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METEOROLOGICAL CONDITIONS PRECEDING THUNDERSTORMS ON THE NATIONAL FORESTS

2. THE BLUE MOUNTAINS OF WASHINGTON AND OREGON

By W. R. STEVENS

[Weather Bureau, Washington, D. C , May 1935]

A series of studies are being made to determine whether any simple relationships exist between certain antecedent meteorological conditions and the occurrence of thunderstorms on the national forests in the northwestern sections of the United States, where lightning is the greatest of all forest-fire hazards and thunderstorms are so difficult to forecast with precision. The results of the first of these studies were published in the October 1934 issue of the REVIEW. Certain special terms are used in the present article which are defined in the first paper. Essentially the same methods have been employed in both studies, except that by plotting 3 elements instead of 2 on each graph the results presented in this paper are considerably better than those in the first article.

The majority of serious lightning storm days in the Blue Mountains occur in connection with troughs of low pressure which extend from northwestern Mexico to British Columbia or Alberta. The pressure distribution is quite similar to that which attends serious lightning storms in western and central Oregon, except that the trough line usually is farther to the east when serious storms occur in the Blue Mountains, often being as far as Idaho.

The season of lightning fire hazard is usually from July to about September 15. In the 7 years studied, 1925–31, inclusive, no "wide-spread" and only 1 "scattered" storm day was reported during the June months. After September 15 there was no "widespread" and only 1 "scattered" storm day. The season included in this study is the months of July and August, the season of greatest lightning fire hazard.

The following table shows the number of thunderstorm days, classified according to type, on the national forests of the Blue Mountains during the period.

JULY

	Local	Scattered	Wide-spread
1925	9	1	5
1926	7	5	1
1927	2	5	3
1928	12	4	4
1929	1	1	1
1930	7	0	3
1931	7	2	0
Total	45	18	17

AUGUST

	Local	Scattered	Wide-spread
1925	9	0	3
1926	8	1	0
1927	8	7	2
1928	7	6	1
1929	5	2	3
1930	9	0	7
1931	3	1	1
Total	49	17	17

During the 7-year period there were 8 more "local", 5 more "scattered", and 11 more "wide-spread" storm days in the Blue Mountains than in western and central Oregon.

METEOROLOGICAL CONDITIONS IN MORNING AND THUNDERSTORM ACTIVITY SAME DAY

The majority of serious storm days in the Blue Mountains occur when the 8 a. m. E. S. T. pressure at Spokane is below 29.95 inches.

During July, when the morning pressure at Spokane is below 29.95 inches and lower than at Havre or not more than 0.04 inch higher, the pressure at Baker lower than at Eureka or not more than 0.06 inch higher, and the vapor pressure at Baker 0.22 inch or higher, a dangerous thunderstorm condition exists (fig. 1).

Conditions are dangerous during July when the morning pressure at Spokane is above 29.95 inches and lower by 0.06 inch or more than at Havre, the pressure at Baker lower than at Eureka or not more than 0.12 inch higher, and the vapor pressure at Baker 0.24 inch or higher (fig. 2).

Dangerous conditions prevail during August when the pressure at Spokane is below 29.95 inches and not more than 0.02 inch higher or more than 0.26 inch lower than at Havre, the pressure at Baker lower or not more than 0.06 inch higher than at Eureka, and the vapor pressure at Baker 0.22 inch or higher (fig. 3).

During August, when the pressure at Spokane is above 29.95 inches and is the same or not more than 0.26 inch lower than at Havre, the pressure at Baker lower or not more than 0.02 inch higher than at Eureka, and the vapor pressure at Baker is 0.20 inch or higher, a dangerous thunderstorm situation exists (fig. 4).

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METEOROLOGICAL CONDITIONS IN MORNING AND THUNDERSTORM ACTIVITY NEXT DAY

During July, conditions are dangerous for the next day when the morning pressure at Spokane is below 29.95 inches and lower than at Havre or not more than 0.04 inch higher, the pressure at Spokane is higher than at Seattle or not more than 0.18 inch lower, and the pressure at Baker is lower than at Eureka or not more than 0.04 inch higher (fig. 5).

Conditions are dangerous during July when the pressure at Spokane is above 29.95 inches and lower than at Havre, and higher or not more than 0.10 inch lower than at Seattle, and in addition the pressure at Baker is the same or not more than 0.12 inch higher than at Eureka (fig. 6). Every "wide-spread" and "scattered" thunderstorm day reported when the pressure at Spokane was above 29.95 inches occurred under these conditions.

During August, conditions are safe for the next day when the morning pressure at Spokane is below 29.95 inches, the pressure at Seattle less than or not more than 0.04 inch higher than at Kamloops, and the Seattle pressure is less than at Roseburg (fig. 7). Otherwise rather dangerous conditions are indicated when the pressure at Spokane is below 29.95 inches.

Conditions are safe during August when the pressure at Spokane is above 29.95 inches, the pressure at Baker more than 0.02 inch higher than at Roseburg and more than 0.10 inch higher than at Havre (fig. 8). Otherwise relatively dangerous conditions are likely to occur the next day when the morning pressure at Spokane is above 29.95 inches.

It will be noted that the last two figures do not involve a third factor. The writer has failed, although very extensive studies have been made, to discover a third factor which will improve these charts. Consequently, these charts are not as satisfactory as the others contained in this paper.

CONCLUSION

The writer wishes to emphasize that the records upon which this study is based are only 7 years in length, and that the results must not be considered as final. However, it is believed that the relationships presented will be helpful in forecasting thunderstorms for the Blue Mountains.

