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Research Note

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FIRE WEATHER IN WESTERN OREGON AND WESTERN WASHINGTON IN 1952 COMPARED WITH OTHER YEARS

By

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How did the potential burning conditions of the 1952 fire season compare with those of previous years? The answer is important to those who protect forests from fire. Knowing the relative severity of the burning conditions will help them judge the effectiveness of their fire protection programs. This paper reports ratings of the weather factors most closely related to burning conditions, that is, to the start and spread of fires. The ratings show that in comparison with previous years, the 1952 fire season weather was of near normal severity for the season as a whole, but was much above normal in the fall in western portions of Oregon and Washington.

Three weather indices, all closely related to burning conditions, are used in the comparison:

1. Burning index is a numerical rating that indicates the rate of fire spread that could be expected in fine forest fuels. It can vary from 1 to 100. A high index means that burning conditions are severe and fires will spread rapidly. It is based on measurements of relative humidity (or fuel moisture) and wind speed. Seasonal averages are based on the burning index at 4:30 p.m. on the 50 percent of the days with the highest burning indices. The western Washington burning index is an average of records from Weather Bureau stations at Toledo, Seattle (Boeing Field), Bellingham, and Stampede Pass. The western Oregon index is an average of the records from Portland, Eugene, Sexton Summit, and Medford.

2. The average number of days since a wetting rain provides a measure of the length of dry spells or degree of drought. A wetting rain is defined as .25 inch or more precipitation in one 24-hour period. A high index means a long, unbroken drought, and an extremely dry forest. (The records show that there is little relation between this index and the next, the total number of rainless days.) Seasonal averages are based on Weather Bureau records from Hoquiam, Toledo, and Bellingham in western Washington, and from Portland, Eugene, North Bend, and Medford in western Oregon.

3. The total number of rainless days provides a measure of the proportion of the season when fires might be expected to spread and fire protection effort is needed. Since this index is an inverse measure of the number of rainy days, it is also roughly related to the total amount of rain. As the number of rainless days increases, the index becomes higher and the season more severe. Averages are based on records from the same stations used in computing the average number of days since a wetting rain.

Time available for this study has limited the number of past years for which indices could be computed. For western Oregon the two indices of rain occurrence were prepared back to 1922 omitting only 1923 and 1927, both mild years. Burning index was computed for each year back to 1945 and for portions of the more severe seasons back to 1932. For western Washington the two rain occurrence indices were computed for every year starting with 1936; the burning index for every year starting with 1944.

The fire season as used in this study is from April 1 to October 31. In order to separate the summer drought period from the spring and fall periods of intermittent dry weather and rain, the season was divided into three portions: spring (April 1 to June 30), summer (July 1 to September 15), and fall (September 16 to October 31). Dangerous fire weather occasionally occurs outside the April 1 to October 31 season, but not with sufficient regularity to justify routine evaluation of fire-weather severity. Each of the three indices was computed separately for each portion of the fire season and for the entire season.

Data for each state are shown in three charts:

1. Indices for the 1952 and earlier fire seasons are shown in figures 1 and 4. The three indices are plotted side by side so that the years when all three indices are high can be easily distinguished from the years when all indices are low. The relative importance of different kinds of indices cannot, however, be determined by comparing the heights of different kinds of bars because they represent different units of measure. Similarly, the index values in one section of the chart, representing spring for example, should not be visually compared with those in another section because the sections are plotted on different scales as shown on the right.

2. Weather history of 1952 in terms of daily burning index and occurrence of wetting or nonwetting rains is charted in figures 2 and 5. The manner in which burning index varies from day to day and the occurrence of high ratings during the season are evident. The charts likewise show effect of rainfall and time of year on burning index. They also show that rain during the fire season is usually general rather than local.

3. The relation of 1952 values to extreme values of record is shown for each index in figures 3 and 6. These charts also show how the range of extreme spring values compares with that for the summer or fall. Owing to the difference in length of the spring, summer, and fall portions of the season, both the total number of rainless days and the percent of days without rain are charted. Comparisons between spring, summer, and fall should be made on the percent chart.

