Restoring FIRE to National Park Wilderness

B.M. Kilgore. American Forests, March 1975

All photos courtesy of the National Park Service, except where noted

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IT WAS EARLY OCTOBER in Yosemite National Park. Flames crept slowly through the pine needles until they reached a pile of dry twigs and branches. Then they exploded, racing up through the inter-laced branches of a 15-foot red fir, killing it before dropping to the ground and again moving slowly up the slope.

This fire, touched of when lightning struck a snag in the vicinity of Mount Starr King just south of Yosemite Valley, had been burning for two months at an elevation of 8,000 feet. Before it was put out by early winter snow, it had spread across nearly 4,000 acres of Yosemite's red fir-lodgepole-Jeffrey pine forest.

For the first two months, the National Park Service made no effort to suppress the flames, although Dick Riegelhuth, Chief of Resources Management at Yosemite, and Dr. Jan van Wagtendonk, the Park's Research Scientist, watched closely to see that it stayed within a designated zone where natural fires are allowed to burn. As the flames neared the edge of the natural fire zone, Yosemite Superintendent Les Arnberger and Riegelhuth decided to establish a small fire line along the side to keep the fire inside the zone boundary.

Meanwhile, in Grand Teton National Park, Wyoming, a similar fire was at tracting national attention from the news media. Also started by lightning in July, it covered nearly 3,700 acres of forest land before it was put out by late autumn snows.

Because the slow-burning Grand Teton fire was highly visible across Jackson Lake and smoke at times obscured the view of the mountains, public controversy erupted. Some permanent residents, visitors, and elements of the tourist industry accused the Park Service of a "scorched earth" policy and

These two photos, taken 80 years apart in the Mariposa Grove, Yosemite N.P., illustrate plant succession in the absence of fires. The 1890 photo (left) shows few understory trees. By 1970 (right) a dense thicket of white fir has grown. Such thickets provide fuel which could support a crown fire fatal to even mature sequoias.

complained of air pollution from smoke.

Superintendent Gary Everhardt feels such public reaction is understandable, conditioned as it was by years of believing that all forest fires are bad and should be put out immediately. But what people were witnessing was a rather spectacular example of a new policy, begun modestly in 1968, under which National Park rangers and scientists, working with Mother Nature, are restoring natural fires and sometimes ”prescribed” fires to their historic role in National Park ecosystems.

It should be emphasized that in size at least, the Grand Teton and Yosemite fires were not typical. More than 90 percent of these natural burning fires are less than one-quarter acre in size.

They do, however, represent a basic shift in the National Park Service attitude toward fire. From the founding of the Service in 1916 until the mid-1960’s, the ”no burn” policy – personified by Smokey the Bear – was rarely challenged. National Park Service policy called for prompt suppression of all fires on park lands, whether natural or man-caused, often at great cost in both money and environmental impacts. Over the past decade, the NPS has spent an average of $1.3 million per year on emergency fire suppression. And although much of this would have been essential under any policy, it is hoped in the future to save a good share of this expense by learning to work with fire to reduce the inevitable buildup of wildland fuels.

Beginning in the 1950s, some scientists began taking a closer look at what unnatural suppression of all fires was doing to the ecosystems of certain national park forests and grasslands. And they didn’t like what they found.

At Everglades National Park in Florida, Research Scientist Dr. William Robertson, Jr. discovered that fire plays an important role in controlling tropical hardwoods which in the absence of fire replace pines, natural to these areas. Other scientists also found that fire was essential to maintaining the stability of saw grass glades.

Cautiously, the scientists and rangers at Everglades began helping Nature by deliberately substituting a few fires of their own in carefully selected locations and under the right conditions. This policy of scientifically setting fires, for ecological reasons, is called ”prescribed burning,” the first such program in the Park Service.

