USING GEOGRAPHIC INFORMATION SYSTEMS TO EVALUATE FIRE IGNITION PATTERNS IN THE ARID AND SEMI-ARID WESTERN UNITED STATES

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ABSTRACT

The evaluation of fire patterns is fundamental to both an understanding of fire ecology and the formulation of fire danger models. Yet, current knowledge of fire patterns and fire danger in the arid and semi-arid regions of the western United States is deficient. This study used geographic information systems (GIS) to correlate fire ignition patterns from 1980-1996 with vegetation cover-types, precipitation, and topography within portions of five arid or semi-arid ecoregions in the western U. S. Fire size, ignition frequency, and vegetation cover-type data were used to generate and apply a method for forecasting long-term fire danger over several time periods in these ecoregions. Ecoregions showed distinct fire ignition patterns based on their climate, land-use, and vegetation characteristics. The frequency of fire ignitions was generally not well correlated with yearly or seasonal precipitation. In ecoregions with a strong winter precipitation regime, fire ignition frequency was correlated with monthly precipitation. In ecoregions with a fall monsoonal influence, fire ignition frequency was not correlated with yearly or monthly precipitation. However, in the driest areas there is some correlation between fire ignition frequency and average spring precipitation. Lightning fires were more prevalent at higher elevations, on ridgetops, and upper-slopes. Human-caused fires were more abundant at lower elevations and in valley bottoms. Most fire ignitions occurred on shallow slopes but there was not an obvious correlation between the number of fire ignitions and aspect. Both lightning and human fire danger exhibited substantial temporal variation. Displaying fire danger information over short intervals during the fire season greatly improves our ability to know when and where large conflagrations are likely to occur. The methods used in this study provide fire managers with a procedure that can be applied at a variety of spatial scales and which is flexible enough to allow the incorporation of improved vegetation maps and several other variables which may be important in evaluating fire danger at more local scales.