WESTERN OREGON

For western Oregon, the spring portion of the 1952 fire season was near normal (figs. 1 and 3) and far less severe than 1951[1/]--a record year. The summer was slightly below normal severity even though total number of rainless days equaled 1951. The fall, however, was the most severe since 1936. The entire season was about average, although it set a 31-year record for total number of rainless days.

Low relative humidities (30 percent and below) were much less frequent in the spring, slightly less frequent in the summer, and much more frequent in the fall than during corresponding periods for 1951.

Western Oregon rainfall was substantially below normal in every month but June. Total deficit for the April-October period averaged 8 inches. Nevertheless, the prolonged summer drought was tempered by general wetting rains in late June and scattered rains in early September (fig. 2). Summer rains were more frequent in southwest Oregon (Medford) than in northwest Oregon (Portland). The first substantial fall rains occurred the last three days of October but were only of light intensity in southwest Oregon. Outstanding for severity was the month of October, which was not only the driest since 1936, but also the warmest October ever reported for western Oregon.

Following the fire season, November was also exceedingly dry and added another 6 inches to the rainfall deficit for western Oregon. No general wetting rains occurred between November 14 and November 30 when the rainy season finally arrived. Drying east winds were frequent particularly at higher elevations and near the Columbia Gorge. In the past 30 years, 1936 was the only other fall when drought extended through November. In that year there were no general wetting rains between September 15 and December 3.

1/ Cramer, Owen P. and Kirkpatrick, Robert. Comparative ratings of 1951 forest fire weather in western Oregon. Pacific Northwest Forest and Range Experiment Station Research Note No. 76. December 1951.

Weather Bureau records of dates when lightning storms occurred in Oregon show that the Cascade Range had more days with lightning in 1952 than in 1951. Occurrence was about the same as the 10-year average in the northern Cascades, and well above the average in the southern Cascades. West of the Cascades lightning occurrence was considerably below the average. (East of the Cascades lightning storm frequency was slightly greater than in 1951 and was near the 10-year average.)

The extremes of the indices during the years of record (fig. 3) show some interesting differences between portions of the fire season. For example, for each of the three indices, some springs were more severe than some summers. Fall indices varied more widely than spring or summer indices. In the years analyzed, the summers were less variable than the springs or falls in terms of burning index and percent of rainless days. The number of rainless days for the entire fire season varied from 140 in 1948 to 176 in 1952. Owing to the long time since a wetting rain at the beginning of the fall of 1932, the average number of days since a wetting rain exceeded the total number of days in that portion of the fire season.

WESTERN WASHINGTON

For western Washington, the spring and summer portions of 1952 were near normal (figs. 4 and 6) and far below the records set in 1951. In contrast, the fall fire weather was extremely severe with periods between wetting rains the longest since 1942, and number of rainless days the greatest since 1936. The fall burning index also set a new mark, being the highest in nine years of record. Although the total number of rainless days during the season equaled the 17-year record, the combination of burning index and time since wetting rain indicates a season of only slightly greater than average severity.

In 1952 relative humidities of 30 percent and below were much less frequent in the spring, about equally frequent in the summer, and much more frequent in the fall than for corresponding periods in 1951.

Rainfall in western Washington was below normal every month of the fire season except June. The deficit for the 7-month period averaged 8.8 inches. Although spring rains were only slightly more numerous than in 1951, they were better distributed (fig. 5). Wetting rains which effectively broke up the summer dry spell occurred in late June, late July, late August, and in early September. The longest period without a wetting rain was between September 10 and October 20. (For the state as a whole October had the fourth highest mean temperature of record and the third lowest rainfall for that month since 1895.)

November also was a fire-weather month in 1952; no rains occurred between the 15th and the 30th. November rainfall deficit averaged 6½ inches for western Washington. East winds with low humidities were frequent, particularly in mountainous portions and near the Columbia Gorge. The late fall drought was similar to that of 1936.

Extremes of the indices in the period of record (fig. 6) show fire season characteristics of western Washington to be different from those of western Oregon. Of the three portions of the fire season, the summers show the greatest range of values for burning index and average time since a wetting rain. Spring and summer have similar average burning indices. Summer would normally be considered more severe, since the average time between wetting rains is usually greater. The percent of rainless days was most variable in the fall. Since 1936 the number of rainless days in the April to October fire season has varied from 123 days in 1941 to 162 in 1938 and 1952.

