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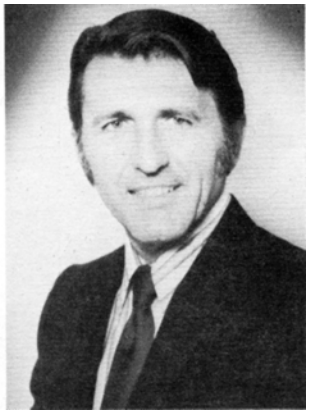
Restoring Fire to High Elevation Forests in California

Since 1968, the National Park Service has allowed lightning fires to burn in certain sections of Sequoia and Kings Canyon National Parks in the southern Sierra Nevada of California. Elevations in these Parks range from 1,600 feet to nearly 14,500 feet. About half of the Parks' 847,000 acres lie above 9,000 feet; lightning fires which occur above this elevation, and in other selected locations, are generally allowed to burn, except where fuels are continuous across Park boundaries into lands owned or managed by other agencies.

Of 53 fires started in four years in this zone, all but four burned less than 10 acres. The four larger ones did not burn beyond expected boundaries and created no unacceptable damage.

This "let-burn" program conforms to the present Park Service policy of restoring and maintaining natural environmental conditions in the Parks. From the 1920's until 1968, the Park staff attacked all fires as soon as possible and held burned area to the least possible acreage. This policy tended to favor the development of a vegetative mosaic quite different from that produced by naturally occurring fires. Stimulated by several studies, the Park Service has adopted a new policy, permitting prescribed fire in lower elevations of these Parks and restoring lightning fire to higher elevations where possible.

Bruce M. Kilgore **George S. Briggs**



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Natural Role of Fire

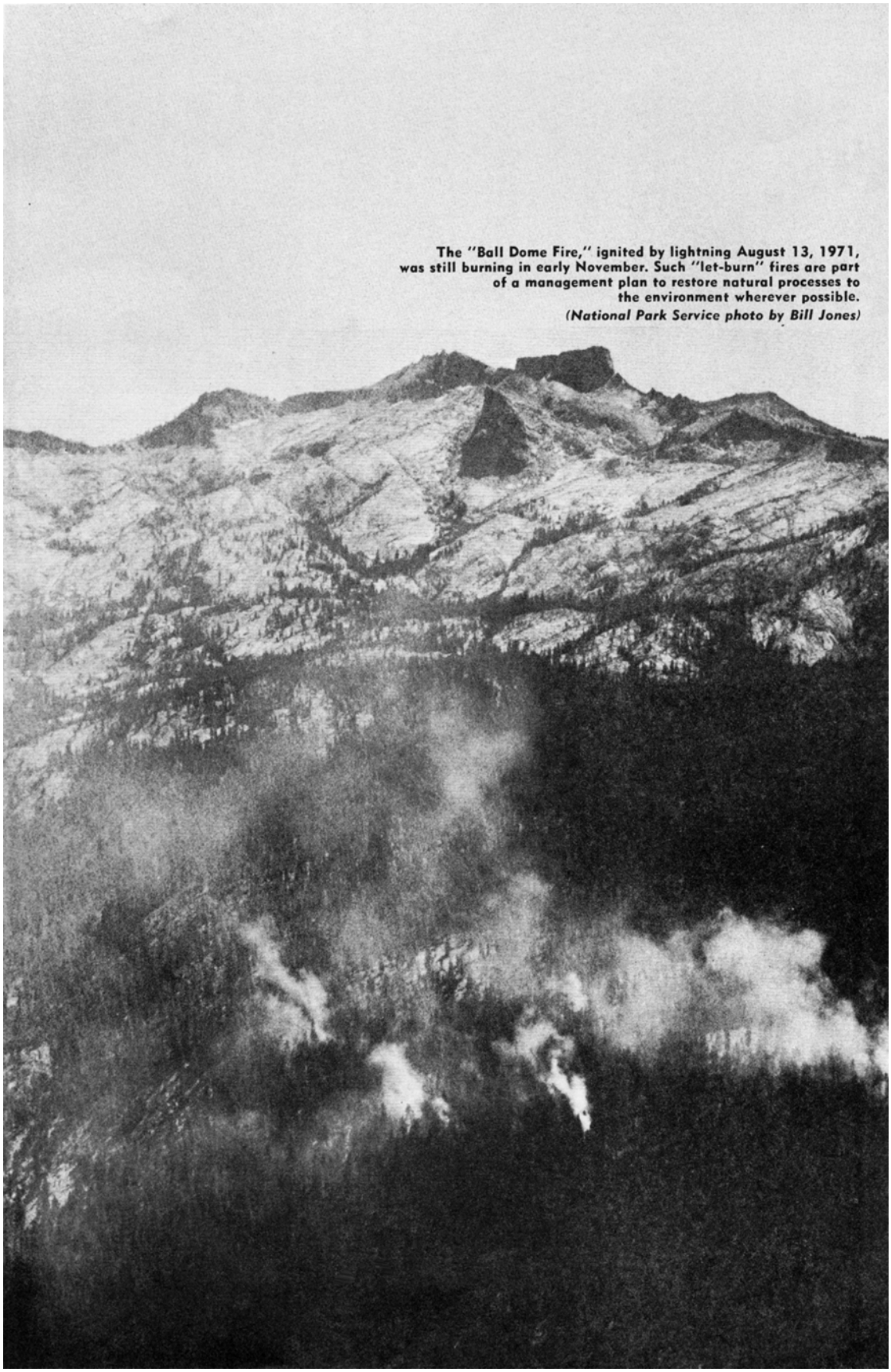
Lightning fires were common in the past wherever vegetation would support them (7, 8). In Sequoia and Kings Canyon National Parks, about 40 fires have been started annually by lightning. The frequency of such fires varies considerably in different forest types (3), and we are seeking data to pin down this variability locally (4).

