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MAPPING PAST AND POTENTIAL FIRE REGIMES

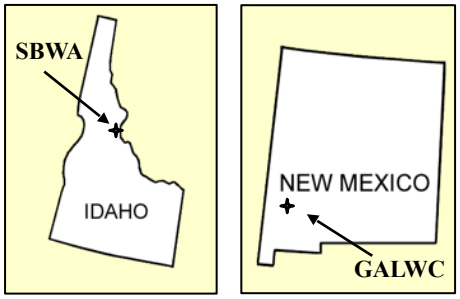
Keywords: fire suppression, fire history, fire rotation, fire perimeter data

Background & Management Issues:
Large wilderness areas, relatively uninfluenced by human activity, provide a valuable laboratory to study historical fire patterns. Understanding the historical extent and rate of burning within an ecosystem is necessary if managers wish to emulate natural fire regimes. In addition, comparing two climatically distinct areas may help understand the influence of individual variables on fire patterns.

Project Objectives:

- ❖ Characterize the relationships among fire, topography, and vegetation in the Gila/Aldo Leopold Wilderness Complex (GALWC) in New Mexico and in Selway-Bitterroot Wilderness Area (SBWA) in Idaho and Montana.
- ❖ Evaluate changes in fire size and frequency under different fire-management strategies in these two areas.

Project Description: Fire data for the GALWC and the SBWA was compiled from old fire reports and operational fire perimeter maps, then digitized and "layered" to create models of fire frequency for each area. Fire regimes in both wildernesses were divided into three distinct periods according to the level of fire suppression activity: Pre-Modern Suppression, before the advent of aerial operations; Modern Suppression, when aerial technologies greatly increased the ability to suppress fires; and Wildfire Use, when manager-ignited fire and natural fire were included with fire suppression in U.S. Forest Service fire management.



Results: Pre-Modern Suppression (1909-1946 in the GALWC, 1880-1934 in the SBWA)

- ✓ The area burned in the GALWC was relatively low compared with estimates of pre-Euro-American fire regimes, and fire rotations were long. This was probably due to the high level of livestock grazing in the wilderness from the late 19th to mid-20th century, which caused a sharp reduction in fine fuels.
- ✓ In contrast, the SBWA experienced far more fire in the late 19th and early 20th centuries than would be expected based on our understanding of this area's natural fire regimes. This abundance of fire was likely caused by increased rates of anthropogenic ignition, seasonal droughts, and the lack of modern suppression technology.

Modern Suppression (1947-1974 in the GALWC, 1936-1974 in the SBWA)

- ✓ The area burned annually in the GALWC was highly variable. In 1951 and 1953, during severe droughts, 89% of the total area burned was from large fires despite modern suppression techniques.
- ✓ Less than 1% of the total area of the SBWC burned during this period.
- ✓ Wildfire Use (1975-1993 in the GALWC, 1975-1996 in the SBWA)
- ✓ Relative to the Modern Suppression Period, each area showed moderately increased rates of burning, and shorter fire rotations.
- ✓ Despite being the wettest period in the century, fire incidence and area burned in the GALWC

increased in Douglas-fir and ponderosa pine Potential Vegetation Types (PVTs). Fewer, smaller fires occurred in higher-elevation spruce-fir PVT than at any time on record, perhaps due to continued effective fire suppression.

- ✓ Less area burned in the SBWA than would be expected under pre-Euro-American fire regimes despite increased burn rates.
- ✓ The greatest fire frequency occurred in the Douglas-fir and ponderosa pine PVTs although at different elevations, slopes, and aspects in the different areas.

Management Implications:

- ❖ Fire has been more common in the GALWC and SBWA during the Wildfire Use period than the Modern Suppression Period. However, in many forest types there is still much less fire than would be expected under pre-Euro-American fire regimes, and consequently, greater fuel buildup. For example, at this reduced fire rate, ponderosa pine forests are likely be replaced by more shade-tolerant species, leading to fuel build-up and greater stand homogeneity across the area.
- ❖ Most fire in the GALWC in the 20th century was due to a few large fires in the 1950s and large prescribed fires in 1992 and 1993. Without these isolated events, the area burned would be extremely small relative to the expected area burned under pre-Euro-American fire regimes.
- ❖ Fuel accumulation is greatest in spruce-fir PVTs in the GALWC, and these high-elevation forests are at risk of large, high severity fire. Large, stand-replacement fires at long intervals are within the natural range of variability for these forests, however.
- ❖ Even though the area burned increased dramatically during the Wildfire Use Period in the SBWA, the largest fire burned only one-fifth the area of the largest fire in the Pre-Modern Suppression Period.

Publications / Products:

- ❖ Rollins, Matthew; Swetnam, Tom; Morgan, Penelope. 2000. Twentieth-century fire patterns in the Selway-Bitterroot Wilderness Area, Idaho/ Montana, and the Gila/Aldo Leopold Wilderness Complex, New Mexico. In: Cole, David N.; McCool, Stephen F.; Borrie, William T.; O'Loughlin, Jennifer, comps. Wilderness Science in a Time of Change Conference–Volume 5: Wilderness Ecosystems, Threats, and Management; 2000 May 23-27; Missoula, MT. Proc. RMRS-P-15-VOL-5. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 283-287. **Leopold Publication Number 403.**
- ❖ Rollins, Matthew; Swetnam, Tom; Morgan, Penelope. 2001. Evaluating a century of fire patterns in two Rocky Mountain wilderness areas using digital fire atlases. Canadian Journal of Forest Research. 31: 2107-2123. **Leopold Publication Number 444. See the** NRC Research Press Website**.**
- ❖ Rollins, M. G.; Morgan, P.; Swetnam, T. W. 2002. Landscape-scale controls over 20th century fire occurrence in two large Rocky Mountain wilderness areas. Landscape Ecology. 17(6): 539-557.

- ❖ Also see the Fire Sciences Lab's Fire Effects Program**.**

For additional information…

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