SUMMARY

During the 1952 fire season, the number of rainless days was extremely high in both western Oregon and western Washington. Fortunately, the rains were spaced so that the rainless periods were shorter than in 1951 and the drought less severe. Except in the fall, burning index was likewise lower than in 1951. Over the entire season, fire weather was near normal in western Oregon and slightly above normal severity in western Washington. Fall fire weather in both states was one of the most severe on record. For the first time since 1936, burning conditions remained serious up to the end of November.

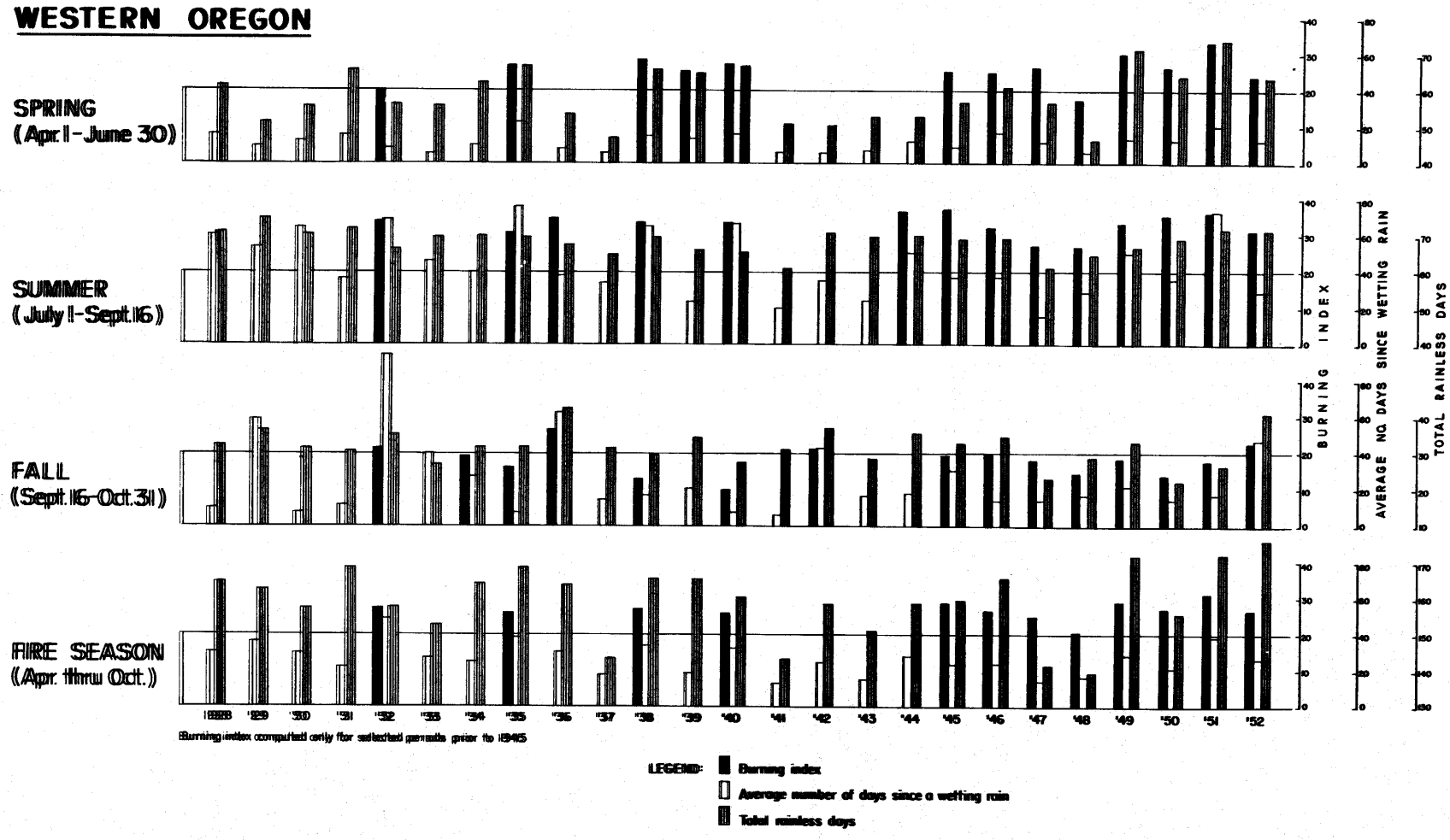
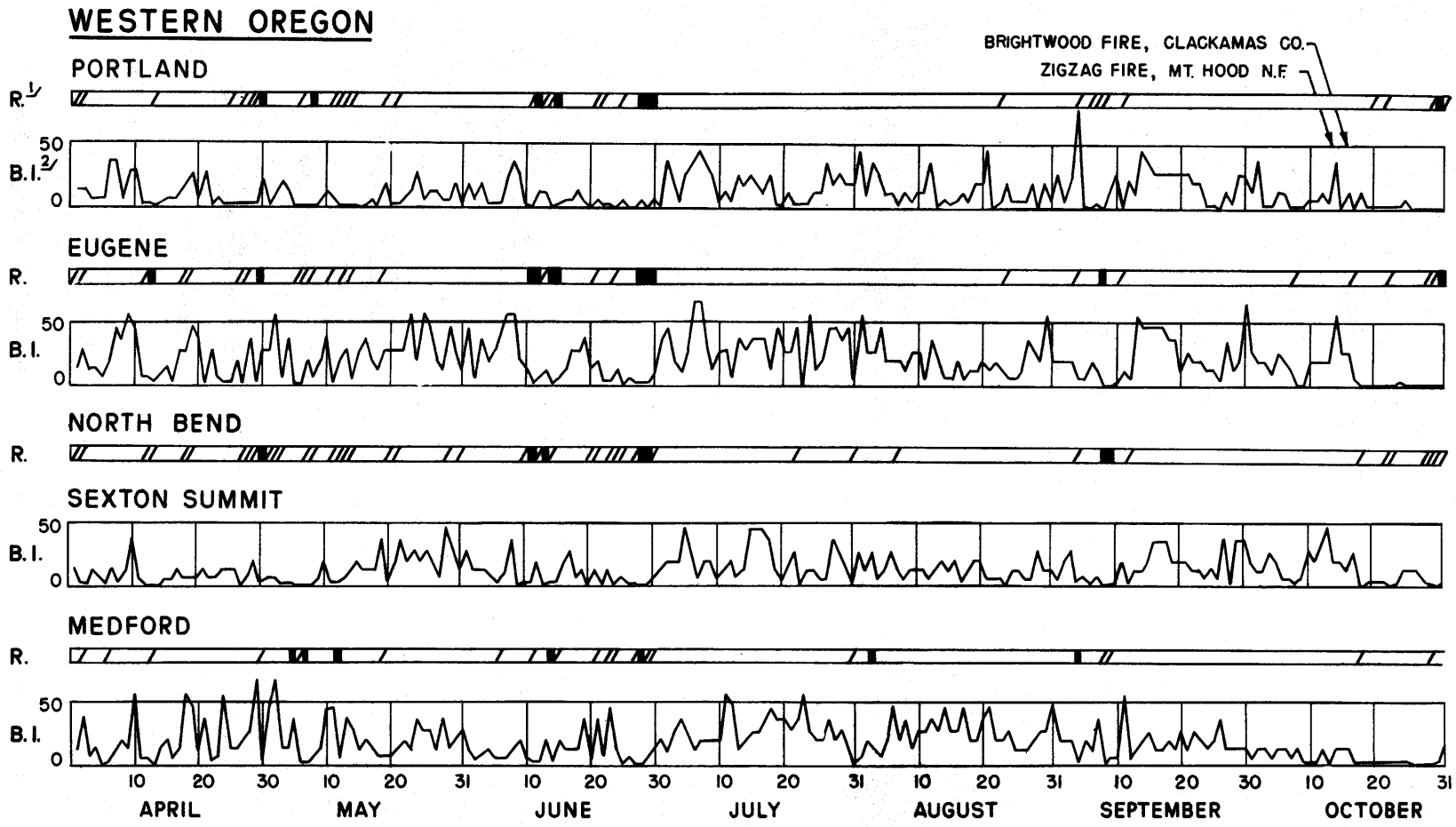


