, or extremely low relative humidity are telegraphed to the State forester, district fire wardens, forest supervisors, and others whenever they are imminent. These special warnings are usually sent out by telegraph in the evening, the time of day when the protective organizations are most closely in touch with the personnel of their organizations, to provide them with ample opportunity for preparing beforehand for any possible emergencies that may arise. Only in an emergency, due to sudden changes in the weather, are the special fire-weather warnings ever sent out by telegraph in the morning.

The special fire-weather warnings, sent out by telegraph in Oregon, are received by 16 forest fire patrol associations, 5 State patrolled counties, 14 national forests, 2 Indian reservations, and 1 national park. They are also sent, upon request, to several logging operators who bear the cost of having these messages telegraphed. All of these organizations look after the dissemination, in their respective districts, of all fire-weather warnings telegraphed them by the Weather Bureau.

The length of the fire-weather season in the Pacific Northwest has been arbitrarily fixed, for convenience, to

include the months of April to September of each year. Precipitation then is at a minimum for the year, and there are frequent days, or groups of days, with low relative humidity. The peak of the fire-weather season usually occurs during the latter part of July or the first part of August. There are occasional days, or groups of days, with low relative humidity from October to March, but these months make up the wet season of the year when there is a maximum frequency of rainy days and the forests are generally quite wet, so that forest fires of any importance rarely ever occur. During the last two winter seasons, however, on February 23, 1928, and February 9, 1929, two small forest fires occurred along the west slope of the Coast Range. The fire on February 23, 1928, burned over an area of about 300 acres, starting in a large fern tract and burning through a large and thickly forested area before dying out. The fire on February 9, 1929, was farther south on the west slope of the Coast Range and was not so large. A fire also burned up a steep slope to its summit through old snags in Wind River Canyon in the State of Washington on February 23, 1928, the ground at the time being heavily covered with snow. The relative humidity was very low on both of these dates, and had been very low for a day or so previously.

West of the Cascade Range in the Douglas-fir region, where vegetation on the forest floor is dense and heavy, a dangerous forest-fire hazard is considered to exist whenever the relative humidity is 38 per cent or lower for any length of time. East of the Cascade Range in the yellow pine sections, where it is normally much drier and the vegetation on the forest floor much less than in the Douglas-fir regions, a lower relative humidity base 25 to 20 per cent or lower, is used for rating dangerous periods of forest-fire hazard. Over the extreme southwest part of the State, where a complex system of mountain ranges exists the vegetation on the forest floor largely partakes of the nature of that in the yellow-pine sections, but is somewhat heavier, so a relative humidity base of 25 per cent or lower is used for rating dangerous periods of forest fire hazard over this section of Oregon.

Observations of relative humidity are made at first-order Weather Bureau stations and are available as far back as the records for each station extend. Weather Bureau stations, however, even though within forested regions, are located in cities outside of the forests themselves, so the relative humidity records at these stations are not always entirely representative of the humidity changes and conditions prevailing within the forests themselves. These relative humidity records, nevertheless, serve to give good conceptions of some of the humidity changes and conditions taking place within or near the forests in their respective localities. They have also been valuable to investigators for making correlations of past peak forest-fire occurrences with the relative humidities occurring at those time as recorded at these stations. In this way determinations were made of some of the reasons why so many forest fires should have occurred on a certain day or group of days and did not occur at other times. These investigations showed decisively that peak forest-fire occurrences in the past took place on a day or group of days when the relative humidity was low. It is these days, or group of days, with low relative humidity that forest-fire protective organizations wish to anticipate as far in advance as possible so that they may amply prepare their organizations to meet, promptly and effectively, any contingency that may arise. The United States Weather Bureau, endeavor-

ors to anticipate, so far as practicable, days with low relative humidity, and in this way its service has become an integral part of the protective systems of these organizations.

Tabular data, dealing with the occurrence and persistence of low relative humidity at the regular Weather Bureau stations in Oregon, and for two Weather Bureau stations in southern Washington near the Oregon-Washington boundary line, and therefore representative of weather conditions for these respective sections of northern Oregon, are presented in this paper. The Weather Bureau stations are North Head and Walla Walla, Wash., and Portland, Roseburg, and Baker, Oreg. The records considered are for April to September, inclusive, from 1889 to 1928, a period of 40 years, except at Baker, Oreg., where the available records are only for 1911 to 1928, inclusive, or for 18 years, previous records having been destroyed by fire. Only relative humidity data from observations made regularly at 5 p. m., one hundred and twentieth meridian time, at these stations have been considered. Included in each of these tables are also relative humidity data for three other stations in Oregon, at Medford, Bend, and Lakeview. The humidity records at these latter stations, however, are only for a period of four years, from 1925 to 1928, inclusive, and include data only for the months of May to September of each year. Relative humidity conditions for the sections of Oregon near Medford, Bend, and Lakeview are different from those shown near the other stations in Oregon, hence the humidity records at these stations have been included to set forth some of these contrasting conditions, even though the available humidity records cover only a few years. The type of tables and their arrangement are similar to those used by G. W. Alexander in connection with his article on *The Frequency and Persistence of Low Relative Humidity in the State of Washington*, published in the *MONTHLY WEATHER REVIEW* for April, 1928. Thus, those who so desire can more readily make a direct comparison of the low relative humidity conditions prevailing in the two States.