Meanwhile, in the Sierra Nevada of California, scientists like Dr. Richard Hartesveldt and colleagues from California State University, San Jose, and Dr. Harold Biswell and associates at the University of California, Berkeley, as well as the author and other Park Service scientists, conducted experimental studies involving prescribed burning in the Sequoia mixed-conifer forests of Sequoia and Kings Canyon National Parks.

This work, together with field and laboratory studies by U.S. Forest Service scientists at Missoula, Montana, and Riverside, California, led to the conclusion that fire plays several essential roles in the ecology of the sequoia mixed-conifer forests, and that sequoia forests literally can’t survive without it.

The role of fire in these forests is as follows:

1. Fire prepares a seedbed in which sequoia seeds sprout and flourish. It does so by changing the thick litter and duff into soft, friable, ashy soil on which the lightweight sequoia seeds fall and are buried. It also kills pathogens such as damping-off fungi which kill seedlings. And by reducing litter and duff and killing some trees, more water reaches the soil and is available to sequoia, an important factor in summer survival of seedlings.
2. Fire efficiently recycles nutrients back into the soil by releasing minerals formerly tied up in dead plant materials. While hot fires volatilize some nutrients, lighter burns often increase available nitrogen, phosphorous, potassium, calcium, and magnesium and generally improve soils chemically.
3. Recurring light fires adjust the successional pattern by favoring sun-loving and fire-tolerant species (such as sequoia and pine) over shade-tolerant and fire-susceptible species (like white fir) . They do so by periodically killing understory young fir and producing sunny openings in the forest where sequoia seedlings grow well.
4. Fire in sequoia-mixed conifer forests provides conditions which favor wildlife by stimulating germination or sprouting of palatable shrubs, herbaceous plants, and trees useful to birds and mammals for food or cover. It also makes openings in forest understory and canopy which improve habitat for many species of

wild animals.

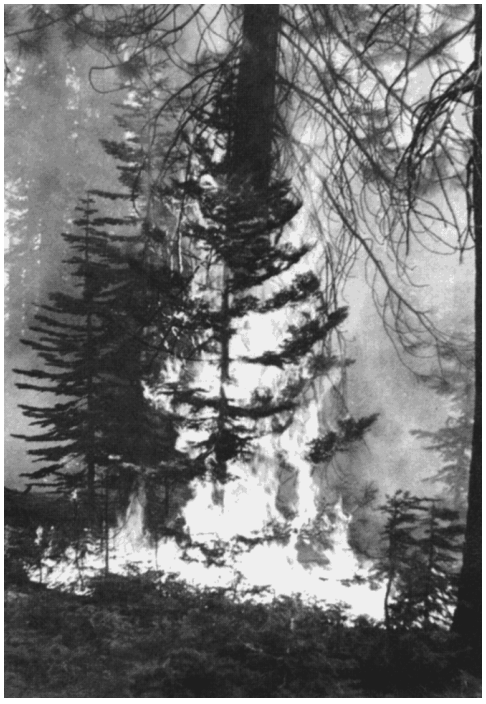
5. Fire contributes to the development of a mosaic of age classes and vegetation types because species differ in their tolerance to fire and because Sierra forests burn in a highly variable pattern. It may burn hot enough to kill fir and even young pine where surface fuels or larger pine are present but not in openings left by previous hot burns, Thus, when fire creates openings by burning hot enough to kill all fir and pine in a given area, the new young pines and sequoia will survive the next fire.
6. Fire changes the numbers of trees susceptible to attack by insects and disease. While insects are attracted to fire-damaged trees, fire also apparently has a sanitizing effect by thinning stands and improving vigor of trees, making them more resistant to insect attack. It also eliminates old trees before insects and disease have overtaken them, and smoke plays a role in inhibiting disease organisms.
7. Lighter burns reduce the likelihood of extremely hot crown fires by removing the ladder of understory trees and brush and reducing accumulations of dead surface fuels.