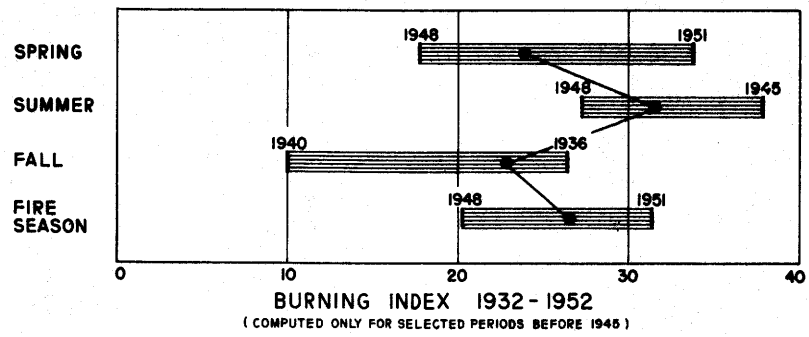
Figure 11 — Three fire-weather factors during past fire seasons in Western Oregon



1/ 24-HOUR RAINFALL: / 0.01 TO 0.24 INCH; ▮ WETTING RAIN, 0.25 INCH AND GREATER
2/ BURNING INDEX

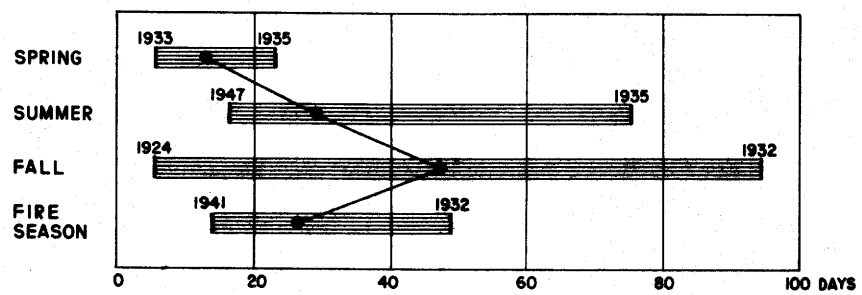
Figure 2 -- Rainfall Occurrence and 4:30 p.m. Burning Index Values for 1952 Fire Season at Western Oregon Stations

WESTERN OREGON

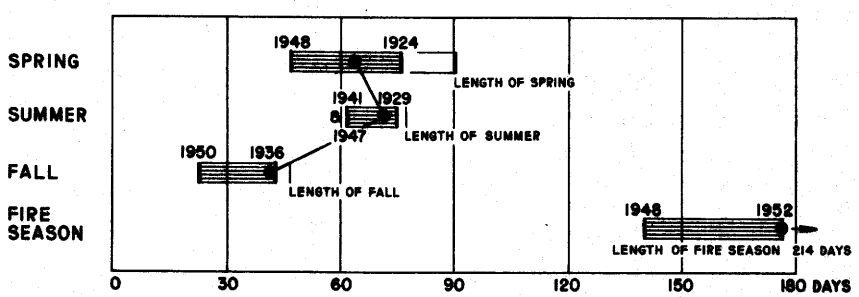


BURNING INDEX 1932 - 1952

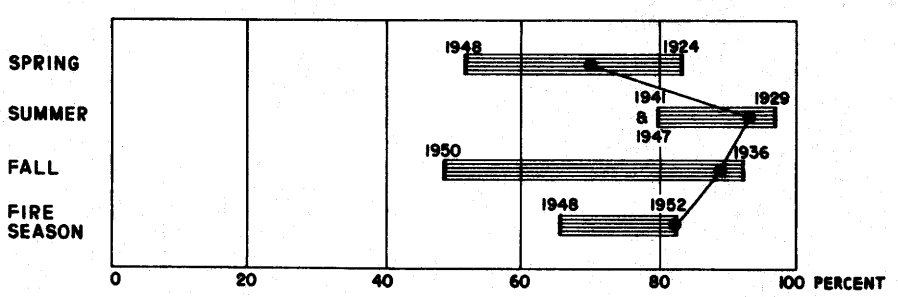
(COMPUTED ONLY FOR SELECTED PERIODS BEFORE 1945)



