CALIFORNIA FIRE SCIENCE CONSORTIUM

Research Brief for Resource Managers

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What Makes Wildfires Destructive in California? Study Points to Distance to Human Development and Fire Weather

Syphard, A.D., Keeley, J.E., Gough, M., Lazarz, M., Rogan, J. 2022. What makes wildfires destructive in California? Fire, 5(5), p.133. https://doi.org/10.3390/fire5050133

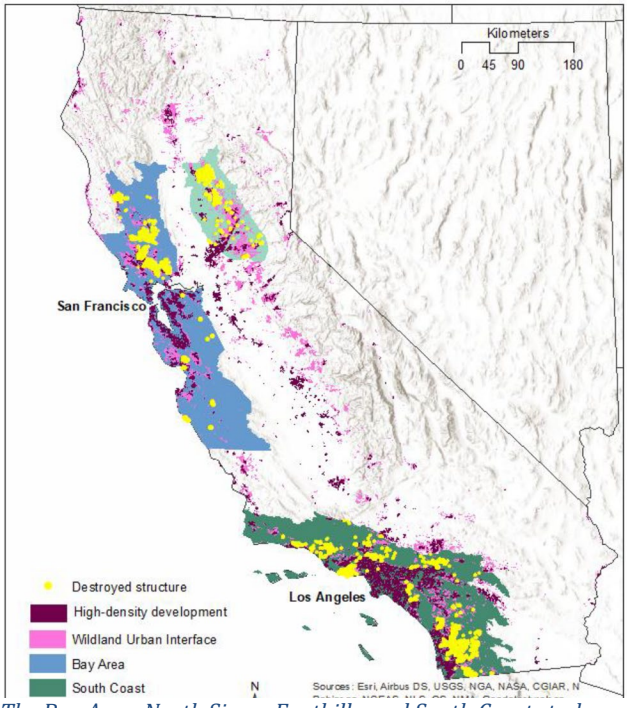
Management Implications

- Land use planning to reduce exposure of new housing to wind-driven wildfires could be one of the most effective long-term strategies to prevent future losses.
- Targeted ignition prevention programs could reduce the occurrence and frequency of wildfires with potential to become destructive.

A new paper by USGS and partners investigated why some California wildfires are destructive and others are not. They found that that proximity to the Wildland Urban Interface was the most important factor in the Bay Area and northern Sierra Nevada foothills, while wind speed on the day of ignition was most important in Southern California.

Recent wildfires globally have resulted in hundreds of lives lost, tens of thousands of structures destroyed, and exorbitant financial costs. In California, the most destructive fire events include the 2017 Wine Country Fires, which destroyed nearly 9000 structures, and the 2018 Camp Fire, which destroyed more than 18,000 structures. However, most California wildfires destroy few or no structures. Destructive fires are often large and close to human development, but the role of even these factors in destruction are not clear-cut: some small fires are destructive while many large ones are not, and while proximity to human development is associated with more ignitions, it also means better proximity to suppression resources.

The new study systematically examined a variety of possible factors to determine how destructive California wildfires (defined as destroying at least one structure) differed from non-destructive fires. The researchers characterized overall differences between fires that resulted in structure loss and those that did not from 2000-2018, across three California