In the State of Washington the total number, the averages, and the monthly totals for all days below the upper index vary directly with the normal variation in temperature and hours of sunshine throughout the season, and inversely as the precipitation, except for all brackets at North Head and the two lower brackets at Portland, where the opposite is true. None of these abnormalities show for any of the stations for the eastern sections of the State. The abnormalities at North Head and the two lower brackets at Portland are developed by the HIGHS that occur with greater frequency and intensity over the plateau late in spring and early in autumn—in April, May, and September—than during the height of the fire-weather season in summer—in June, July, and August. These continental HIGHS of late spring and early autumn, being of greater intensity and importance, give rise to easterly winds that blow with considerably greater force than during the summer months and extend their continental influences over coastal regions for periods of from one to three days in succession, thereby displacing for the time all maritime influences by which the weather over the coastal regions of the State are normally controlled. The easterly winds of summer always produce a bad fire-weather situation west of the Cascade Range whenever they occur, but their influence rarely ever extends much beyond the eastern slope or summit of the coast range.

TABLE NO. 1.—Total number of days with relative humidity as indicated (5 p. m. observation)

Relative humidity (per cent)	April	May	June	July	August	September	Season
North Head, Wash. (1889-1928)							
50 to 41, inclusive.....	14	12	4	4	4	17	55
40 to 31, inclusive.....	8	3	0	1	2	19	33
30 or lower.....	5	3	3	0	1	10	22
Total, 50 or lower.....	27	18	7	5	7	46	110
Portland, Oreg. (1889-1928)							
38 to 31, inclusive.....	133	152	158	267	250	107	1,067
30 to 26, inclusive.....	57	68	69	84	89	43	410
25 to 20, inclusive.....	68	46	40	41	35	31	261
19 or lower.....	20	16	21	17	13	19	106
Total, 38 or lower.....	278	282	288	409	387	200	1,844
Roseburg, Oreg. (1889-1928)							
30 to 26, inclusive.....	87	116	130	215	208	121	877
25 to 20, inclusive.....	67	76	101	163	192	92	691
19 to 15, inclusive.....	21	21	29	63	50	32	216
14 or lower.....	4	4	8	16	12	4	48
Total, 30 or lower.....	179	217	268	457	462	249	1,832
Walla Walla, Wash. (1889-1928)							
25 to 20, inclusive.....	126	170	215	309	308	153	1,281
19 to 15, inclusive.....	48	68	142	265	264	62	849
14 or lower.....	16	19	49	187	129	15	415
Total, 25 or lower.....	190	257	406	761	701	230	2,545
Baker, Oreg. (1911-1928)							
25 to 20, inclusive.....	61	75	59	114	125	80	514
19 to 15, inclusive.....	13	25	19	61	76	54	248
14 or lower.....	4	9	12	37	41	25	128
Total, 25 or lower.....	78	109	90	212	242	159	890
Medford, Oreg. (1925-1928)							
30 to 26, inclusive.....		32	25	29	28	10	124
25 to 20, inclusive.....		11	15	46	48	14	134
19 to 15, inclusive.....		2	3	18	14	3	40
14 or lower.....		0	0	1	2	1	4
Total, 30 or lower.....		45	43	94	92	28	302
Bend, Oreg. (1925-1928)							
25 to 20, inclusive.....		9	27	44	29	12	
19 to 15, inclusive.....		10	16	22	36	12	
14 or lower.....		2	3	8	6	5	
Total, 25 or lower.....		21	46	74	71	29	
Lakeview, Oreg. (1925-1928)							
25 to 20, inclusive.....		10	22	15	17	19	
19 to 15, inclusive.....		6	17	38	33	15	
14 to 11, inclusive.....		0	13	34	28	12	
10 or lower.....		0	1	25	29	16	
Total, 25 or lower.....		16	53	112	107	62	

Records for May at Bend and Lakeview for 1927 and 1928 only.
Records for June at Bend and Lakeview for 1926 to 1928, inclusive.

TABLE NO. 2.—Average number of days with relative humidity as indicated, monthly and for the season, with season extremes

