



Subalpine Forest Fire Regimes

The Question: What are the factors that determine fire regimes in RMNP?

Wildfire patterns are controlled by a range of factors including the amount and type of fuel available, topography, and regional climatic variation. This study was conducted in order to determine what factors and at what scale (regional, meso, or local) these factors determine the wildfire regimes (frequency, size, and severity of fires). Understanding the interactions of these factors and their consequences enables resource managers to better understand wildfires and help guide forest management.



Large stand replacing fires like the 1988 Ouzel Fire (shown here) are a natural part of the park's fire regime.

The Project: Use vegetative mapping and tree core samples to analyze fire history.

Jason Sibold (University of Colorado - Boulder) and colleagues studied the fire history of 74,000 acres of subalpine forest in the southern two-thirds of the park. They used vegetation maps and aerial photos to identify forest patches with potentially similar fire histories and then assessed field characteristics based on evidence of past fires (i.e., tree stands of similar ages, fire-scarred trees, charred wood). Researchers confirmed the stand-replacing and surface fire history with tree core samples and fire-scar samples, respectively. Investigators then added the fire history attributes to the park. They used Geographic Information System (GIS; a computerized map) to produce maps of the extent of past fires. In order to determine the influences of different spatial scales on the fire regimes, the researchers looked for relationships between fire history at the three spatial scales: local (via differences in fire history related to different tree species), meso (via differences in fire history in drainages east and west of the Continental Divide due to climatic differences), and regional (via synchrony of fires across the entire study area indicating regional climate effects).

The Results: Subalpine fire regime is influenced mainly by regional climatic variation and characterized by infrequent fires that are large and stand replacing.

Since 1654 there have been 22 large stand-replacing fires in the southern two-thirds of the park. The researchers found that surface fires do not play a major role in subalpine forests. At the local scale lodgepole pine stands (indicative of dry areas) are much more likely to burn than are spruce-fir stands (indicative of moderately moist areas). The east side of the park had more frequent but smaller fires in comparison to the west side. The average fire rotation period, therefore, is longer on the east side of the park (366 years) than on the west side of the park (219 years) and is likely due to differences in the meso-scale factors of climate and/or surrounding vegetation between the two sides of the park. The fire regime is influenced by both local and meso scale factors; however, the researchers found that climatic variation at the regional scale is the primary fire regime driver. Interactions with local and meso scale drivers increase landscape variation in forest patterns while regional climatic influences decrease forest heterogeneity.

In the subalpine forests of the park the historical fire regime was characterized by large and infrequent stand-replacing fire events—not by surface fires. The high stand densities of subalpine forests of the park are entirely consistent with historical fire regimes. The findings indicate that large and severe fires are a natural part of the historical fire regime and are likely to repeatedly occur in the future. If, however, fire suppression is successful, resource planners must expect an increased number of old forest stands which are more susceptible to both insect outbreaks and wind blowdowns. The researchers stress that “knowledge of the historical fire regimes in the subalpine zone of the park does not support the widespread notion that extensive forest thinning would return fuel conditions to a more natural state.” The park’s resource managers presently thin forests on a very limited basis with the sole intent to reduce hazard fuels.



Researchers used fire scars to determine the fire history of the park.