Lightning fires played an important role in the natural history of Sierra Nevada forests for centuries. In stands of old living trees, fire scars and black scorched bark are common.Small pieces of charcoal are usually found on the ground surface and within the soil.

These periodic fires removed some undergrowth, killed young trees and converted dead organic materia1 into ash, aiding the release of nutrients back into the ecosystem. This process lessened plant competition, resulted in more growth for remaining trees and produced a more open forest.

Changes with Fire Suppression

The National Park Service's policy of holding burned area to the least possible acreage has

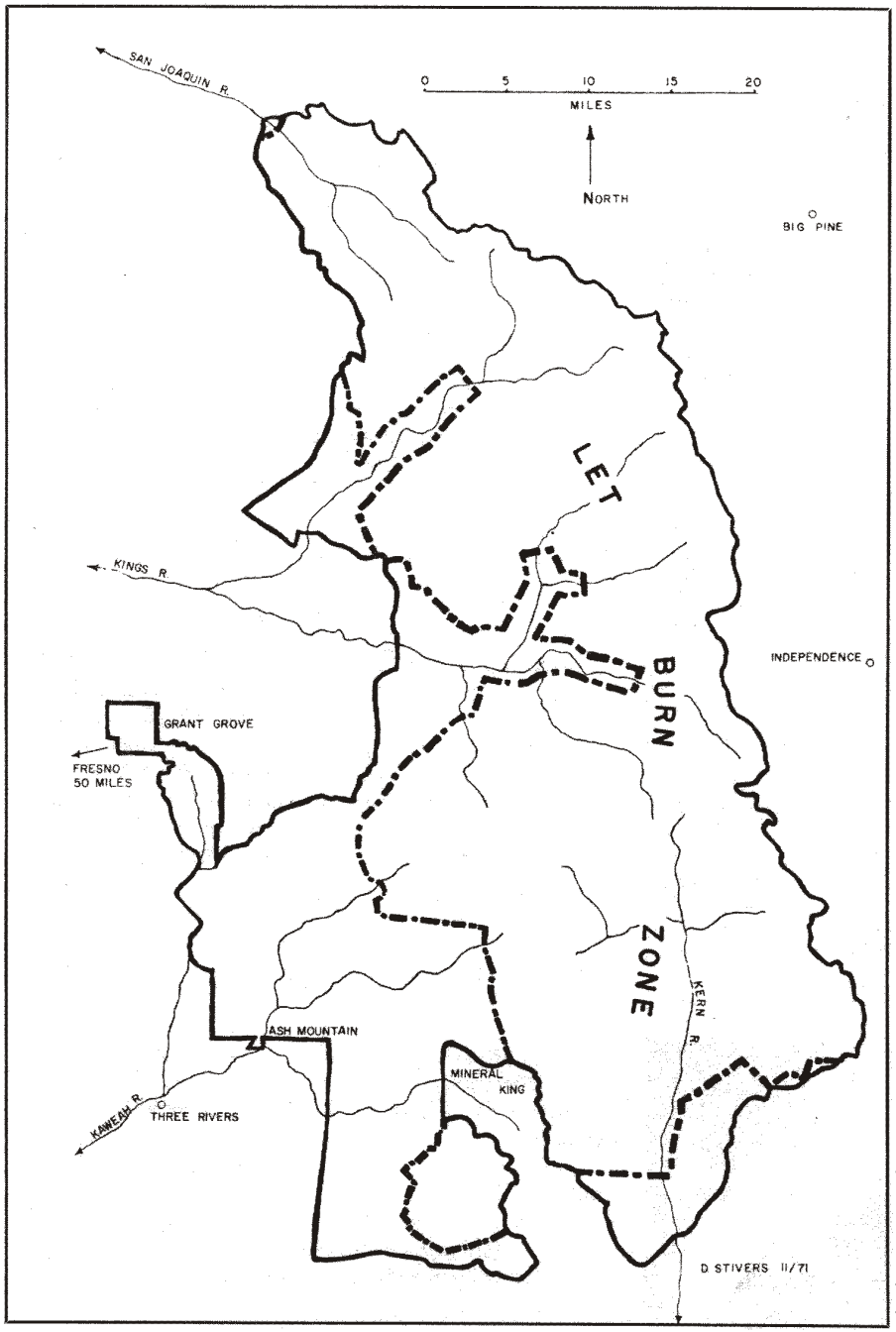


The "Ball Dome Fire," ignited by lightning August 13, 1971, was still burning in early November. Such "let-burn" fires are part of a management plan to restore natural processes to the environment wherever possible.
(National Park Service photo by Bill Jones)

caused ecosystem changes contrary to the natural process, particularly in middle elevation mixed-conifer forests. Nutrients have become tied up in boles of down trees, branches and litter; browse species favored by fire have become less frequent and less vigorous; and the forest has generally become more dense as numerous young saplings, mostly of shade-tolerant species like white fir, have survived where more frequent fires would have killed them. In the mixed conifer forests between 5,500 and 8,500 feet elevation, a considerable fire hazard has built up be- cause of the exclusion of wildfire (9). In the higher- elevation red fir and lodgepole pine forest, however, the fuel accumulation appears to have been less because of a shorter growing season and, consequently, a smaller annual increment of organic material (5).

A New Policy

The concept that wildfire was not necessarily harmful – and, in fact, was important in the creation and maintenance of naturally operating ecosystems – has slowly gained acceptance over



The “let-burn zone,” Sequoia and Kings Canyon National Parks, California amounts to nearly 70 percent of the 847,- 000 acres in the Parks, most of it above 9,000 feet elevation.

