

## Fire Management in the National Parks: An Overview

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FIRE management in the National Park Service has come a long way in recent years. In 1964, few of us would have assumed that a decade later—with a minimum of hostile public reaction and very considerable public support—9 national parks and monuments would let 74 lightning fires burn on 15,000 acres of park wildlands. Nor would many of us have predicted that 5 Park System areas would ignite a total of 46 prescribed burns which covered another 11,000 acres of forest and grasslands. But that is precisely what has happened during the first 9 months of 1974.

There were some with such foresight, however. I can remember Dr. A. Starker Leopold, on a zoology class field trip in Lake County, California, in 1951, telling some of his students that before long fire would be restored to national parks. It seemed a startling and revolutionary idea at the time. For, while the importance of fire to most forest and grassland ecosystems has been known for many years, total suppression had continued as the basic policy in National Park Service areas from their first establishment in the late 1800's until 1968 when the recommendations of the 1963 Leopold Report were adopted as Administrative Policy for the Service. The new policies declared that:

“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.”



Fig. 1. Public controversy arose at Grand Teton National Park, Wyoming, in 1974 because the slow-burning Waterfall Canyon fire was highly visible across Jackson Lake, and smoke at times obscured the view of the mountains. National Park Service photo.

## EVERGLADES: THE EARLY EXCEPTION

The earliest exception to the total fire suppression policy in Park System areas was Everglades National Park in Florida, where in 1951 Research Biologist Dr. William Robertson began a study of the role fire plays in maintaining subclimax pine forests. This was followed in 1958 by experimental research into prescribed burning as a means of controlling tropical hardwood invasion of such pine forests. The Southeast, of course, had been far ahead of the rest of the country in recognizing the profound and hazardous changes being brought about by removal of the fire process from their fast growing pine ecosystems.

To counter this trend and restore some semblance of the natural sequence of events, the National Park Service began a preliminary program of prescribed burning at Everglades which continued in a low-key way until 1972 when far more intensive programs of fire management began. Based on Dr. Robertson's early work and on subsequent studies of the role of fire in saw grass glades, wet prairie, and pineland communities, the fire management program at Everglades has expanded greatly in the past 2 years.



Fig. 2. The first prescribed burning in the national parks was carried out at Everglades National Park, Florida, in the 1950's. Saw Grass burn. National Park Service photo by Larry Bancroft.

The Everglades program involves both prescribed burning and allowing natural and—in some cases—man-caused fires to burn. During the 14-year period from 1958 to 1971, some 102 prescribed burns covered 28,000 acres. In the 3 years from 1972 to 1974, there were 124 prescribed burns covering 27,000 acres, ranging from saw grass glades to pine forest. Some of this burning was done by aerial ignition and is obviously still in an experimental stage of NPS fire management programs. During the last 3 years of intensive fire management at Everglades, lightning ignited 57 fires; all were allowed to burn and they covered 5,200 acres. Under a soil moisture/drought index prescription, some 14 man-caused fires were also permitted to burn, and these covered nearly 3,300 acres.

## SEQUOIA AND KINGS CANYON: THE THREE-PART PROGRAM

In the Sierra Nevada of California, between 1959 and 1966, Dr. Richard Hartesveldt and colleagues at San Jose State College and Dr. Harold Biswell and associates at the University of California, Berkeley, conducted separate but complementary experimental studies involving prescribed burning on 2 to 20-acre plots in the sequoia mixed-conifer forest of Sequoia and



Fig. 3. The 1973 South Sentinel fire in Kings Canyon National Park is typical of the high elevation natural burns in the Sierra Nevada parks of California. Such fires are kept under close observation, but are not automatically suppressed. Most are small and go out before reaching  $\frac{1}{4}$  acre in size. More than three million acres in ten national parks are being managed so that fires play a more natural role in the ecosystem. National Park Service photo by Bill Jones.

Kings Canyon National Parks. Then in 1968, Superintendent John McLaughlin of Sequoia and Kings Canyon approved the Park Service's first experimental natural fire program in the Middle Fork of the Kings River above 8,000 feet elevation. At the same time, an 800-acre prescribed burn was carried out in this high elevation red fir-lodgepole pine forest, with appropriate monitoring of the impact of such burning on various fuel, vegetation, wildlife, water quality, and soil erosion parameters (Kilgore, 1971).

Based on the results of these experimental prescribed fire and natural fire programs and the prior Hartesveldt and Biswell studies, and in consonance with the revised NPS Administrative Policies which developed during the same interval, a three-phase program was initiated at Sequoia and Kings Canyon involving (1) allowing natural fires to burn in higher elevation zones (Kilgore and Briggs, 1972); (2) prescribed burning in middle elevation sequoia mixed-conifer forests; and (3) continued suppression of fires in lower elevation and developed areas.

