Using global satellite data to predict human influence on fire in Mediterranean ecosystems

Alexandra D. Syphard, Volker C. Radeloff, Todd J. Hawbaker [1]

Susan I. Stewart [2]

Abstract

Periodic wildfire is an important natural process in Mediterranean ecosystems, but altered fire regimes threaten the fragile ecology of these regions, which are all considered biodiversity hotspots. Humans strongly influence the frequency and spatial pattern of fire in California, and fire return intervals in some places exceed the resilience of fire-adapted vegetation types; thus, exotic grasses are now replacing native shrublands. Human development and population growth threaten similar ecosystems in the Mediterranean basin, Australia, Chile, and South Africa. Our goal was to determine whether the relationships between humans and fire that we observed in California are significant in all Mediterranean ecosystems. Global-scale remote sensing products monitoring fire activity and human population levels offer the opportunity to use consistent, unbiased data for systematic comparison at an international level. Our first objective was to determine whether we could use 1-km resolution MODIS fire detections with the LandScan Global Population Database to detect the relationship we observed with fine-scale data between population density and fire in California. Results showed a significant positive relationship between population density and fire at an ecoregional level, but not at finer scales. Therefore, we have assembled MODIS and LandScan data to continue the analysis for ecoregions in the other four Mediterranean regions. Population density differs markedly among regions, and cultural land use practices may be important predictors of fire activity. For example, MODIS detected fewer fires in the southern Mediterranean Basin, where traditional land uses are still prevalent. Although natural fire regimes vary, other Mediterranean ecosystems may be at risk of ecological and social damage similar to that occurring in California if current land use trends continue. Therefore, understanding how the relationships between humans and fire vary among Mediterranean ecosystems may provide new opportunities for different countries and cultures to learn from one another and to develop creative solutions for protection of biodiversity.

---

[1] Forest Ecology and Management, University of Wisconsin – Madison, Madison, WI, USA
[2] Northern Research Station, U.S. Forest Service, Evanston, IL, USA