Relative humidity (per cent)	April	May	June	July	August	September	Season	Greatest number	Year	Least number	Year
North Head, Wash. (1889-1928)											
50 to 41, inclusive.....	0.38	0.32	0.11	0.11	0.11	0.45	1.48	5	1896	0	(1)
40 to 31, inclusive.....	.22	.09	.00	.03	.05	.50	.89	6	1926	0	(1)
30 or lower.....	.13	.06	.05	.00	.03	.26	.58	3	1922	0	(1)
Total, 50 or lower.....	.73	.49	.19	.14	.19	1.21	2.95	9	1926	0	(1)
Portland, Oreg. (1889-1928)											
38 to 31, inclusive.....	3.3	3.8	4.0	6.7	6.2	2.7	26.8	40	{1904 1919}	14	1925
30 to 26, inclusive.....	1.4	1.7	1.7	2.1	2.2	1.1	10.2	15	1890	4	{1899 1901}
25 to 20, inclusive.....	1.7	1.2	1.0	1.0	.9	.8	6.6	16	1918	1	{1903 1925}
19, or lower.....	.5	.4	.5	.4	.3	.5	2.6	8	1895	0	{1899}
Total, 38 or lower.....	6.9	7.1	7.2	10.2	9.7	5.1	46.2	73	1918	22	1925
Roseburg, Oreg. (1889-1928)											
30 to 26, inclusive.....	2.3	3.0	3.3	5.4	5.2	3.0	22.2	38	1922	11	1901
25 to 20, inclusive.....	1.6	1.9	2.6	4.1	4.2	2.3	17.3	37	1926	7	1913
19 to 15, inclusive.....	.6	.6	.8	1.6	1.2	.8	5.6	15	1918	1	{1891}
14, or lower.....	.1	.1	.2	.4	.3	.1	1.2	10	1924	0	{1890}
Total, 30 or lower.....	4.6	5.6	6.9	11.5	11.5	6.2	46.3	80	1924	26	1894
Walla Walla, Wash. (1889-1928)											
25 to 20, inclusive.....	3.1	4.2	5.4	7.7	7.7	3.8	32.0	51	1921	5	1902
19 to 15, inclusive.....	1.2	1.7	3.6	6.6	6.6	1.6	21.2	48	1890	1	1902
14, or lower.....	.4	.5	1.2	4.7	3.2	.4	10.4	37	1889	0	(1)
Total, 25 or lower.....	4.7	6.4	10.2	19.0	17.5	5.8	63.6	109	1910	6	1902
Baker, Oreg. (1911-1928)											
25 to 20, inclusive.....	3.4	4.2	3.2	6.3	6.9	4.4	28.4	43	1928	18	1925
19 to 15, inclusive.....	.7	1.4	1.1	3.4	4.2	3.0	13.8	32	1924	3	1918
14, or lower.....	.2	.5	.7	2.1	2.3	1.4	7.2	27	1924	1	1912
Total, 25 or lower.....	4.3	6.1	5.0	11.8	13.4	8.8	49.4	100	1924	25	1925
Medford, Oreg. (1925-1928)											
30 to 26, inclusive.....		8.0	6.2	7.3	7.0	2.5	31.0	36	1928	25	1927
25 to 20, inclusive.....		2.7	3.8	11.5	12.0	3.5	33.5	38	1925	31	1927
19 to 15, inclusive.....		.5	.8	4.5	3.5	.8	10.1	17	1928	3	1926
14, or lower.....		.0	.0	.2	.5	.2	.9	2	1928	0	{1926 1927}
Total, 30 or lower.....		11.2	10.8	23.5	23.0	7.0	75.5	89	1928	64	1927
Bend, Oreg. (1925-1928)											
25 to 20, inclusive.....		4.5	9.0	11.0	7.2	3.0	34.7	41	1926	32	{1927 1928}
19 to 15, inclusive.....		5.0	5.3	5.5	9.0	3.0	27.8	46	1928	18	1928
14, or lower.....		1.0	1.0	2.0	1.5	1.2	6.7	15	1928	3	1927
Total, 25 or lower.....		10.5	15.3	18.5	17.7	7.2	69.2	93	1928	53	1927
Lakeview, Oreg. (1925-1928)											
25 to 20, inclusive.....		5.0	7.3	3.8	4.2	4.7	25.4	28	1928	21	1927
19 to 15, inclusive.....		3.0	5.7	9.5	8.3	3.8	30.3	35	1927	30	1928
14 to 11, inclusive.....		0.0	4.3	8.5	7.0	3.0	23.3	35	1926	14	1927
10, or lower.....		.0	.3	6.2	7.3	4.0	17.3	27	1926	11	1927
Total, 25 or lower.....		8.0	17.6	28.0	26.8	15.5	95.9	108	1928	81	1927

¹ Several seasons.

² Et al.

Records for May at Bend and Lakeview only for 1927 and 1928.
Records for June at Bend and Lakeview only for 1926 to 1928, inclusive.

The severity of any dangerous period of fire-weather depends upon the number of hours during a day, or the number of consecutive days, with low relative humidity. Frequently, there are single days during the season when the relative humidity has been near, or below the point which is considered dangerous for only a short time, in which event the fire hazard for any of these days is naturally small. If the relative humidity has been near or below the danger point for several hours, the fire hazard becomes greater and care with fire must be exercised. When the relative humidity has been low for two or more consecutive days, the fire hazard becomes extremely dangerous so that all precautions must be taken to prevent fire, even to the closing down of all operations within the forests, if necessary. Table 3 shows the tendency of the occurrence or recurrence of days with low relative humidity at each of these stations. Tables 4 and 5 are recapitulations of Table 3 to show the average number of periods, in groups of one or more days, of low relative humidity, and the average duration, in days, of periods of low relative humidity, with the duration and date of the longest period on record.

Table 6 is a chronological list of the number of days of low relative humidity, within the limits indicated, during each season for each of the stations whose records are being reviewed.

TABLE No. 3.—Groups of days with relative humidity

ROSEBURG, OREG. (1889-1928)