AVERAGE NUMBER OF DAYS SINCE A WETTING RAIN 1924-1952



TOTAL RAINLESS DAYS 1924 - 1952



PERCENT OF DAYS RAINLESS 1924 - 1952

LEGEND: ● 1952 VALUES

YEARS SIGNIFY SEASONS WITH LOWEST AND HIGHEST VALUES

Figure 3 -- 1952 Fire-weather factors compared with extreme values for the years of record in Western Oregon

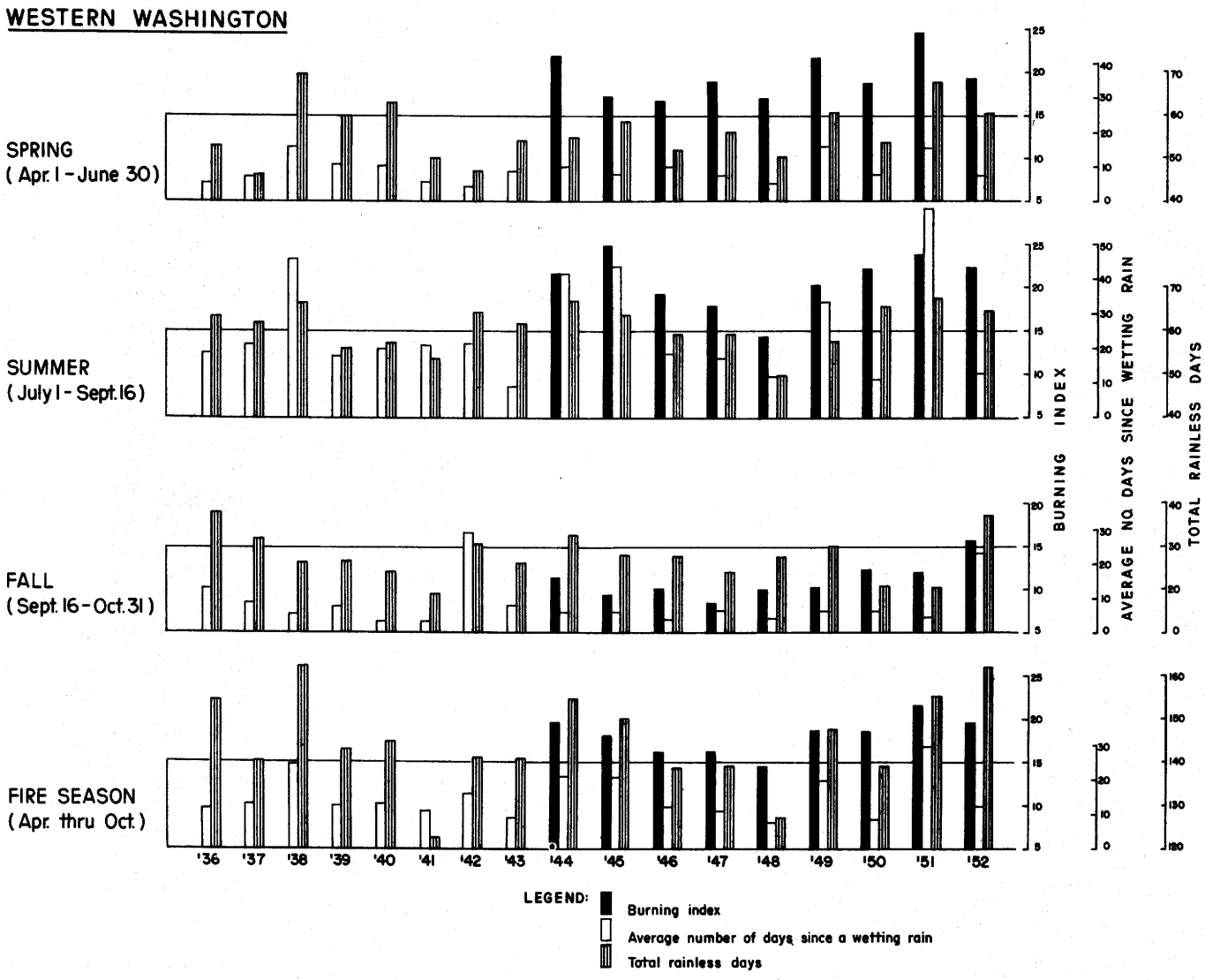
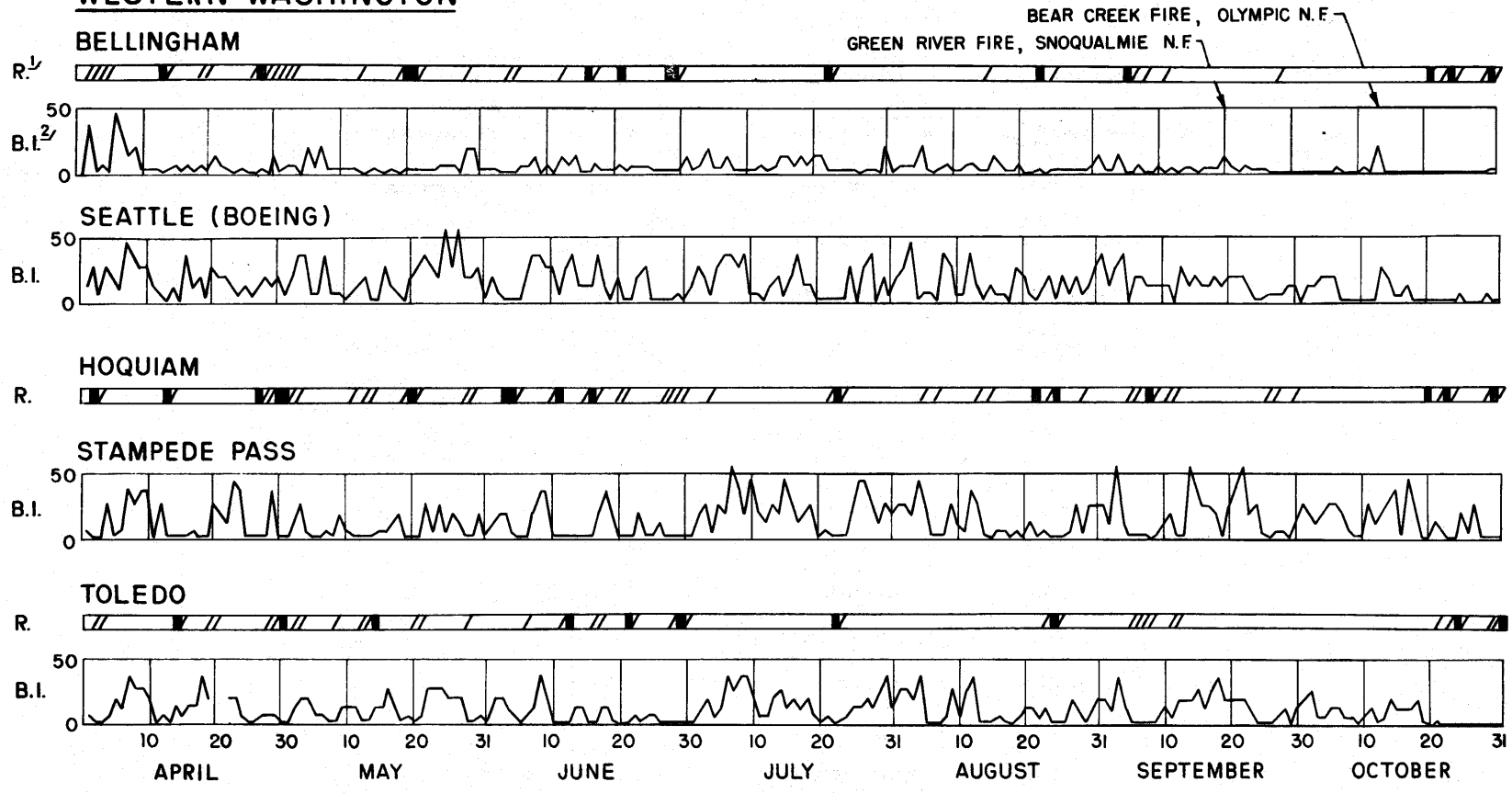


Figure 4 -- Three fire-weather factors during past fire seasons in Western Washington