Lightning fires, like this Ball Dome Fire, have played a role in the natural history of Sierra Nevada forests for centuries. (National Park Service photo by Bruce M. Kilgore.)

the years. And land managers have come to recognize that eliminating fire had other effects, such as contributing to the build-up of wildland fuels.

This effect was dramatized locally in 1955 when a disastrous wildfire swept upslope from the McGee Ranch into Kings Canyon National Park. Within a few hours this fire devastated more than 13,000 acres of brush and forest and had threatened the Park's Grant Grove of giant sequoias. Subsequent research helped document the threat to mature sequoias posed by continued fire suppression without a substitute for the natural role of fire in the forest (1, 2).

A document of great significance to National Park managers was the Leopold report of 1963 (6) which recommended restoring Park forests to pre-European man conditions with and emphasis on more openness: "Much of the west slope [of the Sierra] is a dog-hair thicket of young pines, white fir, incense-cedar, and mature brush–a direct function of overprotection from natural ground fires.... A reasonable illusion of primitive America could be recreated, using the utmost in skill, judgment, and ecological sensitivity." The Leopold report served as a catalyst which brought together previous field observations, research and experience with fire. and led to the formulation of a new fire policy for National Parks. This policy now states:

"The presence or absence of natural fire within a given habitat is recognized as one of the ecological factors contributing to the perpetuation of plants and animals native to that habitat." Natural fires "... are recognized as natural phenomena and may be allowed to run their course when such burning can be contained within predetermined fire management units and when such burning will contribute to the accomplishment of approved vegetation and/or wildlife management objectives. "Prescribed burning to achieve approved vegetation and/or wildlife management objectives may be employed as a substitute for natural fire."

