

## Western Ecological Research Center

# Publication Brief for Resource Managers

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## Climate Impacts on Fire Regimes in Coastal California

Currently there is a great deal of interest in developing fire/climate relationships into predictive tools useful to fire managers. Specifically, knowledge of climate conditions that precede the fire season could provide fire managers with a useful management tool for planning fire resource needs. For much of the western United States, previous research studies have shown there is a highly predictable link between climate and fire activity. There are two important signals. Drought immediately prior to and during the fire season leads to lower fuel moisture and higher fire activity. A second link is heavy and extended rainfall produces enhanced herbaceous growth and in the following year results in higher fuel loads and increased fire incidence. However, in southern California, research by USGS scientist Jon Keeley and published in the *International Journal of Wildland Fire* has shown that the anomalous annual Santa Ana wind conditions in that region override both of these climate signals.

This research used the Palmer Drought Severity Index (PDSI) to investigate historical correlations between fire activity in southern and central coastal California. PDSI is a regional index based on the amount of soil moisture for a given period of time relative to the amount expected under “normal” conditions. Previous studies have used this index to demonstrate the historical role of drought in the fire regimes of different forest types throughout the western U.S. However, this recent research has shown that in southern California the correlation between this drought index and annual fire occurrence was not significant, although there were some slightly significant relationships between drought in different seasons and fire activity. For example, in southern California, area burned is significantly tied to autumn precipitation, which cuts short the annual drought and likely decreases the effectiveness of Santa Ana winds. However, in most cases the correlations

### Management Implications:

- In southern California, there is only a very weak correlation between drought and annual fire activity, due to the overriding impact of autumn Santa Ana winds.
- In central coastal California, correlations between fire activity and climate parameters are stronger.
- Seasonal climate predictors of fire occurrence are different than those predicting area burned.

were weak and explained only about 5–10 % of the total variation, indicating limited value as predictors of future fire activity.

The primary reason antecedent climate is of limited predictive value is because most acreage burned in this region is due to a few large fires that occur during the autumn foehn winds, regardless of the degree of prior drought. Drought, however, does affect the length of the fire season, as area burned in the summer and winter is tied to drought.

This region is also an anomaly relative to much of the western U.S., where strong regional synchrony is evident in fire/climate relationships. In coastal California there is a lack of strong synchrony in fire/climate relationships between the south coast and central coast regions, apparently because of differences in the distribution of autumn foehn winds. In southern California, large conflagrations are usually associated with these annual wind events that follow the long spring and summer drought. Increasing human presence in this region has increased the probability of ignitions during these severe fire weather events.

*Keeley, J.E. 2004. Impact of antecedent climate on fire regimes in coastal California. International Journal of Wildland Fire 13:173–182.*