

A Prescribed Burning Program for Sequoia and Kings Canyon National Parks

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EARLY HISTORY

The well known conservationist John Muir, described a fire as it entered a grove of Giant Sequoia trees in the forest between the Middle and East Forks of the Kaweah River. This was in early September, about the driest time of the year, 1893.

"The fire came racing up the steep chaparral-covered slopes of the East Fork canyon with passionate enthusiasm in a broad cataract of flames. But as soon as the deep forest was reached, the ungovernable flood became calm like a torrent entering a lake, creeping and spreading beneath the trees.... There was no danger of being chased and hemmed in, for in the main forest belt of the Sierra, even when swift winds are blowing, fires seldom or never sweep over the trees in broad all-embracing sheets as they do in the dense Rocky Mountain's woods and in those of the Cascade Mountains of Oregon and Washington. Here they creep from tree to tree with tranquil deliberation, allowing close observation...."

Muir defines the Sierra Forests:

"The inviting openness of the Sierra woods is one of their most distinguishing characteristics. The trees of all of the species stand more or less apart in groves, or in small irregular groups, enabling one to find a way nearly everywhere, along sunny colonnades and through openings that have a smooth, park-like surface, strewn with brown needles and burrs.... One would experience but little difficulty in riding on horseback through the successive belts all the way up to the storm-beaten fringes of the icy peaks."

Another great conservationist, Clarence King, gives this account:

"Passing from the glare of the open country into the dusky forest, one seems to enter a door, and ride into a vast covered hall. The whole sensation is of being roofed and enclosed. You are never tired of gazing down long vistas, where, in stately groups, stand tall shafts of pine. Columns they are, each with its own characteristic tinting and finish, yet all standing together with the air of relationship and harmony.... Here and there are wide open spaces around which the trees group themselves in majestic ranks."

Probably the most important agent that kept the forest clean, open and park-like under natural conditions was fire. Because they were frequent, they were light, even though many of them occurred at the driest time of the year.

The following excerpts are from the notes of George B. Sudworth, who made a field study of a part of the California Sierra region in 1900.

"Note on Kern River Canyon and adjacent country from Trout Meadow to Kern Lakes: Evidences of forest fires through- out and constant sheep grazing, which are doubtless accountable for the "clean" appearance of the forest. All timber more or less severely burned at base of trunk."

"Sequoia National Park to Eastern Divide-High Sierras. Thursday, August 16, 1900. Camp at terminus of Old Colony Road (near 1 mile west of falls of Marble Fork of Kaweah River.) Enroute this morning for Giant Forest (Big Trees between Middle and Marble Fork of Kaweah River.) Typical view of yellow pine forest 2 – 3 miles west of Giant Forest, so-east slope. Shows common burning of trunks. Burned stub of Big-tree west side Giant Forest.... Reproduction on bared soil about trunk."

"August 21, 1900. Camp at 'Redwood Meadow' on headwaters of Granite Creek. Meadow lies on bench 6,500 feet between Granite Creek and another branch east of the East; should be Middle Fork of Kaweah River. Estimated at 160 acres, containing about 200 Big-trees.... Region burned 21-30 years ago, as shown by subsequent trunk growth, and also by seedlings near old burned trees."

"Timber of Big Arroyo and Soda Canyon, and Rattlesnake Basin: Kaweah Mt. plateau burned over 20 to 30 years ago badly and 50 percent of large timber killed from Arroyo to Mt. and to the rim of Kern Canyon. Considerable down dead timber, and 10-15 percent of dead timber standing."

Ben Loverin, a man of some 70 years, whose father was an early cattleman in the Three Rivers area, states that when he was a young boy, his father would step out on the porch, look up at the mountains, and say who was coming out of the country for the winter. Each cattleman would set off a fire on his summer range as he left the country and these fires could be seen for miles.

Sheepmen carried out the same procedure as stated by Sudworth on 1 September 1900:

"Crabtree Meadow area: Down and dead standing timber killed by fires set by sheepmen to clean woodland of logs, in order to facilitate driving from meadow to meadow."

From early reports we do see that fire was a constant companion in the natural scene as well as a way of managing the forest. There were areas where fire did considerable damage in local areas, both in the high mountains as well as in the Sequoia groves. The only thought of the cattle and sheep man was to open up grazing areas; nothing else counted.

Prior to 1920, fire history represented fire suppression. Protection was a mere desire rather than a plan; and no funds were available, even had a plan been laid out. Suppression tools were the shovels, axes, and brush hooks of the seasonal maintenance crews. There were no lookouts, trained fire crews, motorways or fireways. Fires were considered a matter of course and there was much local sympathy with the light burning theory. In 1920, however, definite thought was given to the subject of fire prevention and control, and rough plans were prepared. These plans were given impetus by a disastrous fire which struck in 1921, and showed the need for preparation. Without special funds for the purpose, a quantity of fire tools were purchased and cached for fire use only. Strict enforcement was commenced on the regulation prohibiting leaving campfires burning. Publicity on fire danger

and warnings to violators was obtained from local papers. Some slight additions to tools and equipment were made from year to year, largely through purchase on going fires. Estimates for special fire protection appropriations received no action over a period of years and the rapidly growing travel with its attendant fire hazard kept the park officers constantly worried.