This modified fire suppression policy is in line with the original statement of purpose for the National Park Service – to conserve the scenery, the natural objects and the wildlife by such means as will leave them unimpaired for the

enjoyment of future generations. Ideally for this purpose, all naturally occurring fires should be allowed to run their course. Practically, this cannot be considered in many lower and middle elevation segments of the Parks because of the threat to life, property and natural resources. Hence, prescribed burning has been adopted as the technique for restoring fire to the giant sequoia-mixed conifer forests in the Parks' middle elevations (4).

Fire control experts in the Park Service, however, recognize that naturally occurring fires at high elevations usually behave differently from those burning at lower elevations. High elevation fires commonly spread slowly or not at all, rarely crown into or kill overstory trees, and are usually far less intense than fires in lower elevations. Also, high elevations areas of Sequoia and Kings Canyon National Parks contain many natural fire breaks. These breaks include sharp or sparsely vegetated ridges, barren rocky areas, streams and draws with relatively fire-resistant riparian vegetation, and large areas supporting vegetation of such sparse density that fire cannot spread or its movement is appreciably slowed. With these factors in mind, Park Superintendent John McLaughlin approved in 1968 the first experimental let-burn program.

The Program in Action

The area chosen for the first trial was the drainage of the Middle Fork of the Kings River. All lightning fires above 8,000 feet elevation were allowed to burn. The program has been expanded several times since 1968, and now nearly 70 percent of the area of the two Parks is included within the management unit for naturally occurring high elevation fires – the "let-burn zone." In delineating the let-burn zone, elevation is considered first, but other factors are also important. Nearly all of the Parks' area above 9,000 feet elevation is included, except where fuels are continuous across Park boundaries into areas owned or managed by other agencies. In such places a buffer zone is established, and fires are suppressed in this zone, even though they occur above 9,000 feet. Areas below 9,000 feet elevation are included if they contribute to a logical unit boundary or if the benefits of naturally spreading fire outweigh other considerations. Some areas in the let-burn zone are between 6,000 and 9,000 feet elevation. They include the Middle Fork of the Kings River above 8,000 feet, the Kern Canyon north of Lower Funston Meadows, the Roaring River drainage south and west of Sugarloaf Creek, and the Hockett Plateau. Within the let-burn zone, lightning fires are not ignored. Wildfires are discovered by aerial reconnaissance, with two daily flights during the summer months watching for smokes and reporting to the dispatcher. No suppression action is taken if the fire is within the let-burn zone and believed to be lightning-caused. A report of the fire is immediately completed, including such information as size at discovery, location, terrain, position on slope, aspect, elevation, vegetation type, fire behavior, weather factors and an estimate of potential size, intensity, and perimeter location. Up- dated daily, these incident reports are given to the Park Wildfire Committee, composed of wildfire experts, for evaluation. The Committee, or a quorum thereof, can order a fire suppressed or can order and direct appropriate activity to keep the fire within the let-burn zone or to limit the fire's size by directing it against natura1 fire breaks or barriers.

Results to Date

In the past four years only one of the 53 fires in the let-bun zone received direct suppression action to limit its size:

Year	Allowed to Burn	Suppressed
1968	2	0
1969	2	0
1970	23	1
1971	25	0

All but that one were allowed to burn naturally. Four fires in 1970 and six in 1971 were outside the let-burn zone but were allowed to burn anyway – either because they posed no threat to life, property or natural resource values or because the terrain was too rugged for feasible suppression;

Table 1. Number of Lightning Fires in Let-Burn Zones, Sequoia and Kings Canyon National Parks, 1968-1971.

Size class (acres)	1968	1969	1970	1971
0–0.25	1	2	20	23
0.26–9	1	0	1	1
10–99	0	0	2	0
100–299	0	0	0	1
300+	0	0	1	0
Total acres	8.01	0.30	494.5	115

If it appeared that a fire could become a problem, however, a suppression plan would be formulated. Then, if conditions were to change in a way that might cause the fire to spread out of the let-burn zone or endanger life and property, suppression forces would be ready for immediate action on the fire.