30 per cent or lower														
Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14
April.....	49	21	12	10	1	0	1	1	0	0	0	0	0	0
May.....	69	26	11	7	3	1	0	1	0	0	0	0	0	0
June.....	51	27	10	8	6	3	2	2	0	1	1	1	0	0
July.....	70	32	23	16	5	9	4	5	0	2	0	0	0	0
August.....	72	47	26	10	7	5	5	4	1	0	1	0	3	0
September.....	53	33	15	7	6	1	0	2	0	0	0	0	0	0
Season.....	364	186	97	58	28	19	12	15	1	3	2	1	3	0
25 per cent or lower														
April.....	34	11	7	4	1	0	0	0	0	0	0	0	0	0
May.....	54	9	3	1	2	0	0	0	0	0	0	0	0	0
June.....	42	21	8	0	2	2	0	1	1	0	0	0	0	0
July.....	59	27	15	9	4	2	0	0	0	0	0	0	0	0
August.....	85	26	14	2	4	4	2	0	1	0	0	1	0	0
September.....	40	21	5	3	1	0	0	1	0	0	0	0	0	0
Season.....	314	115	52	19	14	8	2	2	2	0	0	1	0	0
19 per cent or lower														
April.....	17	4	0	0	0	0	0	0	0	0	0	0	0	0
May.....	17	3	0	1	0	0	0	0	0	0	0	0	0	0
June.....	16	7	2	0	0	0	0	0	0	0	0	0	0	0
July.....	32	15	3	1	0	0	0	0	0	0	0	0	0	0
August.....	36	5	4	1	0	0	0	0	0	0	0	0	0	0
September.....	18	7	1	0	0	0	0	0	0	0	0	0	0	0
Season.....	136	41	10	3	0	0	0	0	0	0	0	0	0	0
14 per cent or lower														
April.....	4	0	0	0	0	0	0	0	0	0	0	0	0	0
May.....	2	1	0	0	0	0	0	0	0	0	0	0	0	0
June.....	3	3	0	0	0	0	0	0	0	0	0	0	0	0
July.....	14	1	0	0	0	0	0	0	0	0	0	0	0	0
August.....	12	0	0	0	0	0	0	0	0	0	0	0	0	0
September.....	3	1	0	0	0	0	0	0	0	0	0	0	0	0
Season.....	38	6	0	0	0	0	0	0	0	0	0	0	0	0

TABLE No. 3.—Groups of days with relative humidity—Continued

BAKER, OREG. (1911-1928)

25 per cent or lower														
Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14
April.....	20	13	5	3	0	1	0	0	0	0	0	0	0	0
May.....	24	14	8	1	1	0	1	2	0	0	0	0	0	0
June.....	28	9	8	3	2	0	0	0	0	0	0	0	0	0
July.....	33	15	12	6	2	4	2	3	0	2	0	0	0	0
August.....	37	13	8	7	0	2	3	0	1	1	0	2	0	1
September.....	36	21	7	4	0	3	0	0	1	1	0	0	0	0
Season.....	178	85	48	24	14	10	6	5	2	4	0	2	0	1
19 per cent or lower														
April.....	13	2	0	0	0	0	0	0	0	0	0	0	0	0
May.....	14	6	0	2	0	0	0	0	0	0	0	0	0	0
June.....	16	2	2	0	0	0	0	0	0	0	0	0	0	0
July.....	28	19	1	2	2	0	0	1	0	0	0	0	0	0
August.....	31	13	4	4	2	1	1	0	1	0	0	0	0	0
September.....	38	7	7	0	0	0	1	0	0	0	0	0	0	0
Season.....	140	49	14	8	4	1	2	1	1	1	0	0	0	0
14 per cent or lower														
April.....	4	0	0	0	0	0	0	0	0	0	0	0	0	0
May.....	6	1	0	0	0	0	0	0	0	0	0	0	0	0
June.....	7	2	1	0	0	0	0	0	0	0	0	0	0	0
July.....	26	4	1	0	0	0	0	0	0	0	0	0	0	0
August.....	23	5	3	0	0	0	0	0	0	0	0	0	0	0
September.....	19	3	0	0	0	0	0	0	0	0	0	0	0	0
Season.....	85	15	5	0	0	0	0	0	0	0	0	0	0	0

NORTH HEAD, WASH. (1889-1928)

50 per cent or lower														
Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14
April.....	15	6	0	0	0	0	0	0	0	0	0	0	0	0
May.....	14	2	0	0	0	0	0	0	0	0	0	0	0	0
June.....	7	0	0	0	0	0	0	0	0	0	0	0	0	0
July.....	5	0	0	0	0	0	0	0	0	0	0	0	0	0
August.....	4	1	0	0	0	0	0	0	0	0	0	0	0	0
September.....	24	9	0	1	0	0	0	0	0	0	0	0	0	0
Season.....	69	18	0	1	0	0	0	0	0	0	0	0	0	0
40 per cent or lower														
April.....	9	2	0	0	0	0	0	0	0	0	0	0	0	0
May.....	2	2	0	0	0	0	0	0	0	0	0	0	0	0
June.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0
July.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0
August.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0
September.....	18	3	0	1	0	0	0	0	0	0	0	0	0	0
Season.....	36	7	0	1	0	0	0	0	0	0	0	0	0	0
30 per cent or lower														
April.....	3	1	0	0	0	0	0	0	0	0	0	0	0	0
May.....	1	1	0	0	0	0	0	0	0	0	0	0	0	0
June.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0
July.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0
September.....	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Season.....	18	2	0	0	0	0	0	0	0	0	0	0	0	0

PORTLAND, OREG. (1889-1928)

38 per cent or lower														
Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14
April.....	63	36	14	11	6	2	2	0	1	0	0	0	0	0
May.....	71	34	19	9	4	3	1	0	1	0	0	0	0	0
June.....	60	30	19	11	3	2	3	1	2	0	0	0	0	0
July.....	75	46	36	7	8	6	3	0	0	1	0	0	0	0
August.....	76	43	29	14	4	2	3	2	0	0	1	0	0	0
September.....	57	30	11	5	2	1	1	0	0	0	0	0	0	0
Season.....	402	219	128	57	27	16	13	3	4	1	1	0	0	0

TABLE No. 3.—Groups of days with relative humidity—Continued

PORTLAND, OREG. (1889-1928)

Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14
30 per cent or lower														
April.....	39	18	10	6	1	2	0							
May.....	35	27	8	3	1	0	0							
June.....	47	14	10	4	0	1	1							
July.....	66	19	5	4	1	0	0							
August.....	61	20	7	2	0	1	0							
September.....	41	14	3	2	1	0	0							
Season.....	289	112	43	21	4	4	1							
25 per cent or lower														
April.....	32	15	7	1										
May.....	29	12	1	2										
June.....	38	6	4	1										
July.....	35	8	2	0										
August.....	28	5	1	1										
September.....	23	9	3	0										
Season.....	185	55	18	5										
19 per cent or lower														
April.....	11	4	0											
May.....	8	4	0											
June.....	13	2	1											
July.....	14	1	0											
August.....	11	4	0											
September.....	11	4	0											
Season.....	68	16	1											

TABLE No. 3a.—Groups of days with relative humidity

WALLA WALLA, WASH. (1889-1928)

Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42													
25 per cent or lower																																																							
April.....	49	19	11	7	3	2	1	1																																															
May.....	55	27	14	10	4	4	2	2	1																																														
June.....	40	29	13	6	9	7	5	4	4	0	0	0	0	2	1	0	2																																						
July.....	39	22	15	14	8	5	0	9	3	3	4	3	1	1	3	2	1	1	1	2	1	1																																	
August.....	48	20	18	9	11	5	9	3	4	5	0	0	3	0	2	1	0	1	0	1																																			
September.....	62	22	8	6	4	0	1	2	0	0	1																																												
Season.....	293	139	79	52	39	23	27	21	12	8	5	3	4	3	6	3	3	2	1	3	1	1																																	
19 per cent or lower																																																							
April.....	30	8	2	3																																																			
May.....	35	12	9	1																																																			
June.....	43	16	16	5	4	2	2	1	0	1																																													
July.....	69	25	14	11	4	4	3	6	1	3	4	0	0	0	2	1																																							
August.....	73	28	19	10	12	2	4	3	1	1	0	1																																											
September.....	29	12	4	1	2																																																		
Season.....	279	101	64	31	22	8	9	10	2	5	4	1	0	0	2	1																																							
14 per cent or lower																																																							
April.....	11	1	0	1																																																			
May.....	11	4																																																					
June.....	25	7	1	1																																																			
July.....	54	13	10	3	5	3	2	1																																															
August.....	57	17	8	3																																																			
September.....	11	1																																																					
Season.....	169	43	19	8	5	3	2	1																																															

TABLE No. 3b.—Groups of days with relative humidity

MEDFORD, OREG. (1925-1928)

Days.....	1	2	3	4	5	6	7	8	9	10	11	13	14	16	18	20	21	26
30 per cent or lower																		
May.....	10	6	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
June.....	10	1	3	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
July.....	2	4	2	0	1	0	0	0	0	0	0	1	0	0	1	1	1	1
August.....	3	1	3	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0
September.....	3	3	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Season.....	28	15	12	3	6	2	0	0	0	0	1	2	1	1	1	1	1	1
25 per cent or lower																		
May.....	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June.....	4	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
July.....	8	7	1	3	0	0	0	2	0	0	1	0	0	0	0	0	0	0
August.....	9	5	4	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0
September.....	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Season.....	29	17	5	5	3	0	1	2	1	2	1	2	0	0	0	0	0	0
19 per cent or lower																		
May.....	2	0	0	0														
June.....	2	1	0	0														
July.....	4	0	1															
August.....	10	0	2	0														
September.....	2	1	0	0														
Season.....	23	6	2	1														
14 per cent or lower																		
May.....	0																	
June.....	0																	
July.....	1																	
August.....	2																	
September.....	1																	
Season.....	4																	

TABLE No. 3c.—Groups of days with relative humidity

BEND, OREG. (1925-1928)

Days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
25 per cent or lower															
May.....	4	0	1	1	0	0	0	0	0	0	1	0	0	0	0
June.....	5	4	2	1	0	0	0	0	0	0	0	1	0	0	1
July.....	7	2	2	1	4	0	1	0	0	1	0	0	0	1	0
August.....	3	3	2	0	2	1	0	0	2	0	0	0	0	0	1
September.....	10	2	1	1	0	0	0	0	0	0	1	0	0	0	0
Season.....	29	11	8	4	6	1	1	0	2	1	2	1	0	1	2
19 per cent or lower															
May.....	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0
June.....	6	3	1	1	0	0	0	0	0	0	0	0	0	0	0
July.....	7	3	1	1	2	0	0	0	0	0	0	0	0	0	0
August.....	10	2													

TABLE NO. 3d.—Groups of days with relative humidity

LAKEVIEW, OREG. (1925-1928)

