CALIFORNIA FIRE SCIENCE CONSORTIUM

# Research Brief for Resource Managers


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# Extreme Drought Causes Chaparral Type Conversion


*Park, I.W., J. Hooper, J.M. Flegal, and G.D. Jenerette. 2018. Impacts of climate, disturbance and topography on distribution of herbaceous cover in Southern California chaparral: insights from a remote-sensing method. Diversity and Distributions 12pp.DOI:* 10.1111/ddi.12693


## Management Implications

- A non-native, grass dominated "herbaceous groundcover [was] pervasive throughout the study footprint" (Fig.2), contrary to expectations.
- Where fire frequency was normal, site-specific moisture was "the dominant factor in determining the distribution of grasses and other herbaceous cover."
- Lowered available moisture inhibits seedling recruitment and kills vulnerable endemic seedlings, leaving gaps that are vulnerable to the non-native, understory invasion.

The rugged, chaparral dominated Angeles National Forest (ANF, California) is a beautiful and popular recreation destination. However, it is being damaged by a combination of overwhelming anthropogenic stressors, including climate change-induced mega-droughts, unnaturally shortened fire intervals, very poor air quality (e.g., high levels of nitrogen deposition), and the invasion of non-native groundcover plants (e.g., *Bromus tectorum*, *B. madritensis*, and *Spartium junceum*). To discern the relative importance of these stressors on ANF chaparral, these researchers asked two specific questions: 1) what is the extent of the non-native herbaceous groundcover in the ANF; and 2) how much do moisture, disturbance, and local topography differentially influence that groundcover over the course of a year?

After finding an average 2008 groundcover estimate of 31%, these researchers showed that **moisture** availability explained 47% of the variation for that year while the other combined factors (i.e., **topography** and **disturbance**) only explained 17% of that variability (see Fig.1). The conclusion was that wherever fire return intervals remain normal, impending climate-change induced precipitation reduction will be the most important factor in ANF chaparral type-conversion to novel, non-native plant communities.

Because the authors felt that standard monitoring techniques were inadequate for detecting landscape-scale invasive groundcover in chaparral shrub communities, they devised a remote sensing protocol.

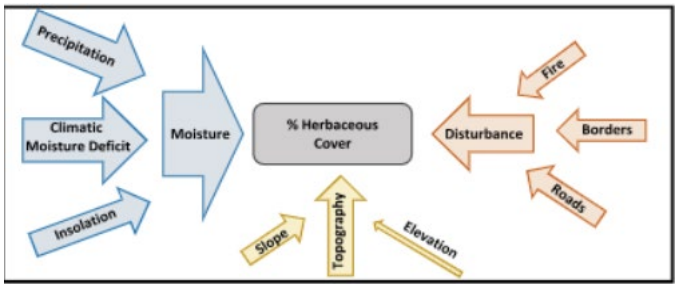


**Figure 1**. Contributions of all factors to distribution of herbaceous cover. Arrow weights correspond to relative importance of each factor in prediction the percent of herbaceous cover.

The baseline, 31% unnatural chaparral understory was assessed via 2008 NDVI (normalized differential vegetation index) estimates from Landsat TM4-5 surface reflective data and compared to slope data, precipitation data, climate moisture deficit data, fire return interval data, and forest boundary data. A manual calibration of these pixel data consisted of 275 randomly placed pilot sites, each representing a 30m pixel of either: intact chaparral, highly invaded grassland, or mixed chaparral/herbaceous cover. These manually acquired pixel data were then used to describe the remote-sensed pixels via regression models. A series of 15 useable images every three or four weeks showed the variable, min and max NDVI's for 2008.

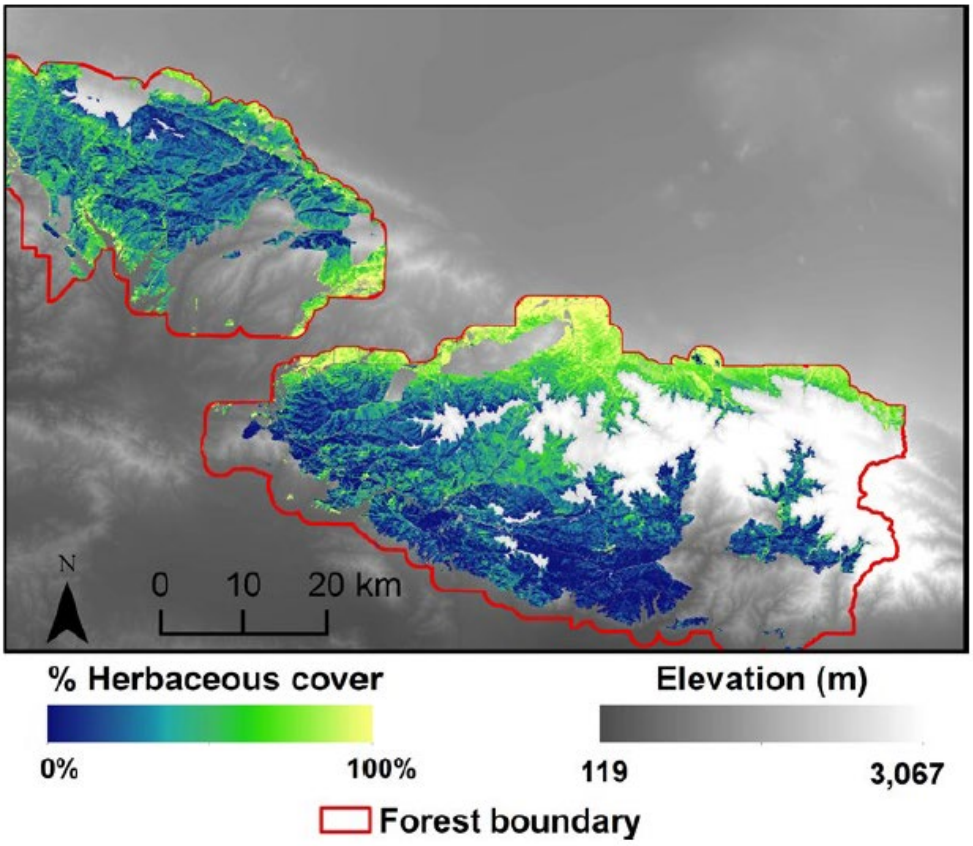


**Figure 2**. Estimated herbaceous cover across study footprint within Angeles National Forest. Blue, Green, and Yellow areas represent the area evaluated in this study. Red lines indicate forest boundary.