Most of the fires were small, less than an acre in size, and went out in a few days (Table 1). In 1970 the three largest fires were 18, 21 and 452 acres. The 452-acre “Bubbs Creek Fire” burned scattered Jeffrey pine with a fairly continuous shrub layer of manzanita. About 80 percent of the brush burned, but few pines more than 10 feet tall were killed. Lightning started the fire August 28; it continued to burn until September 22, when it reached natural barriers. These barriers consisted of an open rocky ridge above the fire, a draw covered by quaking aspen on one flank, a rocky escarpment on the other flank and steep, rocky, sparsely vegetated bluffs below the fire.

The only sizeable fire in 1971 was the “Ball Dome Fire.” It burned in a stand of red and while fir with practically no shrubs or herbaceous plants except an occasional isolated stand of manzanita in openings. Jeffrey pine grew on exposed ridges and was scattered in other parts of thc predominantly fir stand. The forest floor was littered with dead branches, large stumps, and boles of dead and down trees. Begun August 13, the fire was still burning in early November and covered about 115 acres before being extinguished by snow. The fire spread slowly – primarily downhill – and was limited on one flank by a wet draw and on another by a grassy glade and by fuel discontinuities. Many small trees were killed, and most snags and some standing live trees with catfaces or decayed interiors burned completely. Field evidence indicates that fire burned in tree crowns only on very rare and isolated occasions.

Public Reaction

Some concern has been expressed about the public’s willingness to accept a new direction in fire management. Our experience is that the public seems ready to accept both the natural role of fire in the forest and our plans to restore fire to that role as nearly as possible and practicable. We take every opportunity to explain the reasons for both our ”let-burn” program in the high elevations and our use of prescribed fire in lower elevation forests of these Parks.

We use press releases, feature articles in newspapers and magazines, talks before civic organizations, schools and colleges, scientific and conservation groups and other interested organizations, handouts at visitor con- tact stations within the Parks and interpretive campfire programs and walks in the forest to tell about the new program’s objectives. We try to keep other land management agencies informed, particularly those agencies having lands adjacent to the Parks. We fee1 confident that candor on our part will continue to enhance public acceptance of this new, exciting, and ecologically viable management of Park lands.

Conclusions

After four seasons’ experience with this program of allowing naturally occurring fires to burn in high elevations, we have concluded that lightning fires starting in the ”let-burn” zone usually can be allowed to burn unobstructed. By following this practice, our suppression costs have been substantially reduced. But pre- suppression activities and costs have changed little since there has always been a great potential for wildland fires to burn large acreages and damage life, property and natural resources in the 1ower elevations of these two Parks. As we move forward with this program, we will always be aware that unusually severe fire weather conditions may affect our “let-burn” decisions. The future spread and behavior of monitored fires must be continually estimated, and an action plan must always be ready in case suppression

An experimental prescribed fire in a red fir forest in Kings Canyon caused this amount of change. Photo on the left was taken before the fire; photo on the right, from the same point a year after the fire. The log in the foreground and snag just right of mid-center (left) were largely consumed by the fire. Young red fir were killed, but the larger fir and lodgepole pine in the background were little affected. (National Park Service Photos by Bruce M. Kilgore.)

becomes appropriate. In summary, the National Park Service's former fire suppression program eliminated the dynamic effects of naturally occurring lightning fires on plant succession and encouraged unnatural vegetation changes in Park forests. Through an imaginative resources management program based on management-oriented research, the Park Service is now attempting to restore fire to its important and primeval role in the forest ecosystems of Sequoia and Kings Canyon National Parks. A similar program may be appropriate elsewhere when the maintenance of an open forest approximating the primitive natural environment is a primary objective.

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Table 1. Number of Lightning Fires in Naturally Occurring High Elevation Fire Management Zones, Sequoia and Kings Canyon National Parks, 1968-1974.

Size Class (acres)	1968	1969	1970	1971	1972	1973	1974	Total Fires (By size class)
0. - 0.25	1	2	20	23	11	7	15	79
0.26- 9.	1	0	1	1	2	1	0	6
10. - 99.	0	0	2	0	2	0	2	6
100. -299.	0	0	0	1	1	0	1	3
300+	0	0	1	0	0	3*	1*	5
Total acres	8.01	0.30	494.5	115.0	161.79	4,772.65	3,311.8	
Fires (by year)	2	2	24	25	16	11	19	99

*South Sentinel Fire - 2,486 acres (1973)

Moraine Creek Fire - 1,760 acres (1973)

Chagoopa Fire - 525 acres (1973)

Comanche Fire - 3,060 acres (1974)

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