



## Research Brief for Resource Managers

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# Increasing Fire Activity for Arid California: Different Fire Trends from Different Fire Drivers

Syphard, A.D., J.E. Keeley, and J.T. Abatzoglou. 2017. Trends and drivers of fire activity vary across California aridland ecosystems. *Journal of Arid Environments* 144:110-122.  
<http://doi.org/10.1016/j.jaridenv.2017.03.017>

Within the Desert Renewable Energy Conservation Plan (DRECP) Boundary of Southern California, fire activity has increased in the last 40 years. However, when fire activity was sorted by frequency and size patterns for five distinct ecoregions within the boundary, the trends were much less homogenous. For example, fire frequency was found to have increased and plateaued for some ecoregions but not all of them, but burn area continued to rise across all five ecoregions. These complex trends were quantified and the significance of the various known human and biophysical fire drivers behind them was compared.

The results showed that the individual fire trends for each ecoregion came from unique sets of circumstances, resulting from some combination of direct drivers (like powerline and roadside ignitions) with indirect drivers (like invasive grasses, air pollution, and landscape fragmentation terrestrial intactness). A number of unidentified factors are also likely to blame. The Mojave Desert was most impacted by powerline ignitions

### Management Implications

- Direct fire drivers such as ignition sources are easier to control than indirect drivers, such as air pollution and increased grass biomass.
- Human ignition sources vary considerably by ecoregion. This means that locally tailored approaches are necessary to control them.
- Controlling invasive grasses and other exotic herbaceous fuels (i.e., not native woody fuels) would help to reduce both the frequency and the size of fires for these arid ecosystems.
- Many unidentified fire drivers remain to be discovered within the DRECP Boundary.

(Fig. 1). Fire activity in the Sonoran Desert was most impacted by distance-to-roads ignition patterns, while fire activity in the Mojave Desert, the Sierra Nevada and southern California mountains were all significantly impacted by invasive grass biomass (Fig.2). Although the main fire drivers were statistically ranked for each region, the complexity of the interactions among the various drivers dictates that fire management be customized for each ecoregion.

Within the DRECP Boundary, the land was partitioned into five distinct ecoregions based on geology, vegetation, climate and land use. Data on both large (> 20 ha) and small Federal land fires from 1970 to 2010 were assembled to generate simple linear and

quadratic trend models over time. Within each ecoregion, the data were further sorted by vegetation type (i.e., tree, sparse, scrubshrub, non-vegetated, riparian, grass), then more data layers were added for modeling, including: fine fuels (NDVI), climatic water deficit (CWD), two terrain variables (elevation & ruggedness), and

several anthropogenic variables (distance to roads and urban development, location of point energy sources, terrestrial intactness, and nitrogen deposition pattern). Multiple-regression, hierarchical partitioning, and structural equation modeling was used to find the relative significance of each variable for driving fire activity in each ecoregion.

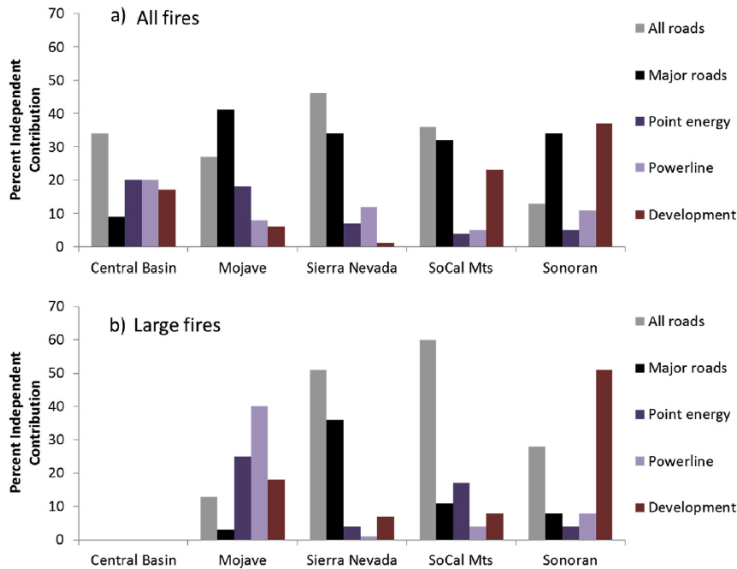


Fig. 1. Relative importance of five anthropogenic variables for influencing the spatial and temporal distribution of a) all and b) large fires across the Desert Renewable Energy Conservation Plan (DRECP) study area.

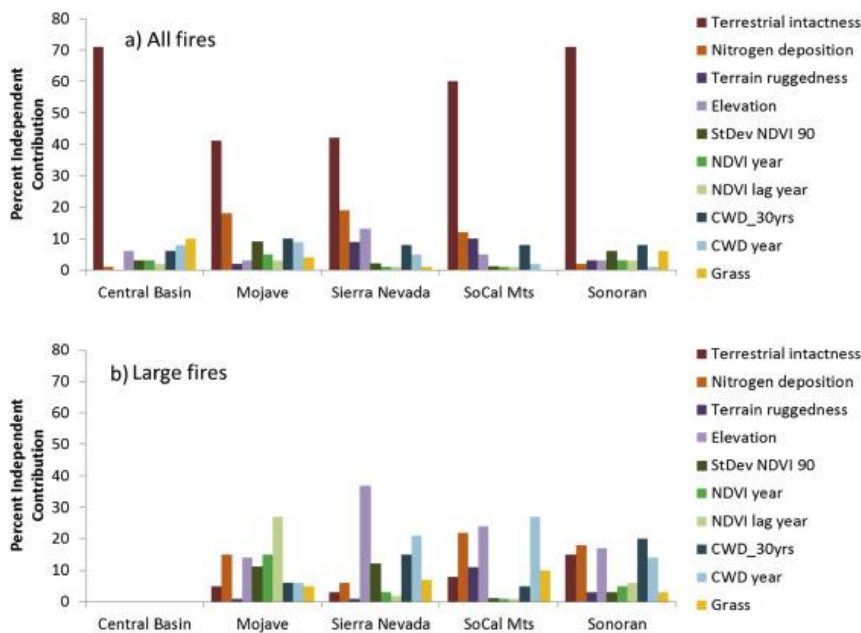


Fig. 2. Relative importance of human and biophysical variables for influencing the spatial and temporal distribution of a) all and b) large fires across the Desert Renewable Energy Conservation Plan (DRECP) study area. NDVI: Normalized Difference Vegetation Index and is used to show changes in vegetation for different measurements. CWD: Climatic Water Deficit and is a measure of drought stress on vegetation.