These relationships are not intended to take the place of knowledge that forecasters for the region have gained through study and experience, but rather to serve as auxiliaries to the weather map in much the same way that use is now made of auxiliary charts such as pressure change, upper air, etc.

It is not presumed that the most reliable relationships that exist for the region have been presented in this paper. These simply represent the best that the writer has been able to find.

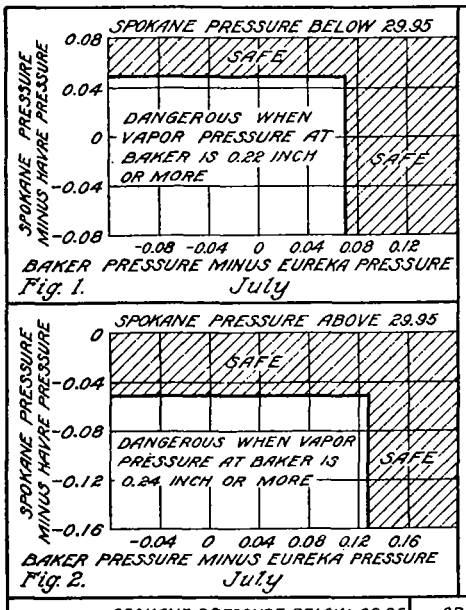

Fig. 1. July

Fig. 2. July

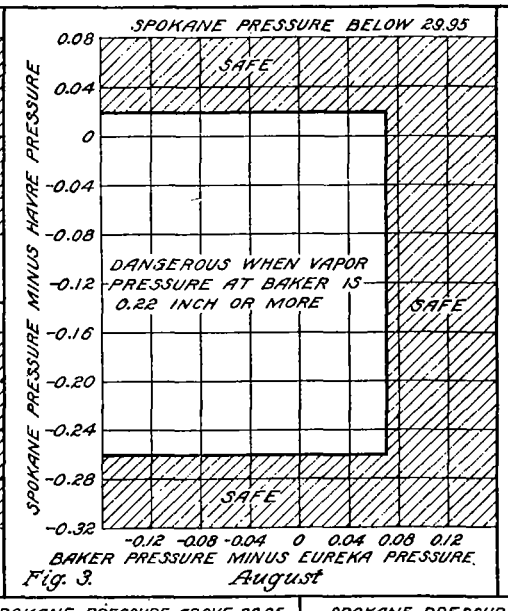

Fig. 3. August

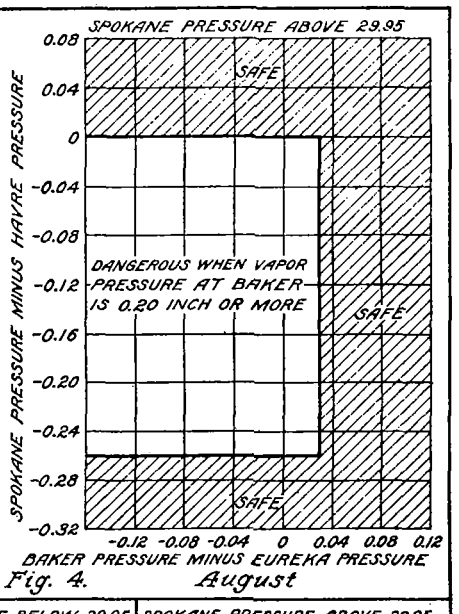

Fig. 4. August

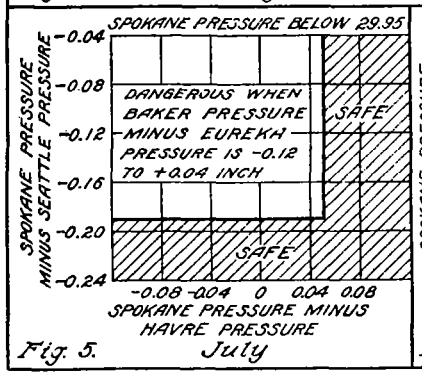

Fig. 5. July

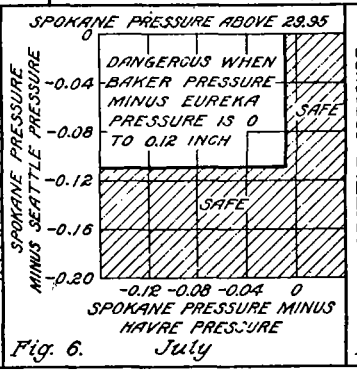

Fig. 6. July

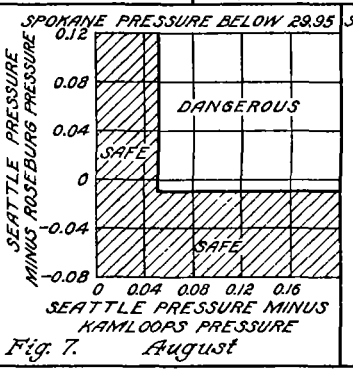

Fig. 7. August

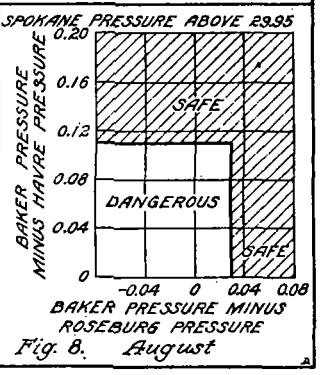

Fig. 8. August