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FOREST FIRE WEATHER

IN WESTERN OREGON AND WESTERN WASHINGTON

IN 1958

by

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In terms of general weather, the 1958 fire season will be classed as one of the hottest on record and as having unusually frequent spring and summer lightning storms. It was also unusual in that spring and most of the summer were less rainy in western Washington than in normally dry southwestern Oregon. Thus, until late August, cumulative fire-season rainfall ranged from well below normal in western Washington to considerably above normal in southwestern Oregon.

Compared with the 1957 fire season, the 1958 season was similar in western Oregon but more severe in western Washington. Compared with the average of the previous 10 years, overall severity of fire weather during the April 1—October 31 season was near normal in western Oregon and substantially above normal in western Washington. Breaking this down further, the following general observations can be made: Spring fire weather was near normal in Washington but damper than normal in Oregon; one of the most severe summers on record was experienced in Washington, whereas average severity prevailed in Oregon; and fall weather was only

^{1/} The author is indebted to Mrs. Lois M. Inghram for computing burning index figures from U. S. Weather Bureau teletype reports.

slightly more severe than normal in Washington, whereas in Oregon the dry, windy weather in the mid-September—October period was in some respects the most severe since 1936.

Except for generally rainless weather in southwestern Oregon, rain dominated the western halves of both States until April 25. Dry and warm weather prevailed to about May 20, giving way to intermittent rains, wetting on some days, to about June 8. Rains again fell during the last week in June. May and June temperatures in the western parts of both States were at record high levels and continued so through July and August. July was rainless except in southwestern Oregon. August also was rainless until the 26th to the 31st, when general rains occurred in western Washington and scattered showers in western Oregon.

Following a return to dry weather, September 8 to 25 was rainy except in southwestern Oregon. Drying weather prevailed in western Oregon September 26 to October 17 and again October 23 to 30, with wetting rains in the October 17—23 period. A rainy period in October in western Washington lasted from the 6th to the 19th, with additional wetting rains on the 31st. September temperature was only slightly above normal but October was considerably warmer than normal, particularly in southern Oregon. Rainfall in both September and October varied from above normal in northwestern Washington to less than half of normal in southwestern Oregon.

Weather conditions during the 1958 fire season are compared with those of previous years through use of three indexes that provide a measure of ease with which fires start, speed with which they spread, and depth to which they burn. These indexes are: (1) total number of days when no rain fell, (2) average number of days since a wetting rain of one-fourth inch or more, and (3) burning index, a rating of the combined effect of relative humidity and wind speed on rate of fire spread. High burning index means high rate of spread.

Each index is an average of separate measurements from a number of widely distributed Weather Bureau stations.^{2/} Statistical

^{2/} Although all days in the April-through-October fire season were used in the calculation of rainless days and number of days since a wetting rain, the burning index rating is based on only the 50 percent of days with highest burning index, according to the Forest Service scale used in the Pacific Northwest Region.

tests have demonstrated for western Oregon and western Washington that the number of man-caused fires and the proportion of all fires in different size classes are closely correlated with fire-weather conditions as indicated by the 3 seasonal indexes.

Supplementary information on other features of fire weather during 1958 are also presented to show number of days with (1) relative humidity of 30 percent or lower, (2) burning index greater than 28, and (3) lightning storms over the national forests.

Fire-Weather Indexes for Western Oregon

Each of the 3 indexes indicated the season was slightly more severe than the average of the previous 10 seasons (table 1). In terms of rainless days and spacing of wetting rains, it was the driest year since 1952. Burning index, however, averaged slightly less than in 1957 despite well above normal temperatures in May, June, July, August, and October. East winds with accompanying low humidity and high fire danger occurred in all months except August but were generally not severe. They were most frequent in October.

The indexes indicated overall severity of spring fire weather slightly below both the 1957 level and the 10-year average. Usual severity of spring fire weather in southern areas was effectively reduced by substantial rains in early June following two comparatively dry months.

The summer part of the season was nearly normal in severity and slightly less severe than the summer of 1957. This varied from well below normal severity in the south to above normal in the north. A burning index only slightly above normal did not keep pace with the temperature, which continued near record high levels during July and August. Except for mid-July rains in the south, summer was without general rains until the second week of September.

Fall indexes were all higher than average, with both rainfall indexes the greatest since 1952. The combination was similar to 1952 and was the most severe since 1936. Conditions were more severe in the south, where frequent easterly winds and absence of wetting rains resulted in one of the worst fall periods on record. Though more pronounced in the south, above-normal temperature and below-normal rainfall were experienced throughout the half-State area.

