

Restoration of Fire in National Parks

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Over the past century, policies related to the management of fire in U.S. National Parks have evolved from efforts to eliminate all fire to recognition of the importance of restoring and maintaining fire as a natural ecological process. Prior to their formal designation by Congress, most National Parks had experienced thousands of years of periodic fire. Long-term interactions of climate, vegetation, and fire are largely responsible for shaping the ecosystems that most parks were established to protect.

Early European explorers frequently commented on their observations of fire (both lightning and Indian ignited) burning in western forests. John Muir's (1901) detailed observations of a 1875 fire in the sequoia forests of the southern Sierra Nevada provide a particularly vivid account of the patchiness of presettlement fire behavior. Yet, when the first National Parks were established, Yellowstone in 1872, and Sequoia, General Grant, and Yosemite in 1890, the dynamic nature of the park ecosystems was given little attention. The emphasis was on scenery and the protection of objects, for example, geysers, waterfalls, deep canyons, big trees, and charismatic fauna (Graber 1985). Early park management was functionally equivalent to museum curation (Christensen 1995) with emphasis on the protection and enjoyment of the scenery. Realistically, this meant control or elimination of everything considered to detract from the scenery, for example, predators, insects, disease, and of course, fire. The importance of ecosystem processes such as fire were poorly, if at all, understood.

Despite a policy of fire suppression, there was little effective control of fire in the early years of the National Parks (van Wagtenonk 1991). It took creation of the Civilian Conservation Corps in the 1930's and the post World War II surge in availability of aircraft and other technological advances for fire suppression efforts to become fully effective. The increasing effectiveness of these efforts led to the buildup of a complex suppression infrastructure that included virtually unlimited funding for firefighting. Fire suppression became firmly ingrained as a dominant agency philosophy that was enthusiastically enacted with a confidence that belied understanding of its long-term consequences. Yet the stage was being set for later concern over hazardous fuel accumulations, a lack of reproduction of key species, and forest health problems caused by the interaction of overstocked stands, drought, and insects.

A report by Starker Leopold and others (1963) to the Secretary of Interior provided the first widespread recognition of the effects of fire suppression in altering park

ecosystems. In recommending active restoration of presettlement conditions, articulated as a largely static view of "vignettes" of primitive America, the report recognized how the exclusion of fire had changed park ecosystems and the importance of using fire as a tool to restore the "primitive open forest." In 1968 this thinking was incorporated into National Park Service policy by formally recognizing the importance of the presence or absence of fire in determining the characteristics of an area. The new policy permitted the use of prescribed burning and allowed lightning fires to burn to help accomplish approved management objectives (van Wagtenonk 1991).

These policy changes were slowly incorporated into management programs. The first prescribed natural fire program (allowing lightning fires to burn under prescribed conditions) was approved in Sequoia and Kings Canyon National Parks in 1968 (Parsons and van Wagtenonk in press). Experimental prescribed burning programs, with associated research and monitoring, were begun in several parks at about the same time. Despite continued opposition within the agency (Bonnicksen 1989), there was a gradual increase in recognition of the effects of fire exclusion and the importance of restoring fire as a process (Parsons and others 1986). It was recognized that suppression had not eliminated fire; rather it had most often simply changed local fire regimes to include less frequent but more intense fire with results potentially detrimental to management goals.

By 1988, 26 parks had operational prescribed natural fire programs, and many others had active management ignited prescribed fire programs. Although the goals of specific programs may have differed somewhat, National Park Service fire policy emphasized the importance of fire in influencing park ecosystems and the legitimacy of using fire as a tool to achieve resource management objectives (van Wagtenonk 1991). The 1988 fires in the Greater Yellowstone Area (Christensen and others 1989) brought National Park Service fire policies under close scrutiny. The most immediate effect was on the prescribed natural fire program. A moratorium on all prescribed natural fires in 1989 was followed by onerous new implementation guidelines that must be followed before these programs could be reactivated or new programs approved (Botti and Nichols 1995). By 1990 only three parks (Yosemite, Sequoia-Kings Canyon, and Voyageurs) had active prescribed natural fire programs. This number had increased to 20 by the middle of the 1995 fire season. The actual acreage burned in prescribed natural fires since 1990 has yet to approach the average acreage burned prior to the moratorium (an average of 3,708 acres per year has been burned from 1990 to 1994 as opposed to 32,135 acres per year for the 5 years prior to 1988).

Additional concerns regarding the success of the National Park Service's efforts to restore fire to park ecosystems have been raised in relation to the prescribed burning program in

In: Hardy, Colin C.; Arno, Stephen F., eds. 1996. The use of fire in forest restoration. Gen. Tech. Rep. INT-GTR-341. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.