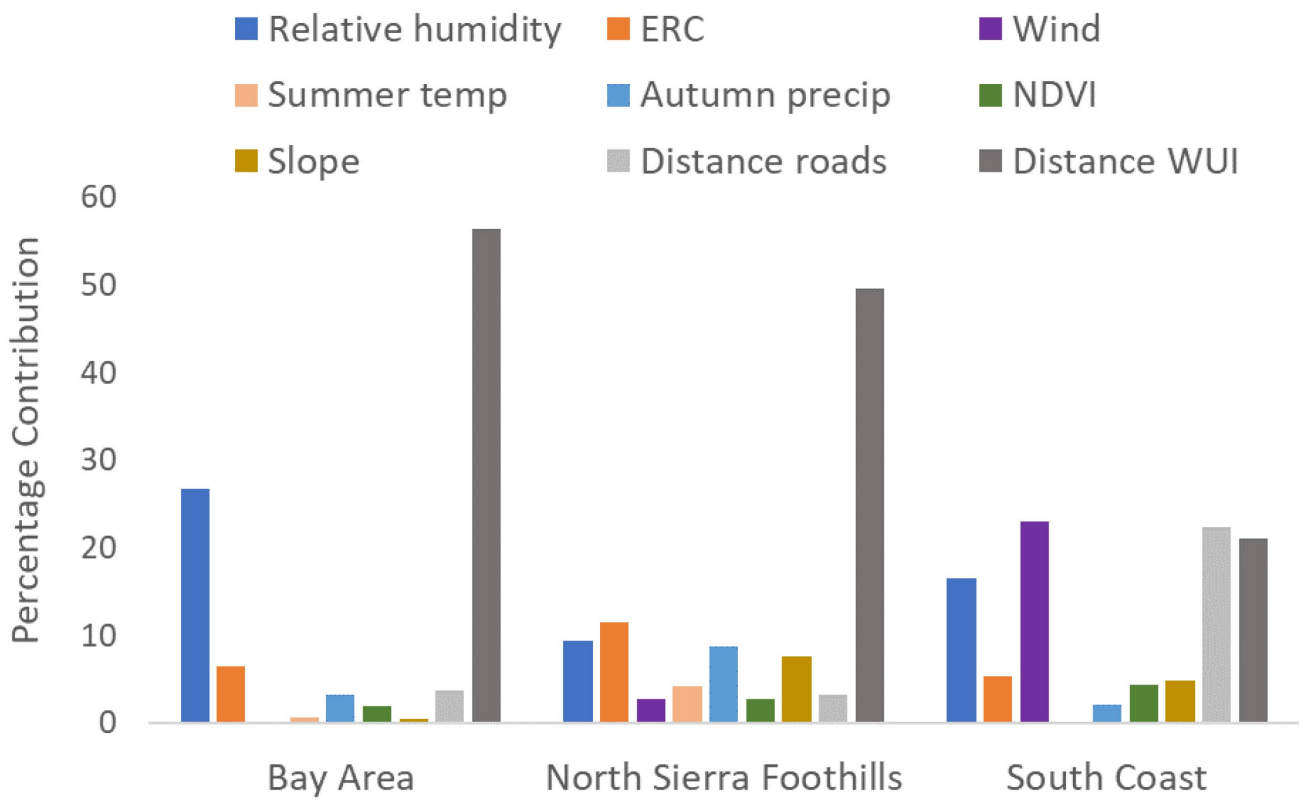
The Bay Area, North Sierra Foothills, and South Coast study regions in California, USA. From Syphard et al. 2022.

regions, analyzing the role of weather, seasonal climate, vegetation productivity, topography, and distance to roads and the Wildland Urban Interface (the zone where structures and other human development meet or intermingle with vegetation).

Overall, 6% of all fires and 19% of fires over 100 hectares (~250 acres) overlapping the study boundaries from 2000–2018 had at least 1 structure destroyed. The Bay Area had 41 destructive fires, the northern Sierra Nevada foothills had 59, and the Southern California coast had 59. There were 28 fires with more than 100 structures lost (including 8 fires with over 1000 structures lost), but most destructive fires had fewer than 10 structures lost.

Not surprisingly, fires that resulted in structure loss were significantly larger and burned at higher severity than fires that did not result in structure loss. Among fires larger than 100 hectares, the differences between destructive and non-destructive fires for the fire weather variables were consistent for all three regions; the relative humidity was lower, the fuel moisture was higher, and the winds were faster for destructive fires. For all three regions, large destructive fires had shorter distances to roads and the WUI than large non-destructive fires. Distance to the WUI was by far the most important variable for the Bay Area and the North Sierra Foothills, while wind speed on the day of ignition was most important in the South Coast region.

While the results point to the major factors that elevate the risk that a given fire will lead to structure loss, the findings also highlight how multiple factors contribute and the importance of geographical differences among regions.



Relative independent variable importance explaining the difference between destructive and non-destructive wildfires ≥100 ha for three California regions from 2000–2018. Variables account for: weather (relative humidity, energy release component (ERC, a measure of fuel moisture), and wind velocity) on the date that fires started, seasonal climate (summer temperature (summer temp), autumn precipitation (autumn precip, vegetation productivity (normalized difference vegetation index (NDVI) in the year before the fire, slope, distance to roads, and distance to the Wildland Urban Interface (WUI) in the year 2000. From Syphard et al. 2022.