Days.....	1	2	3	4	5	6	7	8	9	10	13	14	15	18	19	25	27	28	37
25 per cent or lower																			
May.....	4	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June.....	3	0	2	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0
July.....	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1
August.....	0	0	1	1	0	1	0	1	0	0	0	1	0	2	0	0	0	0	1
September.....	2	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Season.....	9	4	4	4	1	2	2	2	0	0	1	1	1	2	1	1	0	1	1
19 per cent or lower																			
May.....	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June.....	5	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July.....	6	6	2	1	1	0	0	1	1	1	0	0	0	0	0	0	0	1	0
August.....	7	2	3	2	0	1	0	2	0	0	1	0	0	0	1	0	0	0	0
September.....	8	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Season.....	30	11	5	3	2	2	0	3	2	1	1	0	0	0	1	0	1	0	0
14 per cent or lower																			
May.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June.....	7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
July.....	11	5	3	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0
August.....	9	0	2	3	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0
September.....	5	2	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0
Season.....	32	7	5	4	3	3	1	2	0	1	0	0	0	0	0	1	0	0	0
10 per cent or lower																			
May.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July.....	14	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August.....	5	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
September.....	5	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Season.....	25	6	1	6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Late in the season of 1924, through cooperation with the forest fire protective organizations of Oregon, steps were taken to have daily observations of relative humidity and other pertinent weather data made regularly within the forests of the State in an intensive manner for the balance of the season. This cooperation with the protective organizations has been subsequently maintained in the succeeding fire-weather seasons, but has been materially expanded to include a large number of logging operators. In this way, a large amount of data on relative humidity has been acquired from within the forests which has given the fire-weather forecaster a far more comprehensive conception of the relative humidity changes going on within the forests themselves. This greater knowledge of the relative humidity changes going on within the forests places the forecaster in a better position of forecasting these changes and he is able to render the protective organizations a greater and more valuable service.

Regular observations of relative humidity, made only with sling psychrometers, were received from 46 observers during the past season. Similar reports were also received from 22 other observers, together with the hygrothermograms from hygrothermographs which these observers also have as additional instrument equipment. Hygrothermograms were also received regularly from 29 other hygrothermographs, 18 of which are owned by logging operators, operating principally over the northwest portion of Oregon where most of the logging activities of the State are centered. The observations taken with sling psychrometers are principally available without interruption from the latter part of June through July and August to the first part of September of each season, while the hygro-thermograph records generally cover a longer period of each season from some time in April or May until the latter part of September.

Using only the lowest daily relative humidity taken regularly with sling psychrometers, supplemented by hygrothermograph records wherever they are needed to complete the relative humidity survey for a State subdivision, the average frequency of days with low relative humidity, within certain limits, for the two months of July and August for the four seasons, 1925 to 1928, has been compiled for 75 cooperating stations. These stations have been grouped into eight State subdivisions as in Table 7. Table 7 shows the average frequency of days with low relative humidity, within the limits indicated, for each subdivision, also the number of stations reporting within each subdivision and their average elevation.

It is interesting to note the gradual increase in the number of days with low relative humidity during July and August from the coast eastward to the west slope of the Cascade Range and eastern Oregon. Relative humidities of 20 per cent, or lower, rarely ever occur in the Willamette Valley and westward to the coast during these two months, but they do occur several days each season near and along the west slope of the Cascade Range. Low relative humidities occur with greater frequency along the lower portions of the west slope of the Cascade Range than along its upper portions, except near gaps in the summit which permit the drier air from east of the mountains to drift to the west side for short distances without much hindrance. The lowest relative humidity recorded in western Oregon occurred at Herman Creek Ranger Station in the Columbia River Gorge on July 23, 1927. In eastern Oregon, where the weather is normally warmer and drier and the absolute humidity content of the air is lower, the frequency of days with low relative humidity increases and normal relative humidities average decidedly lower than over western Oregon.

TABLE No. 4.—The average number of periods (groups of 1 or more days) of low relative humidity

Relative humidity (per cent)	April	May	June	July	August	September	Season
North Head, Wash. (1889-1928)							
50 or lower.....	0.57	0.43	0.19	0.14	0.13	0.88	2.34
40 or lower.....	.30	.11	.08	.03	.08	.58	1.18
30 or lower.....	.11	.05	.08	.00	.03	.26	.53
Portland, Oreg. (1889-1928)							
38 or lower.....	3.4	3.6	3.3	4.6	4.4	2.7	21.8
30 or lower.....	1.9	1.8	1.9	2.4	2.3	1.5	11.8
25 or lower.....	1.4	1.1	1.2	1.1	.9	.9	6.6
19 or lower.....	.4	.3	.4	.4	.3	.4	2.1
Roseburg, Oreg. (1889-1928)							
30 or lower.....	2.4	3.0	2.8	4.2	4.5	2.9	19.7
25 or lower.....	1.4	1.7	1.9	2.9	3.5	1.8	13.2
19 or lower.....	.5	.5	.6	1.3	1.2	.6	4.8
14 or lower.....	.1	.1	.2	.4	.3	.1	1.1
Walla Walla, Wash. (1889-1928)							
25 or lower.....	2.6	3.0	3.0	3.7	3.5	2.6	18.2
19 or lower.....	1.1	1.4	2.2	3.7	3.8	1.2	13.5
14 or lower.....	.3	.4	.8	2.3	2.1	.3	6.2
Baker, Oreg. (1911-1928)							
25 or lower.....	2.3	2.8	2.8	4.4	4.7	4.1	21.1
19 or lower.....	.8	1.2	1.1	2.9	3.2	2.9	12.2
14 or lower.....	.2	.4	.6	1.7	1.7	1.2	5.8
Medford, Oreg. (1925-1928)							
30 or lower.....		5.5	4.5	3.5	3.0	2.2	18.8
25 or lower.....		2.5	2.0	5.5	5.5	1.0	16.5
19 or lower.....		.5	.8	3.0	3.0	.8	8.0
14 or lower.....		0.0	0.0	.2	.5	.3	1.0
Bend, Oreg. (1925-1928)							
25 or lower.....		3.5	4.7	4.8	3.5	3.8	20.3
19 or lower.....		2.5	3.7	3.5	4.2	2.2	16.2
14 or lower.....		.5	1.0	1.0	1.0	.8	4.4
Lakeview, Oreg. (1925-1928)							
25 or lower.....		4.0	3.3	1.5	2.0	1.2	10.9
19 or lower.....		2.5	2.3	5.0	4.8	2.8	18.2
14 or lower.....		0.0	2.7	5.8	4.5	2.5	17.4
10 or lower.....		0.0	.3	4.8	2.8	2.0	11.5