### **THE NATURAL FIRE PROGRAM**

The early fire research and prescribed burning at Everglades together with this three-part fire management program at Sequoia and Kings Canyon have since led to the development of similar programs or modifications of them in nine other park and monument areas. We will, of course, be hearing in detail about the programs of the northern Rocky Mountain parks in the papers which follow. But summarizing the programs for the National Park Service as a whole, the 9 areas which allow natural fires\*<sup>1</sup> to burn within certain designated zones and under specified conditions occur in five regions, from the Southeast to the West and including the Rocky

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\*Man-caused fires are suppressed in all areas except Everglades National Park where certain man-caused fires are also allowed to burn.

Table 1. Numbers and sizes of fires allowed to burn in national parks & monuments, 1968-1974

Area	Acreage in Natural Fire Zone	1972		1973		1974		7-Year Totals 1968 to 1974	
		No.	Acres	No.	Acres	No.	Acres	Number	Acres
Everglades*	705,000	30	1325	25	3928	16	3521	73	9425
Sequoia & Kings Canyon	592,900	14	162	11	4772	19	3312	97	8112
Yosemite	465,600	8	—	27	34	22	4170	57	4200
Saguaro	56,000	10	896	4	1	4	—	28	903
Yellowstone	300,000	2	1	1	—	6	900	9	900
Grand Teton	146,000	—	—	1	—	3	3700	4	3700
Rocky Mountain	233,000	—	—	2	—	3	—	5	—
Carlsbad Caverns	35,000	—	—	—	—	1	—	1	—
North Cascades	580,000	—	—	—	—	—	—	—	—
TOTAL	3,113,500	64	2384	71	8735	74	15603	274	27240

\*Everglades figures include some man-caused fires which were also allowed to burn.

Mountain, the Southwest, and the Pacific Northwest. The areas are Everglades, Sequoia and Kings Canyon, Yosemite, Yellowstone, Grand Teton, Rocky Mountain, Carlsbad Caverns, and North Cascades National Parks and Saguaro National Monument.

More than 3 million acres within these units are being managed so that wildland fires play a more nearly natural role. When fires are ignited by lightning in these zones, they are kept under close observation but are not routinely suppressed. Provided the fires can achieve particular vegetation or wildlife management objectives, they are allowed to burn. Most natural fires in the Sierra and Rocky Mountain parks are small and go out before they reach ¼ acre in size. Any sizeable acreage burned in a given year in these park areas (Table 1) resulted from the one or two large fires which happened to burn under favorable conditions, allowing them to attain considerable size.

A wide variety of vegetation types are found in the natural fire zones of these 9 areas reflecting considerable differences in burning conditions and the frequency, intensity, and hence role of fire. Vegetation ranges from the pineland, saw grass, and coastal prairie communities of Everglades and the basket grass and yucca of Carlsbad Caverns; through the ponderosa pine forest of Saguaro National Monument, to the red fir, lodgepole pine, and parts of the mixed-conifer forest of the Sierra Nevada; and the lodgepole pine, Douglas-fir, aspen, and spruce-fir of the Rocky Mountain parks. Since the beginning of this new thrust in 1968, some 274 fires have been allowed to burn in these 9 national parks and monuments and have covered more than



Fig. 4. Fire in the red fir-lodgepole-Jeffrey pine forests of the Sierra reduces ground fuels, recycles nutrients back into the soil, and prepares an ideal seedbed for pine and other sun-loving, fire-dependent species. Because of the frequent surface fires, crown fires are seldom seen here. National Park Service photo by Bill Jones.

27,000 acres without any unacceptable loss of natural resources and no known threat to human life or substantial loss of property.

In Everglades, the objective is to manage fire as one of the environmental factors, along with water, that generated and sustained the vegetative mosaic of pine forest, interior glades, and coastal prairie so as to allow as nearly as possible the natural processes to perpetuate these ecosystems. In the Sierra parks, the general objective is to restore fire to its natural role and reduce wildland fire suppression to the smallest possible scope. Only when fires in the natural fire zones appear to be a threat to life, property, or natural resource values or when they appear to be approaching a zone boundary beyond which they may threaten such values is suppression normally undertaken.

The program at Saguaro National Monument is unique. Chief Ranger Les Gunzel has developed a prescription which must be met before he allows lightning fires to burn. The primary requirements before burning is allowed are (1) at least 2 inches of rain after June 15; (2) the summer monsoon rain pattern is established; and (3) specified buildup and spread indices must not be exceeded. This program may have special value in the southern Rockies for Forest Service as well as Park Service areas.

### **PRESCRIBED BURNING PROGRAMS**

The five Park System areas using prescribed burning programs are Everglades, Sequoia and Kings Canyon, Yosemite, Grand Teton, and Wind Cave National Parks. Since 1968, some 267 prescribed burns have been carried out in these five areas involving more than 37,000 acres of parklands (Table 2). It should be noted that while the largest prescribed burning acreage is in Everglades, substantial prescribed burns have also occurred at Sequoia and Kings Canyon and Yosemite.

