A Predictive Model of Wildland Arson Ignitions

Jeffrey P. Prestemon and David T. Butry

Southern Research Station, USDA Forest Service

Abstract: Arsonists ignite 1,500 wildfires that burn 50,000 acres annually in Florida, creating risks for residents and requiring substantial wildfire suppression capabilities, even in developed regions of the state. Using panel and non-panel versions of a Poisson autoregressive model of order $p$, or PAR($p$) model, we identify the statistical influences of weather, systematic daily and monthly crime variations, wildland fuels management, recent wildfire activity, and aggregate economic factors on the count of daily wildland arson ignitions in nine high-arson counties over the period 1994-2001. We find that wildland arson demonstrates a high degree of persistence, likely accounting for either serial or copycat criminal activity or omitted factors correlated with recent ignitions. The highly autoregressive nature of arson on the daily time scale that we identified statistically is evidence that PAR($p$) models may be better able to explain low-frequency outbreak events than would traditional count models. Our model estimates also may enable more efficient mobilization of law enforcement activities in high risk months and days of the week and in periods of arson outbreaks, help to determine where to stage wildfire presuppression and suppression resources before the fire season begins, and aid in understanding long run patterns and expected trends in arson ignitions in places undergoing significant demographic changes.