TABLE No. 5.—The average duration in days of periods of low relative humidity, with date and duration of longest period

Relative humidity (per cent)	April	May	June	July	August	September	Season	Longest period with date
North Head, Wash. (1889-1928)								
50 or lower...	1.3	1.1	1.0	1.0	1.2	1.4	1.2	4, September, 1926.
40 or lower...	1.3	1.5	1.0	1.0	1.0	1.1	1.2	4, September, 1926.
30 or lower...	1.2	1.5	1.0	0.0	1.0	1.0	1.1	2, April, 1928, and May, 1922.
Portland, Oreg. (1889-1928)								
38 or lower...	2.1	2.0	2.3	2.3	2.2	1.8	2.1	11, August, 1923.
30 or lower...	1.9	1.8	1.7	1.5	1.5	1.5	1.6	7, June, 1898.
25 or lower...	1.4	1.5	1.3	1.3	1.3	1.4	1.4	4, several dates.
19 or lower...	1.3	1.3	1.2	1.1	1.1	1.3	1.2	3, June, 1920.
Roseburg, Oreg. (1889-1928)								
30 or lower...	2.0	1.8	2.5	2.6	2.6	2.1	2.3	13, August, 1908-18-20.
25 or lower...	1.7	1.4	1.9	1.9	1.9	1.7	1.8	12, August, 1908.
19 or lower...	1.2	1.3	1.3	1.4	1.3	1.3	1.4	4, several dates.
14 or lower...	1.0	1.3	1.5	1.1	1.0	1.2	1.1	2, several dates.
Walla Walla, Wash. (1889-1928)								
25 or lower...	2.0	2.3	3.5	5.7	4.0	2.0	3.4	42, July-August, 1910.
19 or lower...	1.5	1.6	2.3	3.1	2.5	1.6	2.4	16, July, 1911.
14 or lower...	1.3	1.3	1.4	2.1	1.5	1.1	1.6	8, July, 1911.
Baker, Oreg. (1911-1928)								
25 or lower...	1.9	2.1	1.8	2.7	3.0	2.1	2.4	14, August, 1924.
19 or lower...	1.1	1.5	1.3	1.8	2.1	1.5	1.7	9, August, 1924.
14 or lower...	1.0	1.1	1.4	1.2	1.4	1.1	1.2	3, several dates.
Medford, Oreg. (1925-1928)								
30 or lower...		2.0	2.3	8.5	5.2	3.6	4.0	26, July, 1927.
25 or lower...		1.3	2.2	2.9	2.9	4.8	2.7	11, July, 1928, and August, 1927.
19 or lower...		1.0	1.3	1.6	1.3	1.3	1.5	4, July, 1928.
14 or lower...		0.0	0.0	1.0	1.0	1.0	1.0	1, several dates.
Bend, Oreg. (1925-1928)								
25 or lower...		3.1	3.6	2.7	4.6	2.1	3.5	15, June, 1926, and August, 1928.
19 or lower...		2.0	1.7	2.1	2.1	2.3	2.1	11, August-September, 1928.
14 or lower...		2.0	1.0	2.0	1.5	1.7	1.6	3, July, 1928.
Lakeview, Oreg. (1925-1928)								
25 or lower...		2.0	4.2	15.0	13.5	4.6	7.5	37, August-September, 1928.
19 or lower...		1.2	1.7	4.8	4.2	2.3	3.4	27, July, 1928.
14 or lower...		0.0	1.7	2.4	3.4	3.1	2.7	19, August, 1926.
10 or lower...		0.0	1.0	1.4	2.4	2.1	1.8	8, August, 1928.

TABLE No. 6.—Number of days with low relative humidity, within the limits indicated, for each season. (April to September, inclusive)