Armed with this information, and bolstered by a recommendation from the prestigious panel of scientists known as the ”Leopold Committee,” (named after its Chairman, Dr. A. Starker Leopold, of the University of California, Berkeley) the National Park Service in 1968 updated its traditional policy of total fire suppression, and adopted instead a three-part program of fire management. The new policy seeks to restore and maintain natural environmental conditions in the parks; to do so, the Service must restore natural processes – including fire – or simulate the results of fire. This nation- wide policy was first implemented at Sequoia-Kings Canyon.

This sequoia-white fir forest on Redwood Mountain in Kings Canyon NP had been protected from fire for 50 years resulting in hazardous accumulation of debris.

Lower left: After prescribed burn area is clear of litter allowing increased light penetration to forest floor which will encourage growth of herbaceous plants and shrubs.

Flames from a natural burn in Yosemite NP move from needles and twigs on the ground up through branches of a small fir before dropping again to the ground.



The new program: (1) establishes a policy of letting some natural fires burn when they do not threaten human life or developed properties; (2) recognizes prescribed burning as a proper tool of forest management; and (3) continues total fire suppression in lower elevations and around developed areas.

Today, two or more segments of this three-part program are in effect in eleven national parks, namely Everglades, Sequoia and Kings Canyon, Yosemite, Grand Teton, Yellowstone, Rocky Mountain, Wind Cave, Carlsbad Caverns, and North Cascades National Parks and Saguaro National Monument.

More than 5,000,000 acres within these parks are being managed so that fires play a more natural role in the ecosystems. Lightning-caused fires in these ”natural fire” zones are kept under close observation but are not automatically suppressed. Provided the fires can achieve desired vegetation or wildlife management objectives such as preparing a seedbed for fire-dependent species, making openings for wildlife habitat, or reducing hazardous fuels, they are allowed to burn. As noted earlier, most natural fires in the Sierra and Rocky Mountain parks are small and go out before they reach one-quarter acre in size.

A wide variety of vegetation types are found in the natural fire zones of these areas, reflecting considerable differences in burning conditions and the frequency, intensity, and hence, the role of fire. Vegetation ranges from the pineland, saw grass glade, and coastal prairie communities of Everglades to the basket grass, cactus, and yucca of Guadalupe Mountains; from the ponderosa pine forests of Saguaro National Monument, to the red fir, lodgepole pine and mixed-conifer forests of the Sierra Nevada; and the lodgepole pine, spruce, Douglas-fir, and aspen of the Rocky Mountain parks.

This program has expanded considerably since 1968 from the relatively small program at Sequoia- Kings Canyon to 74 fires covering more than 15,000 acres in 1974. Over the seven-year period, 1968 to 1974, a total of 274 natural fires covered almost 30,000 acres.

During the same period, 267 ”prescribed burns” took place, covering some 37,000 acres in six parks – Everglades, Sequoia and Kings Canyon, Yosemite, Grand Teton, and Wind Cave. In Everglades, Resource Manager Larry Bancroft points out that such burns simulate the role of natural fire in favoring pine over hardwoods, reducing fuels, and controlling exotic plants. While dealing with different vegetation, the programs in the Sierra parks, at Grand Teton, and Wind Cave have similar objectives, with strong emphasis on reducing the adverse impacts of past fire suppression – particularly buildup of understory thickets and the accumulation of abnormal quantities of surface fuels. All such burns are only carried out under specifically prescribed conditions of temperature, humidity, wind, and fuel moisture.

Fire suppression, the traditional part of the new NPS program, will continue as the primary action in developed areas and zones with high cultural resource value. Man-caused fires are still suppressed, except in some cases at Everglades. Suppression also will be applied to natural fire zones when the fire threatens areas outside the zones or is not achieving the desired purpose.

There is also the problem of wood smoke and air pollution. As noted earlier, the Grand Teton fire gave rise to cries of ”air pollution.” The Park Service is deeply interested in studies of wood smoke now being made by the Forest Service, the University of California and other universities. We try to take advantage of the best possible weather conditions for burning to minimize negative effects. But we feel it is important to draw a distinction between the quality and quantity of materials released in wood smoke and those found in industrial pollutants or automotive exhaust.

