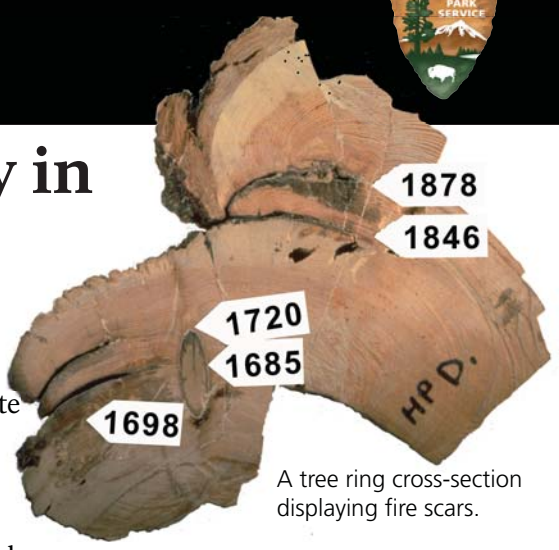
National Park Service
U.S. Department of the Interior

Rocky Mountain National Park
Continental Divide Research Learning Center

Fire Frequency and Intensity in Ponderosa Pine Forests

The Question: What is the natural fire regime of the park's ponderosa pine forests?



A tree ring cross-section displaying fire scars.

A common perception of western U.S. fire history is that prior to the late 19th century, frequent surface fires maintained open, park-like forests. This model is well-supported by data on southwestern ponderosa pine forests but had not been confirmed in other western areas. Two researchers, Rosemary Sherriff and Dr. Tom Veblen (University Colorado-Boulder), asked whether the fire history of Front Range ponderosa pine forests fit the southwestern model. Since one goal of the National Park Service is to maintain forests in their "natural" condition, understanding the historic fire regime (i.e., frequency and intensity of fire events) is important for guiding park fire and forest management decisions.

The Project: Use trees containing fire scars to determine dates and intensity of past fires.

The researchers investigated fire frequency and fire intensity (i.e., surface vs. crown fires; small fires vs. stand-replacing fires) across the elevational range of ponderosa pine in the northern Colorado Front Range. They cut non-destructive cross sections containing fire scars from live and dead trees at 17 search areas, including seven areas within the park, at elevations from 6266 feet to 9087 feet. Dominant forest cover type studied included: grassland-ponderosa, ponderosa pine, ponderosa pine-Douglas fir, and ponderosa pine-mixed conifer species. They analyzed scars using standard methods to provide dates. Various types of analysis were used to compare intensity and aerial extent of fire events.


In the park ponderosa pine typically occurs in multi-species forests that burn infrequently.

The Results: Higher elevation Front Range ponderosa forests have longer fire intervals and higher intensity fires than ponderosa forests in the Southwest. Park ponderosa forests may not have been significantly affected by fire suppression.

Based on this study the southwestern model of frequent (less than 30 years mean fire interval), low-intensity surface fires fit only a small portion (about 20 percent) of the Front Range ponderosa pine zone. Only at the very lowest elevation (below 6890 feet) did these forests historically exist in the savannah-like condition seen in ponderosa forest in the Southwest. As elevation increases ponderosa stands become increasingly dense and mixed with Douglas fir, aspen, and lodgepole. The mean fire interval at intermediate elevations (between 6890 and 7218 feet) is variable ranging from less than 30 years to more than 40 years. In addition to elevation, other factors influencing fire interval include aspect, distance to grasslands, and distance to a ravine.

Above 7218 feet Front Range ponderosa forests were historically typified by a long fire return interval (more than 40 years) and high intensity, that is stand-replacing, fires. All park ponderosa forests fall into this elevation category. (The lowest elevation in the park is 7640 feet.) This study suggests that these higher elevation stands have not been significantly affected by fire suppression efforts and may be within normal variation for fire return interval.

Based on this study park ponderosa forests are unlikely to have accumulated an "unnatural" amount of fuel due to fire suppression. The results also suggest that in periods of drought large, stand-replacing fires were historically "normal" in the park's ponderosa forests.

This summary is based on published, peer-reviewed and/or unpublished reports available at the time of writing. It is not intended as a statement of park policy or as a definitive account of research results.
For more information on the park's research program, see www.nps.gov/romo
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