CALIFORNIA FIRE SCIENCE CONSORTIUM

JOINT FIRE SCIENCE PROGRAM

Research Brief for Resource Managers

What Type-converts Chaparral to Grassland in SoCA?

The type-conversion of closed-canopy chaparral into open, non-native grassland is a serious problem in southern California. Not only is there a loss of biodiversity and essential ecosystem services (e.g., erosion control, drought resistance, fire refugia, fire control, etc.), but there is also a marked lengthening of the fire season, raising the odds in favor of even more catastrophic fire in any given year.

Although a literature search suggests several plausible causes for chaparral type-conversion, these authors wanted to show a direct connection between drivers and type-converted vegetation. To find actual, type-converted chaparral, 1400 plots were randomly located across the Santa Monica Mountains National Recreation Area, SoCA USA. Of these, 788 of the plots were determined to be undisturbed, closed-canopied plots in 1943 using air photography. The authors then compared the 1943 images to 2014 images and recorded changes in cover type. By 2014, 79 of the 788 chaparral plots had completely converted to grassland, while 142 of the plots were more than 51% covered in grass. Overall, 284 (36%) of the 788 chaparral plots had achieved some stage of type-conversion, especially in arid landscapes with low heterogeneity (i.e., they were relatively flat) and close-proximity to trails and roads.

Management Implications

- Of all the measured variables in this study, short interval fire and landscape disturbance in the form of trails and roads put chaparral most at risk for vegetation type-conversion, particularly in water-limited places.
- Mapping the chaparral communities that are most vulnerable to type-conversion and decreasing ignitions are two good strategies for both fire prevention and conservation, simultaneously. This is especially true in a drought-stressed and ignition prone landscapes.

Eleven variables were measured, then ranked by importance in causing type-conversion for each of these plots (see Fig.1). Of the 11 measured variables interacting to cause type-conversion on 36% of the plots, available water was the most important one, followed by site flatness, distance to a trail, and then fire frequency. With this knowledge in hand, the authors then mapped some potentially vulnerable chaparral communities (see Fig.2).

Overall, a literature search showed several plausible causes for chaparral type-conversion, including:
- high frequency fire which incrementally kills the dominant chaparral species over time

- the establishment of invasive grasses that act as flashy fuels, essentially quickening the fire cycle
- atmospheric nitrogen deposition on normally nutrient poor soils, which favors invasive grass growth
- habitat disturbance, which acts as a conduit for invasive grasses
- the biophysical characteristics of a site, like elevation, slope, climate, and soil

However, these authors were able to show a direct connection between the type-conversion of 284 plots and certain, measurable variables, like high frequency fire, land-use disturbance, moisture availability, and site flatness.
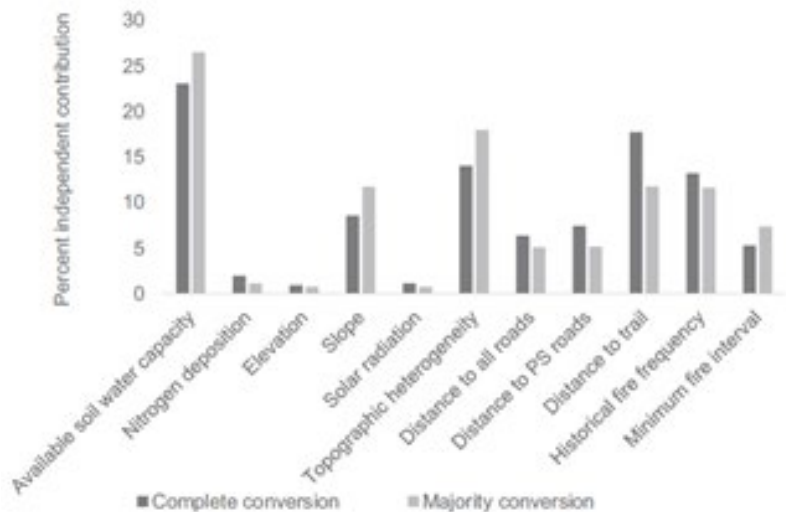
Figure 1. Percent independent contribution of variables in hierarchical portioning analysis explain complete and majority type conversion of woody shrublands to herbaceous cover
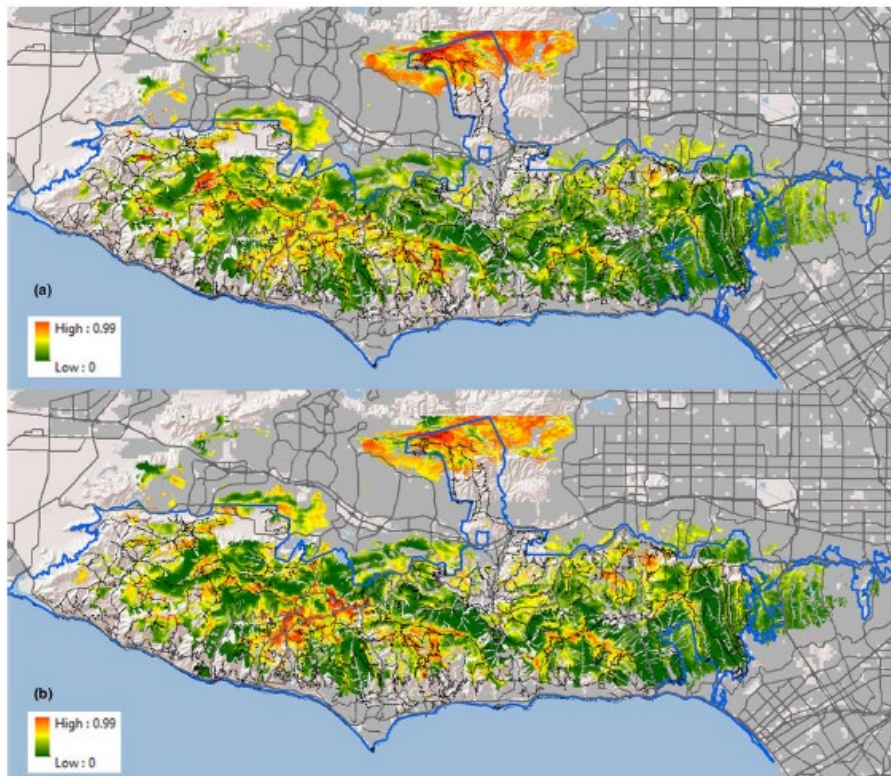
Figure 1. Probabilistic maps representing areas potentially suitable for vegetation type conversion using locations of (a) full and (b) majority conversion of chaparral herbaceous vegetation. Map extent reflect areas with full data coverage for all variables. Small black lines within the study area show locations of trails, and thick grey lines show the distribution of primary and secondary roads.