

Fire Effects Monitoring for Adaptive Management

Prescribed fire is one of the most important resource and fuels management tools used in national parks today. This tool has great potential to maintain as well as change park landscapes to meet wide ranging resource goals, including creation of diverse mosaics of habitats for plants and animals, aiding in recovery of endangered species, and reducing fuels to prevent unwanted wildland fire.

The National Park Service mandates in RM-18 that parks using prescribed fire monitor the effects on vegetation and fuels to facilitate adaptive management. Permanent plots, read before and after prescribed fire, are used to record changes within vegetation types. These data are analyzed and then provided to fire and resource managers to determine if prescribed fire program objectives are being met or if adjustments are needed. Adaptive management also allows park staff to articulate concerns, develop hypotheses, and initiate specific research projects to explore issues that may arise.



Fire behavior monitoring at Bandelier National Monument

Bandelier National Monument – A Management Example

Fire has been widely acknowledged as a keystone natural process in maintaining the structural and functional integrity of southwestern ponderosa pine landscapes. Numerous data sources, such as historic records and journals, aerial and ground-based photos, charcoal deposits from bogs, dendrochronological reconstructions of fire occurrence patterns and precipitation, and field sampling of soils and vegetation support this concept. These extensive historic fire regime studies have produced detailed descriptions of the spatial and temporal variability in past fire frequency, intensity, and extent in southwestern forests. For example, fire history studies conducted at Bandelier NM in the Jemez Mountains of northern New Mexico conclude that before the 1880's frequent low intensity surface fires in ponderosa pine played a major role in maintaining species compositions and forest and woodland structures.

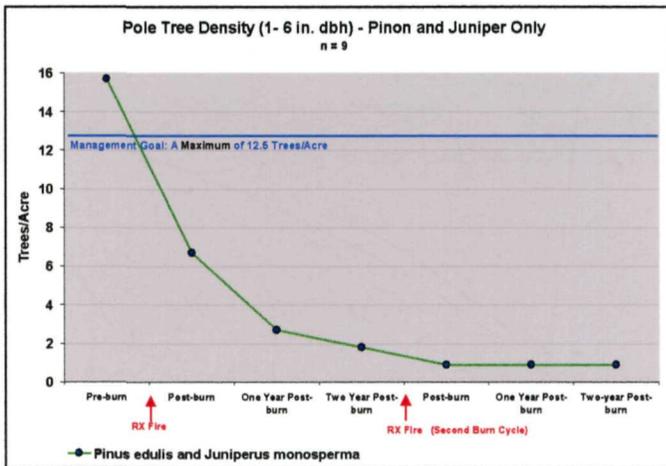
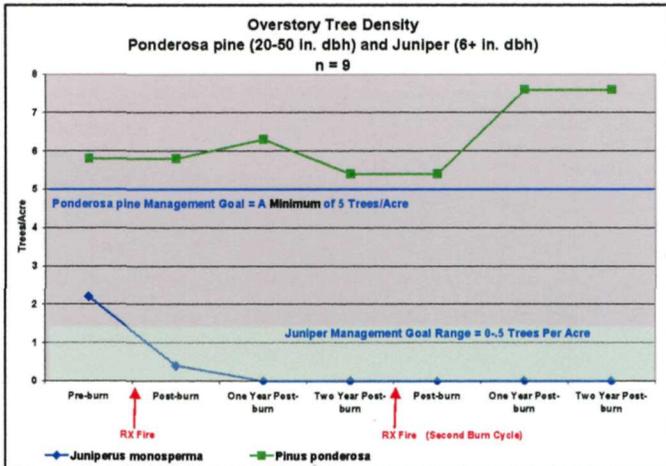
Today, the ponderosa pine ecosystem at Bandelier is unsustainable due to a land use history that included over 100 years of fire suppression and 50 years of overgrazing. Current ponderosa pine forest structure exhibits unstable increases in woody debris and tree densities, as well as upslope recruitment of piñon and juniper trees. Based upon local fire histories, resource and fire managers chose prescribed fire as a tool to help restore forest health.

Bandelier NM fire and resource managers established sustainable management objectives based upon the Resource Management Plan and current ponderosa pine research. Primary objectives to be achieved 5 years post-burn included:

- Reduce overstory juniper tree densities by at least 20%,
- Reduce pole-sized piñon and juniper tree densities by at least 20%,
- Maintain overstory (20-50 inch dbh) ponderosa pine tree densities within 10% of current levels.

Monitoring Results

Park managers burned the area in 1992 and again in 1997. Analysis of data after two prescribed fire cycles show a reduction of overstory juniper density, elimination of pole-sized piñon, decrease of pole-sized juniper and a slight increase in overstory ponderosa pine density.



Adaptive Management

Resource and fire managers use this information to evaluate prescribed fire treatment frequency and prescription in ponderosa pine. At this time, no alterations need to be made to the burn prescription or treatment frequency because managers are reasonably certain that overstory juniper tree and pole-sized piñon and juniper tree densities have decreased, and ponderosa pine densities have, at minimum, been maintained.

Fire effects monitoring in ponderosa pine will continue to track trends into the future. Although prescribed burning appears to be shifting the ponderosa pine to a more sustainable condition, managers need to study long-term changes in tree densities and track collateral effects, such as increases in exotic species, which may negatively impact ecosystem function. The adaptive management process will guide program changes to ensure that the ponderosa pine is managed in a sustainable manner and that prescribed fire is properly applied.



Frijoles Canyon, Bandelier National Monument

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