Table 1.--1958 fire-weather indexes and comparative data
for western Oregon^{1/}

Item	Cur- : year :(1958):	Pre- : vious: year (1957):	10-year : average :(1948-57):	Record low ^{2/}	Record high ^{2/}
Spring (April 1-June 30):					
Burning index	22.1	24.3	24.7	15.9 (1953)	33.7 (1951)
Average days since wetting rain	9.4	10.2	12.7	5.5 (1933)	22.9 (1935)
Total rainless days	59.0	63.2	59.3	46.2 (1948)	75.8 (1924)
Summer (July 1-Sept. 15):					
Burning index	33.1	35.4	31.8	25.3 (1954)	37.8 (1945)
Average days since wetting rain	33.7	42.0	38.6	15.9 (1947)	75.5 (1935)
Total rainless days	70.5	70.2	67.8	59.3 (1954, 1947)	74.8 (1929)
Fall (Sept. 16-Oct. 31):					
Burning index	25.5	19.5	17.1	10.0 (1940)	26.4 (1936)
Average days since wetting rain	44.7	19.6	17.5	5.3 (1955)	94.4 (1932)
Total rainless days	34.8	27.5	30.8	22.2 (1950)	42.5 (1936)
Season (April 1-Oct. 31):					
Burning index	26.8	27.2	25.6	18.5 (1953)	31.3 (1951)
Average days since wetting rain	25.8	23.7	23.0	13.5 (1941)	48.8 (1932)
Total rainless days	164.2	160.9	157.8	139.5 (1948)	176.0 (1952)

^{1/} Indexes based on observations at the following Weather Bureau stations: Burning index--Portland (International Airport), Eugene, Sexton Summit, and Medford. Rainfall indexes--Portland, Eugene, North Bend, and Medford.

^{2/} Burning index computed 1932-58 except for 1933, 1934, 1937, and 1939. Average days since wetting rain and total number of rainless days computed 1922-58 except for 1923 and 1927.

Fire-Weather Indexes for Western Washington

Severity of the April-October fire season, the most severe since 1952, was higher than the average of the previous 10 years (table 2), placing the 1958 season in the upper third of years on record. Certainly it was the warmest of record, with average monthly temperatures setting new all-time highs in May, June, July, and August. Contrary to the usual pattern, spring and summer were relatively more severe in the northern part of the half-State area. Easterly winds occurred in all months except August, with the most severe experienced in mid-May.

Although indexes for the spring part of the season indicated only slightly above normal severity, this was the most severe spring since 1952. Between the well-spaced rains that gave the lowest number of days since wetting rain since 1955, were contrasting periods of high fire danger resulting in the highest spring burning index since 1951. This was in contrast to 1957, when the spring burning index averaged well below normal despite widely spaced spring rains.

The summer part of the season was the most severe since 1951 and was considerably more severe than that of 1957. Most outstanding was burning index, which was the third highest on record, exceeded only slightly by the 1951 index and a bit more by the 1945 index. All indexes were above average, though burning index was higher than might have been expected with the given spacing of rains, probably as a result of the unusually high temperatures that prevailed through July and August.

Fall was less severe than in 1957 but was drier than normal. Rainfall and temperature were both above normal, though total rainless days were the greatest since 1952. Moderate east winds were plentiful in October but no period of severe east wind occurred.

Supplementary Fire-Weather Data

Low relative humidity. --Despite monthly average temperatures running 3 to 6 degrees above normal in 4 of the 7 months, the seasonal frequency of relative humidity of 30 percent or less (4 p.m.) set a new record only for Boeing Field near Seattle (table 3). In the spring, low humidity was most frequent since 1951. For the summer part of the season, a record number of low-humidity days was recorded at both Boeing Field and Eugene. In the fall, low relative humidities

were almost absent in western Washington in contrast to the second greatest frequency on record in southwestern Oregon.

Table 2.--1958 fire-weather indexes and comparative data
for western Washington^{1/}

Item	: Cur- : rent : year :(1958):	: Pre- : vious : year :(1957):	: 10-year : average :(1948-57):	: Record : low ^{2/}	: Record : high ^{2/}
Spring (April 1-June 30):					
Burning index	19.4	12.3	17.1	11.6 (1953)	24.3 (1951)
Average days since wetting rain	9.6	13.5	9.3	4.0 (1942)	15.7 (1938)
Total rainless days	58.3	59.0	53.4	43.7 (1953)	69.7 (1938)
Summer (July 1-Sept. 15):					
Burning index	23.2	16.1	17.6	10.0 (1954)	24.8 (1945)
Average days since wetting rain	27.0	10.7	21.2	8.3 (1943)	60.5 (1951)
Total rainless days	64.0	58.0	60.3	49.3 (1948)	67.5 (1951)
Fall (Sept. 16-Oct. 31):					
Burning index	11.8	15.3	10.0	5.1 (1955)	15.6 (1952)
Average days since wetting rain	4.7	11.0	8.0	2.7 (1956)	28.3 (1942)
Total rainless days	28.3	27.0	25.2	15.7 (1956)	38.0 (1936)
Season (April 1-Oct. 31):					
Burning index	19.1	14.3	15.8	11.8 (1955)	21.4 (1951)
Average days since wetting rain	14.8	11.9	13.3	7.0 (1948)	28.9 (1951)
Total rainless days	150.7	144.0	138.8	122.7 (1941)	162.3 (1938)

^{1/} Indexes based on observations at the following Weather Bureau stations: Burning index--Toledo, Seattle (Boeing Field), Bellingham, and Stampede Pass. Rainfall indexes--Toledo, Hoquiam, and Bellingham.

