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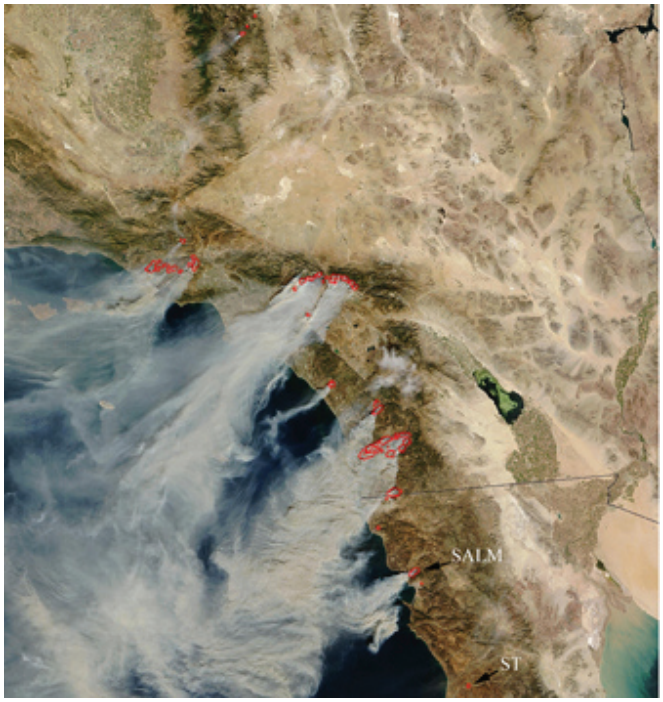
Causes of Large Shrubland Wildfires

Large and damaging wildfires are a major concern to the growing population in southern California. Some scientists contend that the historical fire regime was characterized by frequent, small to moderate size, slow-moving smoldering fires and it has been disrupted by fire suppression activities, resulting in unnatural fuel accumulation and unusually large and catastrophic wildfires. This is of critical management concern because these advocates contend that large, high-intensity fires can be prevented through fuel modification. Although many scientists and fire managers have serious doubts about this model, it is still widely circulated in the popular media. USGS research scientist Jon Keeley and University of Wisconsin professor Paul Zedler present a study in a recent issue of *Ecological Applications* that considers in further detail the problems with this model.



Santa Ana wind-driven fires and smoke in 2003 from Ventura County, USA to San Antonio de Las Minas near Ensenada, Mexico (SALM arrow). Note the apparent lack of Santa Ana winds on the fire further south near Santo Tomás (ST arrow at bottom of panel) due to effects of the Gulf of California and San Pedro Mártir. Image captured by the Moderate Resolution Imaging Spectro- radiometer (MODIS) on the Terra satellite on October 26, 2003 (http://earthobservatory.nasa.gov/NaturalHazards/shownh.php3?img_%20id=11799).

Management Implications:

- Large, high-intensity wildfires are a natural feature of southern California landscapes and are not directly the result of past fire suppression activities.
- Large fires over 25,000 acres have not increased in frequency over the past 125 years of record.
- Baja California is sometimes proposed as a model for southern California fire regimes if fire suppression were abandoned, but this is discounted on numerous grounds.
- Anomalously long droughts have been unusually frequent in the latter half of the 20th century and a major factor behind an unusual number of megafires in recent years.
- Fuel treatments designed to maintain young age classes of shrublands will not provide reliable barriers to fire spread; however, strategic placement may benefit fire suppression activities.
- Increasing community responsibility in locating and constructing new homes and more attention to fire prevention are likely to be avenues for the greatest decreases in community vulnerability to wildfires.

Based on over 100 historical accounts from the 19th century, this study found that large, high-intensity

wildfires predate modern fire suppression policy. Also, based on historical documents, it is concluded that the 1889 Santiago Canyon Fire in Orange County is the largest fire recorded in California and likely exceeded 125,000 ha (~300,000 ac).

Even during the 20th century period of fire suppression policy, Keeley and Zedler showed that large fires were not the result of suppression activities disrupting natural fuel mosaics. These scientists also reported that over the last 125 years there has been no significant change in the incidence of large fires greater than 10,000 ha (~25,000 ac), consistent with the conclusion that fire suppression activities are not the cause of these fire events.

Eight extremely large "megafires" (≥50,000 ha or ~150,000 ac) have occurred since the late 1800s, and all were preceded by unusually long droughts, from 1–4 years. It is hypothesized that these droughts have led to increased dead fuels, and modeling shows that this promotes the incidence of firebrands and spot fires. Since dead fuels persist for many years, the potential for severe fires may continue long after droughts end.

Proponents of the theory that fire suppression is the cause of large fires on these landscapes contend that fuel treatments that maintain the landscape in a mosaic of young age classes will provide a barrier to fire spread and prevent large fires. However, the present study shows that young chaparral is dominated by short-lived species that create a dense surface layer of fine fuels, and fire behavior models show that there is sufficient dead fuel to spread fire even under moderate winds. Empirical studies of fuel ages burned in recent fires illustrate that young fuels often comprise a major portion of burned vegetation and there is no difference between evergreen chaparral and semi-deciduous sage scrub. Keeley and Zedler also present theoretical models of fire spread that demonstrate fuel mosaics can only keep fires small when fuel age is a strict limiting factor to fire spread and only when ignitions are saturating.

Some have claimed that because Baja California has a less aggressive fire suppression policy than regions north of the border, they have managed to avoid massive wildfires and this is a good model for how southern California should handle fire management. However, Keeley and Zedler report that historical documents show massive Santa Ana wind-driven fires did occur in Baja California prior to the intensified land use of the 20th century. It has also been argued by proponents of the Baja model that the present-day fire size distribution in northern Baja California is a model of the historical patterns that were present on southern California landscapes. Applying this model with historical fire frequencies shows the Baja model is inadequate to maintain these fire-prone ecosystems and further demonstrates that fire managers in southern California are not likely to learn much from studying modern Baja California fire regimes.

Keeley, J.E. and P.H. Zedler. 2009. Large, high-intensity fire events in southern California shrublands: debunking the fine-grain age-patch model. Ecological Applications 19:69–94.

[Complete article can be downloaded from web site listed at top of previous page.]