HISTORICAL FOREST FIRE PATTERNS IN WESTERN OREGON

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ABSTRACT

Determining the original range of natural forest conditions is a key component of planning for sustainable forest management. "Ecosystem management" can be guided by information on spatial variability of forest fire patterns over time. Using historical vegetation maps from the 1930s and 1940s and a geographic information system (GIS), we quantified the spatial patterns of prelogging forest conditions in western Oregon. Our objective was to conduct a retrospective analysis of forest fire patterns at three different scales including the region, the large landscape, and small landscape scale. Our analysis at the regional scale showed that 71% of all conifer forests were in the large-forest class (51cm dbh), of which 89% was spatially connected as one patch (the matrix). Our regional and large landscape analysis showed evidence of an anthropogenic influence on the conifer size-class distribution near major rivers (more disturbance near rivers). At the large landscape scale, (329,000 ha) we determined the spatial coincidence of forest patches with slope, aspect, and elevation. Fewer fires occurred on cool, moist aspects, while more fires occurred on hot, dry aspects. We hypothesize that very large cataclysmic fires occurred irregularly, creating extensive forest patches that dominated the landscape mosaic. Between these periods of severe fire weather, smaller and less significant fires (averaging several hundred hectares) probably occurred over the landscape. For 18 randomly selected small landscapes (2,332 ha each), we calculated a fire cycle of 214 years for the central Oregon Coast Range, which is similar to the 242 year fire interval we calculated for the Coast Range at the regional scale. Both of the above estimates used an annual stand fire probability model based on the negative age distribution function. Our fire cycle determinations were similar to results from a recent study of charcoal found in lake sediments in the Coast Range of Oregon. At the small landscape scale, forest pattern variables showed greater variability in prelogging landscapes than in current landscapes. Compared to the coarse-scale patterns created by historical fire disturbances, forest cutting practices have created relatively fine-grained, highly fragmented landscape patterns. The results from our multiscale work indicate that managers should be concerned with maintaining, as much as possible, the complete natural range of variability of forest composition and pattern over space and time rather than a prescribed and static amount of forest types.