^{2/} Burning index computed 1944-1958. Average time since wetting rain and total number of rainless days computed 1936-1958.

Table 3.--Number of days between April 1 and October 31
with relative humidity 30 percent or lower^{1/}

Station	: 1958	: 1957	: Record low	: Record high
Western Oregon:				
Portland	22	15	8 (1941, 1948)	37 (1938)
Eugene	58	36	12 (1941)	65 (1951)
Sexton Summit	37	18	4 (1955)	53 (1945)
Medford	119	100	46 (1948)	135 (1951)
Western Washington:				
Toledo	8	4	1 (1948)	26 (1951)
Stampede Pass	12	8	1 (1948)	20 (1951)
Seattle	<u>2/</u> 42	21	2 (1948)	30 (1951)
Bellingham	3	2	0 (1945, 1948, 1952, 1953)	6 (1946)

^{1/} Relative humidity observed at 4:30 p.m. until June 1, 1957; at 4 p.m. thereafter.

^{2/} New record high.

High burning index. -- Individual days with extreme burning conditions are sometimes lost in the averages. Because of their importance to fire behavior, they are reported separately (table 4). For the entire season there were more of these days than usual, with the most since 1951 in western Washington. In western Oregon, the season total was more nearly normal, though the greatest number of high BI days since 1951 was noted for the summer at Eugene. High BI days in the spring and summer were the most frequent since 1951 in western Washington and about the same in number as in 1957 in western Oregon, though they were less frequent than in 1957 at Medford. Extreme days were almost absent in western Washington in the fall. In Oregon they were about as frequent as in 1957 at Portland, the most frequent since 1936 at Sexton Summit, the most frequent on record at Eugene, and second only to 1942 and 1947 at Medford.

Lightning storms. -- Although they are not tallied here, a record number of lightning storms was observed over the western half of both States during May and June. During the summer part of the season, when lightning is of greatest importance, lightning storms

Table 4.--Number of days between April 1 and October 31
with burning index greater than 28^{1/} 2[/]

Station	: 1958	: 1957	: Record low	: Record high
Western Oregon:				
Portland	11	11	7 (1935, 1953)	27 (1944, 1945)
Eugene	52	43	14 (1942)	76 (1951)
Sexton Summit	13	10	8 (1947)	47 (1936)
Medford	60	97	17 (1953)	97 (1957)
Western Washington:				
Toledo	10	2	0 (1955)	12 (1951)
Stampede Pass	27	7	4 (1955)	34 (1951)
Seattle	26	10	4 (1953)	44 (1951)
Bellingham	2	1	0 (1945, 1948)	7 (1951)

^{1/} Burning index observed at 4:30 p.m. until June 1, 1957; at 4 p.m. thereafter.

^{2/} Burning index greater than 28 is equivalent to class 6 or greater on the Forest Service Region 6 burning index scale.

were more plentiful over western Oregon than in 1957. This was especially true over southwestern Oregon forests (table 5). A record number of days with lightning storms occurred over the Umpqua National Forest. Washington national forests experienced fewer days with lightning storms than in 1957 except on the Snoqualmie, where 11 days were observed.

Table 5.--Number of days with lightning storms
between July 1 and September 15^{1/}

National forest	: 1953	: 1954	: 1955	: 1956	: 1957	: <u>2/</u> 1958
Western Oregon:						
Rogue River	13	3	2	22	9	<u>3/</u> 17
Umpqua	11	2	2	15	4	18
Willamette	7	1	1	16	3	6
Mt. Hood	14	2	8	21	4	6
Siskiyou	6	0	2	13	1	8
Siuslaw	4	1	1	8	0	2
Average	9.2	1.5	2.7	15.8	3.5	9.5
Western Washington:						
Gifford Pinchot	6	2	9	13	11	9
Snoqualmie	10	5	6	19	7	12
Mt. Baker	11	3	1	4	8	11
Olympic	4	0	1	8	7	6
Average	7.8	2.5	4.2	11.0	8.2	9.5

^{1/} Based on daily reports to U. S. Weather Bureau and on ranger district field records (82-R6).

^{2/} Complete field records not yet available.

^{3/} New record high.