A KEY TO BLOWUP CONDITIONS IN THE SOUTHWEST?

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Can minimum nighttime temperatures be used in some areas as an indicator of one type of blowup conditions? A preliminary study of several project fires occurring on the Tonto, Sitgreaves, and Prescott National Forests in the years 1951 to 1961 showed that the night before each of these fires blew out or control was unusually warm. Of particular significance is the fact that most of them occurred following the warmest nights of the critical June fire period and often occurred at a peak after several consecutive days of rapidly rising temperatures. For some fires which occurred in July and September this also appeared to be true. Only 4 of the 13 fires in the study failed to show this, but even for those 4 the temperatures were at or above what is believed to be the critical point. Temperatures on the nights preceding the start or blowup of these fires varied from high of 81° in the semi desert to 52° in the pine above the Mogollon Rim. These temperatures were all unusually high for the area where the fire occurred.

Why in June, are some fires controlled at small size while others defy control no matter what the action taken? Why can you reach some lightning fires while they are still in the tree, yet others explode into major fires? Why does a quiet or apparently controlled fire suddenly act up? A look at relative humidity showed day-to-day fluctuations and seemed not to be an adequate answer to these questions. This study seems to indicate that a deadly one-two combination of an unusually warm night followed by a warm day may be the key.

If further study should prove this to be reliable, we could determine more accurately when to increase emergency fire forces and signal the start of intensive fire prevention. Following lightning, extra efforts to ensure early detection could be undertaken. By taking 8:00 a.m. readings of the previous night's minimum temperature and plotting them on a graph, it might be possible to spot the beginning of potential blowup conditions, There is usually a very sharp rise from relatively cool nights to hot nights over a period of only 2 or 3 days (figs. 1-4). Since this leaves very little time to get ready, the use of nighttime temperatures may be a better indicator than daytime temperatures because it allows more time to prepare.

Too, the charts on the 13 fires studied actually indicate a better tie-in using minimum rather than maximum temperatures.

Fire control organizations are not fully aware of this change in conditions as it is not indicated in present fire-danger meters by any definite rise in the index. During June, the Southwest is in extreme conditions already so it might be said that conditions have suddenly gone from critical to supercritical.

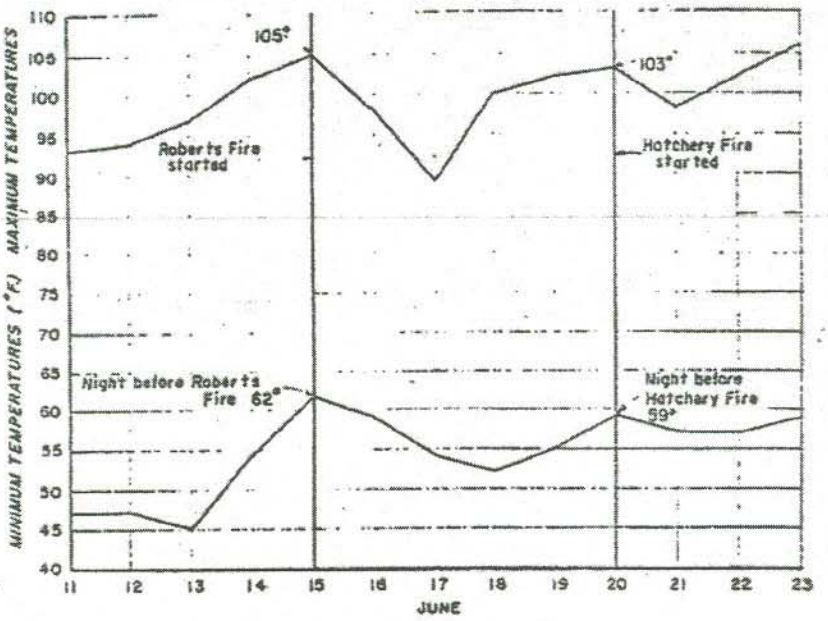

FIGURE 1.—Roberts and Hatchery Fires, June 1961.