Prescribed burning in the Everglades aims to simulate the role of natural fire in favoring pine over hardwoods, reducing fuel hazards, controlling exotic plants, and reclaiming abandoned farmland. In Sierra parks, managers are attempting to reduce the adverse impacts of fire suppression, particularly the buildup of understory thickets and other forest fuels which constitute substantial fire hazards, the advancing plant succession toward shade tolerant white fir, the slowing of natural nutrient recycling processes, and the decrease in wildlife habitat. Although dealing with different vegetation types, the programs at Grand Teton and Wind Cave have similar objectives.



Fig. 5. While smoke is an esthetic problem with all fires, wood smoke like this in Yosemite is not the same in quantity or quality as smoke from auto exhaust or industrial discharges. The Park Service believes that the desire to avoid smoke from prescribed or natural burns must be tempered by the need to control smoke and intense damage that would inevitably result otherwise from future major wildfires. National Park Service photo by Steve Botti.

Table 2. Numbers and sizes of prescribed burn fires  
 in national parks & monuments, 1968-1974

Area	1972		1973		1974		7-Year Totals 1968 to 1974	
	No.	Acres	No.	Acres	No.	Acres	No.	Acres
Everglades	31	4,891	63	12,354	30	9,776	214	33,050
Sequoia & Kings Canyon	5	150	—	—	3	423	14	1,421
Yosemite	1	64	2	192	2	104	20	2,390
Grand Teton	—	—	1	35	—	—	1	35
Wind Cave	—	—	6	41	11	336	17	377
<b>TOTAL</b>	<b>37</b>	<b>5,105</b>	<b>72</b>	<b>12,622</b>	<b>46</b>	<b>10,639</b>	<b>266</b>	<b>37,273</b>

### THE FUTURE OF FIRE IN PARKS

While many changes have taken place in the past few years in National Park Service fire management efforts, an even greater change can be expected in the next decade. Fire research programs at Everglades, Sequoia and Kings Canyon, Yosemite, Yellowstone, Grand Teton, Wind Cave, Carlsbad Caverns, and Guadalupe Mountains must continue to back up ongoing management programs. The intensive research efforts at Grand Canyon, where several experimental burns have been conducted in recent years, should lead to development of an active fire management program by 1975. Fire research at Glacier, Lava Beds, Isle Royale, Redwoods, and Point Reyes can serve as the basis for intelligent fire management programs which are likely to develop in these areas in the near future.

The National Park Service must work closely with Forest Service and university researchers to gain the facts required to continually improve our fire management programs. We need to know (1) how often should an area be burned?; (2) what prescription is appropriate?; (3) how much fuel accumulation indicates the need to prescribe another burn?; and (4) what management actions can best simulate "naturalness" and at the same time minimize smoke contribution to adjacent communities?

Answers to these questions must be sought by carefully controlled laboratory and field studies; but information required to develop practical guides to fire management in the parks must also be gathered by monitoring actual experimental fires and wildfires. Carefully monitored prescribed burns and natural lightning burns will yield evidence as to how we should carry out future fire management programs (Kilgore, 1973). As each conclusion is reached, it becomes part of a management hypothesis which is again continually checked in the field by subsequent monitoring of actual management programs.

The basic choices facing all national park managers are the four noted by Agee (1974):

- (1) Suppress all man-caused and natural fires at all times;
- (2) Prescribe burn in certain zones at certain times;
- (3) Allow natural fires to burn in certain zones under certain conditions;
- (4) Allow all man-caused and natural fires to burn at all times.

Few managers can reasonably choose alternative four because of the many possible adverse impacts on biological, social and economic values. However, most managers will be able to integrate the first three as appropriate for the different zones of their particular area. In backcountry areas, letting natural fires burn may be most desirable, whenever experience and conditions of adjacent landowners permit. In developed zones, on the other hand, total suppression combined with manual removal of fuel may be appropriate. In the middle gray zone,

perhaps where unnatural fuel accumulations need to be reduced and where prescriptions are available for a particular fuel type, prescribed burning may be the answer. The exact mix for a given national park or monument will be determined partly by research and partly by experience.

The National Park Service is committed to restoring and maintaining the integrity of natural areas of the system down through the long future. This objective can only be accomplished when the natural processes which have functioned in the evolution and maintenance of such systems - including fire - are allowed to operate as closely to their natural role as possible.

We can no longer afford the complacent luxury of a seemingly secure policy of total suppression. We must face up to the needs of the real, ever-changing world of forest and grassland ecosystems wherein fire has played a role in the past and will continue to play a role in the future. We must seek out the most logical and reasonable position to take as managers of these dynamic communities and establish integrated programs of prescribed burning, suppression, and allowing natural fires to burn under observation. More than that, we must communicate the essential nature of these programs to the American public, the ultimate owners of all national park and forest lands, who will then demand the best professional recommendations and actions from us. We must provide not the safest management over the short run, but the best management possible over the long run for America's wildland resources.

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