1/ 24 HOUR RAINFALL: / 0.01 TO 0.24 INCH; ▮ WETTING RAIN, 0.25 INCH AND GREATER
2/ BURNING INDEX

Figure 5 -- Rainfall Occurrence and 4:30 p.m. Burning Index Values for 1952 Fire Season at Western Washington Stations

WESTERN WASHINGTON

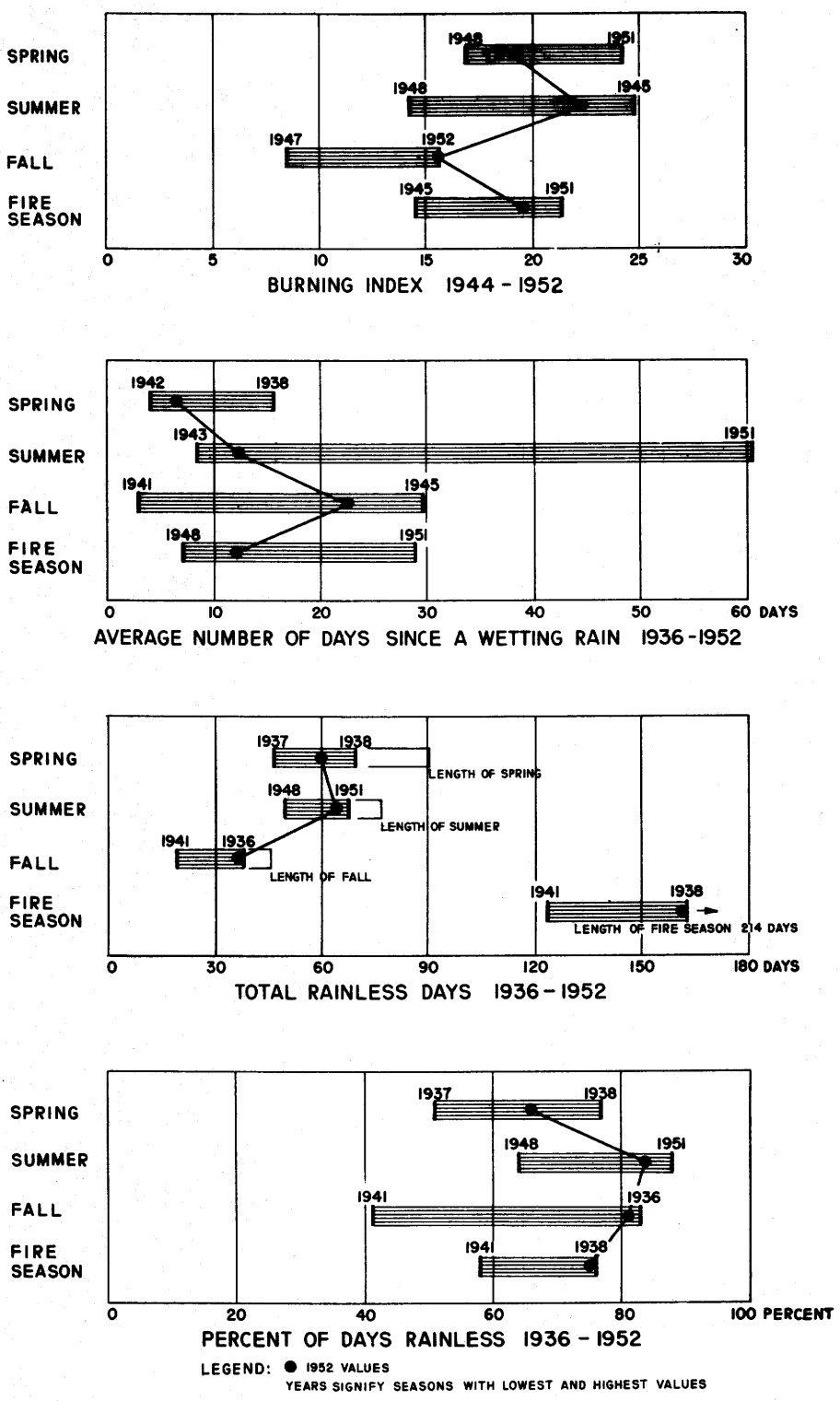


Figure 6 -- 1952 Fire-weather factors compared with extreme values for the years of record in Western Washington