**J9.6** # WILDFIRE-CLIMATE INTERACTIONS ACROSS SOUTHEAST ARIZONA

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## 1. INTRODUCTION

Weather conditions during wildfire events are known to be an important determinant of overall fire size and intensity (Schroeder 1969, Pyne 1984). Often overlooked are the longer-term patterns in climate variability prior to a wildfire event that govern the production of fine fuels and the moisture levels in heavier live fuels. Variability in precipitation and temperature over a region can influence the growth of grasses and small woody plants (Nielson 2003). The production of these fine fuels with wet conditions aids in increasing the landscape level fuel continuity that can carry wildfires to large sizes (Swetnam and Betancourt 1998).

## 2. METHODOLOGICAL APPROACH

This study examines the direct relationship between seasonal wildfire statistics and antecedent climate conditions across southeastern Arizona (Fig. 1). The total area burned (TAB) and the total number of fires (TNF) across southeast Arizona were tabulated for each fire season (April-May-June) from 1973 to 2001. Seasonal wildfire statistics were then correlated with antecedent climate conditions (temperature, precipitation, and Palmer Drought Severity Index) at 16 seasonal lags. This structure examines the influence of climate up to three years prior to an individual fire season.

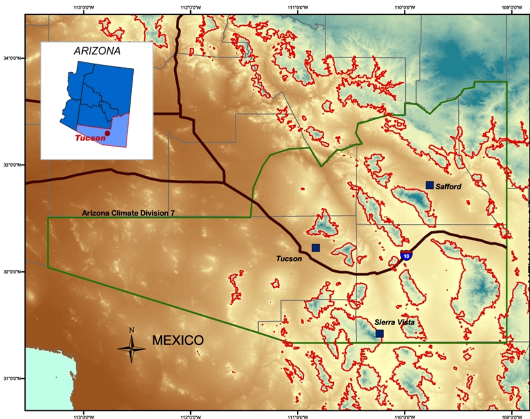


Figure 1. Study area in southeastern Arizona. Red lines are 1500-meter elevation contour.

Upper and lower elevations were analyzed separately to identify if different relationships exist depending on the dominant ecotype. The study area is characterized by basin and range topography with sharp transitions in ecological communities forced by gradients in elevation. Lower elevations are predominantly grasslands with upper elevations consisting of oak woodlands and mixed-conifer forests. These communities most likely respond to climate variability differently and will possess different fire-climate relationships.

The 1500 m contour on a digital elevation map was used to separate lower and upper elevation areas. This elevation breakpoint was guided by the Whittaker and Niering (1965) study conducted over the same area. They determined that on many of the mountain ranges in southeastern Arizona, desert grasslands transition into oak woodlands at around 1500 meters in elevation.

## 3. RESULTS AND CONCLUSION

Significant (p<0.10) positive correlations between antecedent climate conditions and TAB were found when analyzing the upper elevation (>1500m) wildfire dataset. Highly significant (p<0.01) positive correlations occur during the fall (ON[-1]) and winter

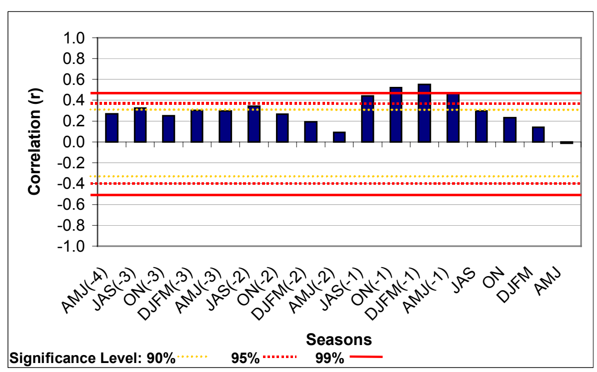


Figure 2. Pearson's r correlations between upper elevation total area burned (TAB) and seasonally lagged PDSI.

(DJFM[-1]) of the year prior to the fire season (AMJ) when using Palmer Drought Severity Index (PDSI) values as the climate variable (Fig. 2). These positive correlations suggest that larger area burned totals are associated with antecedent wet conditions. Higher amounts of precipitation, or soil moisture as measured by the PDSI, may encourage the production of fine fuels that help carry fires to larger sizes the subsequent year.

Lower elevation (<1500m) fires were also associated with antecedent wet conditions. Significantly (p<.10) positive correlations between antecedent PDSI

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and lower elevation TAB extend through all seasons back to the summer of the previous year (JAS[-1]) (Fig. 3). Wet conditions are most likely driving fine fuel productivity in the grassland dominated lower elevation areas.

No significantly negative correlations between PDSI or precipitation and TAB were found at any lags. This suggests that droughty conditions were not necessarily associated with larger seasonal totals of area burned by wildfire. This counterintuitive finding highlights the importance of fuel continuity achieved through fine fuel production in carrying wildfires to large sizes.

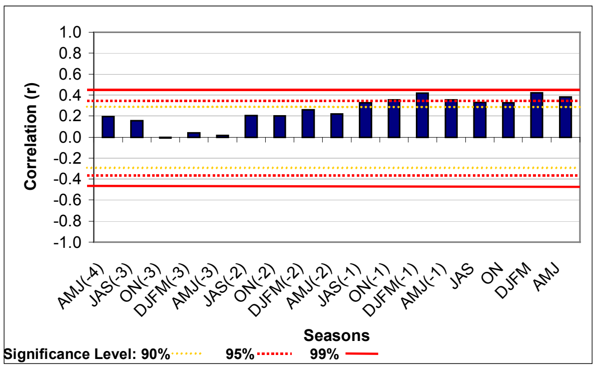


Figure 3. Pearson's r correlations between lower elevation total area burned (TAB) and seasonally lagged PDSI.

## 4. REFERENCES


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