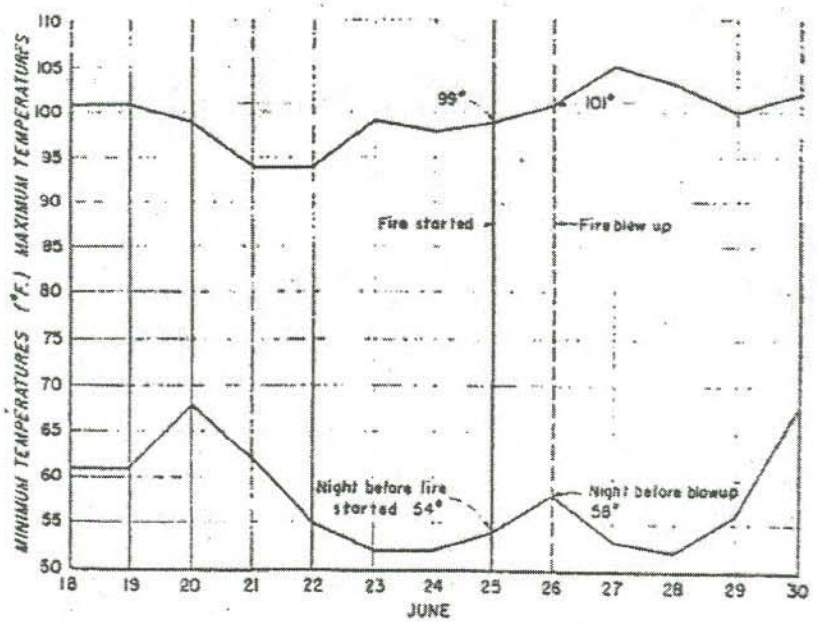

FIGURE 2.—Russell Gulch Fire, June 1951.

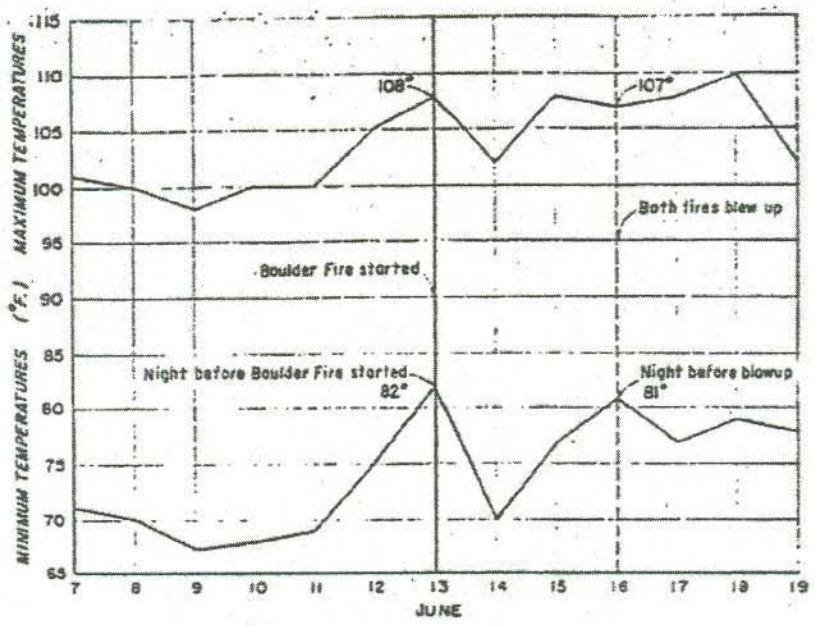

FIGURE 3.—Boulder and Pranty Fires (lightning), June 1959.