Wood smoke is primarily composed of particulate matter, carbon dioxide, and condensed water vapor. Automotive exhausts and industrial discharges, in contrast, contain much larger percentages of poisonous sulfur and nitrogen oxides and lead. The differences are profound and they are environmentally important. The desire to avoid smoke resulting from prescribed burns must be tempered by the need to control smoke and intense resource damage that inevitably would result otherwise from future wildfires of a major nature.

The Service is aware, however, that it is one thing to accept the role of fire intellectually, and quite another to support it when smoke from a natural fire has persisted in an area for many days. While the long-term best interest of the forest resources may be helped by such a fire, the day-to-day gut reaction to smoke may still be negative – thus creating substantial public relations problems for this program.

While many changes have occurred in recent years in

NPS fire management efforts, even greater changes can be expected in the next decade. Fire research is essential to gain new information and monitor results in the eleven national parks with ongoing management programs. In addition to such management-oriented fire research at Sequoia-Kings Canyon, Yosemite, Grand Teton, Yellowstone, and Everglades, similar studies at Grand Canyon, Glacier, Lava Beds, Isle Royale, and Point Reyes can serve as a basis for intelligent fire management programs which may be implemented in the near future in these parks.

Further, the Service must continue to work closely with researchers of the Forest Service and universities to gain the new information required to constantly improve our fire management programs. Among the things we need to know are: (1) How often should an area be burned? (2) What prescription is appropriate, i.e., what temperature, humidity, wind, and fuel moisture conditions should be used to bring about a given intensity of fire? (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 also must be gathered by monitoring actual experimental burns and wildfires. As conclusions are reached, managers must apply them under field conditions to determine their validity in actual management programs.

All National Park managers face four basic choices in fire management. They can (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; or (4) allow all man-caused and natural fires to burn at all times.

The first prescribed burning in the national parks was carried out at Everglades NP, Florida, in the 1950s. Saw grass burn

The fourth alternative, of course, is unrealistic because of many adverse impacts on biological, social, and economic values that would occur. Equally important, it would be unacceptable to the public. Most managers, however, will be able to utilize the first three as appropriate alternatives.

In wilderness areas, allowing natural fires to 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 the fuel is appropriate.

In the middle or gray zone, perhaps where unnatural fuel accumulation needs to be reduced and where scientists have developed ”prescriptions” for a particular fuel type, prescribed burning may be the answer. The exact mix for a given park will be determined partly by research and partly by experience.

We can no longer afford to follow the seemingly secure policy of total fire 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 do so in the future, either through wildfires, natural fires, or prescribed fires.

We must determine the most logical and responsible policies for managing these dynamic ecosystems and establish integrated programs of prescribed burning, suppression, and allowing natural fires to burn in selected zones.

For despite efforts by the most effective fire fighters in the world, coniferous forests, chaparral, and similar vegetation will burn periodically. It behooves us, therefore, as scientists, laymen and environmentally concerned citizens to learn all we can about the natural role of fire in our wildlands and to support intelligent management decisions based on this knowledge. This is particularly true of our national parks and wilderness areas, where natural processes should be allowed to run their course, as closely as possible.

Finally, we must recognize the public relations problem we face with a generation of Americans who have been conditioned by the all ”all fires are bad syndrome.” But we also know that an informed public is a supportive public. The challenge in getting our message across is obvious.

The answer is not to force Smokey the Bear into retirement, because his precepts remain essential and valid for vast areas of forest lands. But we must go beyond simple fire suppression.

The National Park Service is committed to maintaining (and in some cases, restoring) the integrity of our natural areas down through the long future. This objective can only be accomplished when the natural processes that developed and maintained these ecosystems – including fire – are allowed to operate as closely to their natural role as possible.

We must approach the assignment of restoring or maintaining natural environmental conditions with humility and great ecological sensitivity. Our goal must be to provide not the “safest” management over the short run, but the best possible *long- range* management of America’s wildland resources.