Year	North Head, Wash.				Portland, Oreg.					Roseburg, Oreg.					Walla Walla, Wash.				Baker, Oreg.			
	50-41	40-31	30	Total	38-31	30-26	25-20	19	Total	30-26	25-20	19-15	14	Total	25-20	19-15	14	Total	25-20	19-15	14	Total
1889	4	2	1	7	29	10	8	2	49						34	29	37	100				
1890	2	0	0	2	31	15	8	1	55	20	10	2	0	32	40	48	17	105				
1891	2	0	0	2	22	9	6	2	39	30	12	1	0	43	37	24	17	78				
1892	1	0	0	1	24	12	11	2	49	20	18	2	0	40	30	14	3	47				
1893	2	0	1	3	23	6	9	2	34	20	10	1	0	31	17	3	1	21				
1894	3	1	1	4	26	9	3	1	39	15	8	3	0	26	34	13	4	51				
1895	3	0	0	3	30	14	12	8	64	29	16	3	0	48	39	23	3	65				
1896	5	3	0	8	23	15	7	3	48	21	10	6	1	38	18	4	2	24				
1897	2	1	1	4	29	15	10	5	59	24	12	3	0	39	37	11	2	50				
1898	2	0	1	3	23	15	13	7	58	18	12	7	0	37	23	2	1	26				
1899	1	2	0	3	24	4	4	0	32	18	9	2	0	29	20	13	8	41				
1900	1	0	0	1	22	7	2	2	33	20	10	1	0	31	18	9	0	27				
1901	2	0	1	3	18	4	4	1	27	11	20	10	0	41	11	2	0	13				
1902	2	0	1	3	32	8	2	6	48	22	11	5	0	38	5	1	0	6				
1903	1	0	1	2	26	10	1	1	38	14	17	3	0	34	16	5	1	22				
1904	2	0	0	2	40	10	11	6	67	20	22	6	2	50	28	4	0	32				
1905	3	1	1	5	35	7	6	4	52	17	25	4	0	46	21	11	3	35				
1906	2	0	0	2	37	10	7	2	56	18	16	1	0	35	22	12	2	36				
1907	0	1	1	2	30	11	8	5	54	14	20	3	0	37	37	13	2	52				
1908	0	0	0	0	20	6	3	0	29	19	25	4	0	48	35	27	16	78				
1909	1	0	0	1	21	11	7	2	41	28	21	8	1	58	37	34	27	98				
1910	1	1	0	2	27	12	3	0	42	23	14	3	0	40	46	30	33	109				
1911	1	0	0	1	16	5	7	3	31	21	16	5	1	43	39	26	29	94	31	17	10	58
1912	0	3	0	3	16	8	3	0	27	18	13	1	2	34	36	27	8	71	22	10	1	33
1913	0	2	1	3	22	7	2	0	31	18	7	2	1	28	42	34	10	86	20	14	4	38
1914	1	0	0	1	30	12	3	1	46	24	20	6	1	51	27	33	16	76	24	20	11	55
1915	0	0	0	0	32	5	6	0	43	19	16	5	0	40	42	26	12	80	33	11	12	56
1916	0	1	1	2	29	12	6	7	52	18	12	3	2	35	35	15	4	54	33	8	3	44
1917	1	0	0	1	29	15	6	1	51	20	18	9	2	49	33	29	18	80	25	13	6	44
1918	3	0	0	3	29	21	16	7	73	30	25	15	6	76	50	31	8	89	26	3	3	32
1919	3	2	0	5	40	14	11	6	71	27	23	12	2	64	46	29	17	92	34	26	15	75
1920	0	1	0	1	26	14	5	6	51	29	28	11	1	69	34	28	19	81	36	10	3	49
1921	1	1	0	2	36	7	5	2	50	25	19	6	1	51	51	24	14	89	24	10	7	41
1922	2	1	3	6	33	8	6	2	49	38	23	10	7	78	38	21	10	69	31	15	6	52
1923	0	0	0	0	26	13	3	4	46	21	17	6	2	46	37	29	4	70	22	9	1	32
1924	0	3	1	4	25	10	11	2	48	28	33	9	10	80	33	46	19	98	41	32	27	100
1925	3	1	2	6	14	6	1	2	22	26	21	6	0	53	25	35	7	67	19	5	1	25
1926	2	6	1	9	24	10	11	2	47	28	37	11	3	79	34	33	18	85	28	13	5	46
1927	1	0	1	2	21	9	10	0	40	19	16	8	2	45	33	22	12	67	22	10	5	37
1928	1	1	2	4	28	14	10	1	53	26	20	5	1	52	43	29	11	83	43	22	8	73

TABLE 6a.—Number of days with low relative humidity, within the limits indicated, for each season. (May to September, inclusive)

Year	Medford, Oreg.					Bend, Oreg.				Lakeview, Oreg.				
	30-26	25-20	19-15	14	Total	25-20	19-15	14	Total	25-20	19-15	14-11	10	Total
1925	29	35	12	2	81									
1926	34	31	3	0	68	41						35	27	102
1927	25	31	8	0	64	32	18	3	53	21	35	14	11	81
1928	36	34	17	2	89	32	46	15	93	28	30	27	23	108

TABLE 7.—Average frequency of days with low relative humidity, within the limits indicated, for July and August, seasons of 1925 to 1928, inclusive, by State subdivisions of cooperating stations reporting in Oregon

State subdivision	Number of stations	Average elevation (in feet)	Average number of days per season with relative humidity (per cent)							
			40 or lower	35 or lower	30 or lower	25 or lower	20 or lower	15 or lower	10 or lower	
Coast	5	74	0.2	0	0	0	0	0	0	0
Coast Range	6	1,410	11	7	3	1	0.1	0	0	0
Willamette Valley	7	312	25	17	8	3	0.5	0	0	0
Cascade Range, west slope	16	3,326	31	23	16	8	4	1	0.3	
Southwest portion	10	1,682	43	36	28	17	7	1.6	0.1	
Cascade Range, east slope	9	3,849	48	42	35	25	14	5	0.5	
Northeast portion (Blue Mountains)	13	4,467	46	41	34	26	16	6	1	
Southcentral portion	9	4,841	53	46	42	36	27	15	5	

Coast elevations range from 10 to 200 feet.
 Coast Range elevations range from 300 to 3,437 feet.
 Willamette Valley elevations range from 57 to 800 feet.
 Cascade Range, west slope, elevations range from 100 to 9,493 feet.
 Southwest portion elevations range from 200 to 5,310 feet.
 Cascade Range, east slope, elevations range from 1,500 to 6,425 feet.
 Northeast portion (Blue Mountains), elevations range from 1,018 to 9,640 feet.
 Southcentral portion elevations range from 3,950 to 6,000 feet.