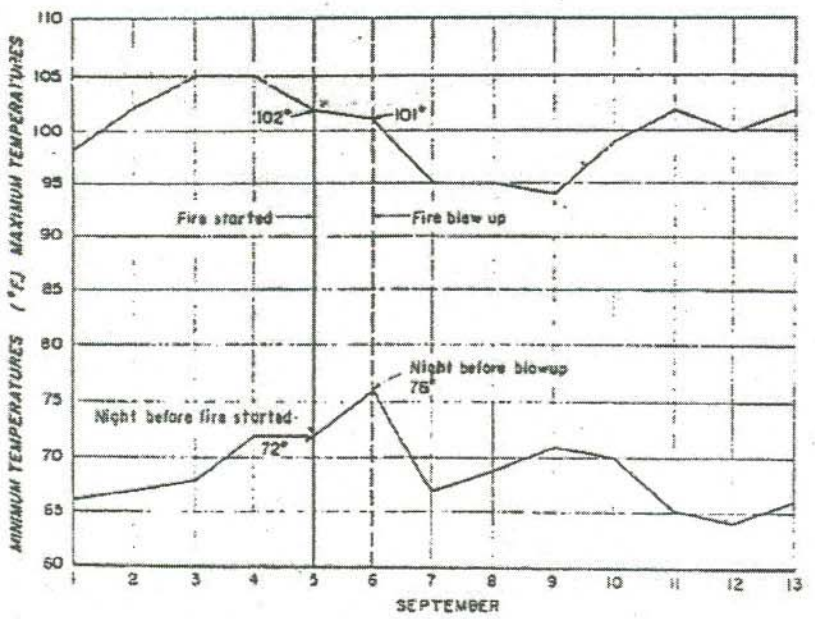

FIGURE 4.—Buckhorn Fire, September 1956.

An attempt to expand on this theory and determine an average date at which this temperature rise occurred proved futile. It can apparently happen almost any time in June in this area and may occur as early as May or as late as July in other southwestern localities. In 1956, the condition seems to have appeared in September on the Tonto National Forest on the Buckhorn Fire, coinciding with a dry fall period. However, June 10 is often mentioned as the breaking point on the Tonto. Each forest-possibly each district-would have to chart this separately and watch for the start of the temperature rise. From this temperature study, I have arbitrarily said that nighttime temperatures above 45° are critical; and with those above 55° blowup conditions exist. Cloudy nights keep nighttime temperatures high and may or may not be serious depending on whether the clouds disappear by morning. During June, there is probably only a small likelihood of nighttime clouds.

It is recognized that factors other than temperatures also contribute to fire size. Some areas have large fires during periods of high early spring winds; some fires are large because of organizational breakdowns, others because of topography; California has its Santa Ana winds; and so on. Undoubtedly, most of these fires would show temperature correlation only through coincidence. On the fires studied there was no attempt to make a complete analysis of all factors affecting the particular fire such as topography, wind, relative humidity, human error, time of day, fuels, and aspect. What was suggested by the study is that this one common denominator may provide a predictable basis for increased manning and a crash prevention effort during those critical periods.

Some assumptions and recommendations that can be made from this limited study follow.

1. High nighttime temperatures do not of themselves cause fires to blow up, but under these conditions, all other factors which tend to cause large fires are maximized.

2. If nighttime temperatures are rising, going fires must be secured before temperatures rise above the critical. This is seen in the case of fires which blow up on the third or fourth day after start.

3. Fires occurring before and after temperature peaks are controlled at small size; some of them under much worse rate-of-spread conditions.

4. Spotting was a big factor in most of these fires although winds were not exceptionally strong. This fact was mentioned consistently in discussing these fires with people who had participated in the suppression. Some of these fires became big even though firefighters were on them at the very start when they were only a few feet across.

5. In June, before the summer lightning period, temperatures can be used as the basis for increased prevention effort at all levels.

6. When lightning occurs, detection forces could be augmented, especially in the case of long aerial patrol routes where some areas are not covered until 3 or 4 hours after daylight.

7. It might be possible to develop new rules for prescribed burning. Limit burning to times when nighttime temperatures are less than 45° and to a time when the temperature trend is down.

8. In the June dry period, rapidly rising nighttime temperatures often seem to presage the first lightning storm of the season. These high nighttime temperatures usually occur from 24 to 48 hours before the lightning storms occur. These first storms are often dry.