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the sequoia-mixed conifer forests of the Sierra Nevada parks (Parsons 1995). With the goal of restoring fire as a process, burning at similar frequencies and intensities and with similar effects as would have occurred if fire suppression had never been employed, the giant sequoia prescribed fire program at Sequoia and Kings Canyon National Parks has been widely recognized as one of the most progressive fire programs in existence. However, in the 26 years since prescribed burning was initiated in 1968, only 4,515 of the 10,810 acres of giant sequoia forest in the two parks have been burned (by prescribed natural fires, management-ignited fires, prescribed fires, and wildfires). Although the fire history record shows considerable variation, extrapolation from data for the Giant Forest grove indicates an average of 2,600 acres (24 percent of the total acreage) would need to be burned per year to achieve the 4.1 year mean fire interval that occurred between A.D. 500 and 1900 (Swetnam 1993). This compares to a mean of 173 acres per year (1.5 percent) that has actually been burned between 1968 and 1994. Even in the very best of years—743 acres in 1991—the acreage burned under current fire management programs is not sufficient to simulate presettlement fire regimes.

Given the concerns presented over the relative lack of progress being made in restoring fire to anything close to presettlement frequencies, it is only natural to ask what can we expect in the future. Although it is impossible to read the crystal ball, it is apparent that there are a number of obstacles and challenges that must be confronted if the National Park Service is to meet its goal of restoring fire to something approaching its natural role in park ecosystems. Following are some of the most significant challenges that must be addressed:

- Clearly articulate goals and objectives, and define what the role of fire is in achieving them. Managers must articulate what they are managing for. How important are visual, scenery goals as opposed to ecological process goals? What does it mean to manage for “natural” ecosystems? How can our ever improving understanding of the importance of the temporal and spatial variability in ecosystem processes be incorporated into management programs? How do fire-based objectives relate to other ecological and human derived objectives?
- Address the practicality of ever restoring natural fire regimes. Although restoration of natural fire regimes (however natural is defined) remains a valid goal, it is becoming increasingly apparent that will not be possible in many places. Constraints on accomplishing this goal include limited funding, requirements for trained personnel, increasing air quality regulations (and their effects on smoke emissions), and the difficulty in burning large enough areas to replicate presettlement patterns (especially in western forest parks). The Park Service is attempting to address the latter problem by initiating a 6 year experimental program to assess the operational requirements and cost effectiveness of watershed-scale prescribed burning in Sequoia National Park. If it proves impossible to burn the acreage required to approach natural fire regimes it may be

necessary to consider putting available resources into doing a complete job in selected areas, even if it means compromising objectives in other areas. This “zoning” concept has yet to be fully discussed within the agency.

- Recognize the need for continued management intervention. Management boundaries were not selected with natural processes such as fire in mind. Today's boundaries dictate that many fires that in the past would have burned into a park or preserve will be suppressed. Similarly, under current policies suppression actions are often mandated by regional fire conditions. These suppressed fires will need to be replaced with future management ignitions if their effects are not to be lost.
- Availability of qualified personnel during active wildfire seasons. When competition for resources becomes intense, wildfire suppression actions generally take priority over prescribed fire. The lack of resources during the fire season severely restricts the number, size, and intensity of prescribed fires, which, in turn, reduces the ecological significance of the program. To restore natural fire regimes, prescribed fires must burn under natural conditions and with minimum constraints. Partially as a result of this constraint, parks currently fail to carry out about half of all prescribed fire projects funded each year. In an attempt to address this problem, the National Park Service has established four prescribed fire teams that are unavailable for wildfire suppression work, except during extreme emergencies. These are mobile resources that can be dispatched to any park needing additional trained personnel.
- Need for an improved information base upon which to make decisions. As management decisions become increasingly difficult, it is critical that solid information be available on which to make decisions. A strong, credible research program, together with monitoring that provides feedback to managers, is essential to a successful fire restoration program. Understanding of historic and prehistoric fire regimes, interactions between fire, vegetation, and climate, and the ability to assess the consequences of alternative policy or management actions through predictive modelling are especially critical.
- Need for interagency and cross-boundary cooperation. Since political boundaries seldom reflect ecosystem boundaries, the condition or sustainability of a given area is likely to be significantly influenced by what occurs on surrounding lands. Effective coordination, communication, and partnerships between Federal, state, and local agencies and private interests are essential for planning, management, and research.
- Humility and willingness to take risks. It is important that we recognize how much we don't know. Decisions will have to be made on less than perfect knowledge. But they must be made. In many ways our use of prescribed fire is still a long-term experiment, the results of which will take decades to fully assess. Nevertheless, we must be willing to take risks—risks that are based on the best available knowledge.

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