In the fall of 1926, the Park Superintendent appeared at Washington before The Appropriations Committee of Congress and drew a striking verbal picture of the fire hazard in the park with its lowlands of dense fields of brush and dry grass and the priceless Sequoia forest lying above. His plea for "an ounce of prevention" instead of a "pound of cure" drew from Congress for the 1928 fiscal year an appropriation of \$10,000 for fire prevention work, the first such fund to be granted for any national park. With this, a fire lookout, some fire trails, and several tool caches were constructed and a supply of the then modern tools were purchased. From that date to the present, fire prevention funds were regularly provided for personnel training, development, equipment and operation. The establishment of the CCC organization in 1933 hastened, in a very material way, the broad plans for fire protection which previously had been laid.

In the spring of 1961 the fire control facilities of Sequoia-Kings Canyon National Parks took on a modern aspect with the use of helicopter operations on fires. A contract helicopter was stationed at Ash Mountain, when the grass burning index at Ash Mountain reached 19. During this first year of operation, the helicopter was involved in 48 fires – hauling men, supplies, and most important, speeding the initial attack. In the summer of 1962, a four man helitack crew was employed and stationed at Ash Mountain, greatly increasing the efficiency of the helicopter operation.

Thus, in a period of 33 years, the fire organization in these parks progressed from a "fire lookout, some fire trails, and several tool caches" to a well organized, well equipped fire organization that has all of the modern fire equipment at its disposal including an air arm. Personnel are well trained, alert, competent and have confidence that the facilities at their disposal will care for normal fire conditions in this area where long rainless summers, vast acreages of timber-like brush; frequent lightning storms and tremendous numbers of visitors are constant concerns of the park officials from early spring until late fall.

However, the money appropriated was for fire suppression and being ready for suppression of wildfires.

In June and July, 1960, the Tunnel Rock Fire burned 4,960 acres, at a cost of \$884,931 in brushland near Park Headquarters. On July 10, 1961, the Harlow Fire, in the foothills of the Sierra Nevada, north of the Parks, burned 43,000 acres, burned up several fire fighters and cost over a million dollars to suppress. This caused us to take another look, and a reevaluation of the situation made with the cost of modern day methods of wildfire suppression. Maybe we should be spending more on planning ways to stop them from starting, or putting in fuel breaks (prepared during the off season) at which we could stop wildfires from spreading.

In 1963 an intensive Smokey the Bear publicity program was instigated by all fire fighting organizations and a system of fuel breaks constructed (approximately 300 feet wide, "cleared in brushlands" along strategic ridges) by the State of California on their lands. We prepared a plan to tie in with theirs throughout the Park, but money for construction was never received.

In 1963, a report by a Wildlife Advisory Committee later called the Leopold Report because it was headed by Dr. A. Starker Leopold, then Professor of Zoology at the University of California, Berkeley, was published. The Advisory Board was appointed by the then Secretary of Interior Udall, and he adopted as National Park Service Policy most of their recommendations.

The report stated "as a primary goal, we would recommend that the biotic associations within each Park be maintained, or where necessary recreated as nearly as possible in the condition that prevailed when the area was first visited by European men." Also the statement was made

"When the forty-niners poured over the Sierra Nevada into California, those that kept diaries spoke almost to a man of the wide-spaced columns of mature trees that grew on the lower western slope in gigantic magnificence. The ground was a grass parkland, in springtime carpeted with wildflowers. Deer and bears were abundant. Today much of the west slope is a dog-hair thicket of young pines, white fir, incense cedar, and mature brush – a direct function of overprotection from natural ground fires. Within the four national parks – Lassen, Yosemite, Sequoia and Kings Canyon – the thickets are even more impenetrable than elsewhere. Not only is this accumulation of fuel dangerous to the giant sequoias and other mature trees but the animal life is meager, wildflowers are sparse, and to some at least the vegetative tangle is depressing, not uplifting."

and they recommended that fire be put back into the ecosystem.

In 1961, Dr. Richard J. Hartesveldt, Professor at San Jose State College, started a series of studies about the Sequoias, one of which was called Fire-Sequoia Regeneration. One of the conclusions was that fire had to be put back into their ecosystem. Due to keeping fires out and over protection Sequoias could not regenerate. So to test this four 4-acre plots were burned in the Redwood Mountain Sequoia Groves in 1964 and 1965. Scientific research based on his findings definitely proved that fire was needed in the ecosystem.

So as a result of the Leopold Report and Dr. Hartesveldts studies a new perspective was opened up and a new National Park Service Policy statement on fire which 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."

Fires, in vegetation, resulting from natural causes 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.

Fire Control: Any fire threatening cultural resources or physical facilities of a natural area or any fire burning within a natural area and posing a threat to any resources or physical facilities outside that area will be controlled and extinguished.

The Service will cooperate in programs to control or extinguish any fire originating on lands adjacent

to a natural area and posing a threat to natural or cultural resources or physical facilities of that area.

Any fire in a natural area other than one employed in the management of vegetation and/or wildlife of that area will be controlled and extinguished.

In 1965 and 1966 we did get some accelerated public works emergency employment money and constructed 7 miles of fuel breaks around Grant Grove and the approach to Cedar Grove, Fresno County. The fuel breaks were 100 feet wide with every- thing cleared up to a height of 9 feet and heavy fuels piled and burned. Also four new lookouts, Cahoon Peak, Milk Ranch, Ash Peak and Park Ridge, were constructed.

Then for several years we studied burning in other areas such as Whitaker Forest, where Professor Biswell was burning in the Sequoias, the Stanislaus National Forest, where Schmike was developing a prescription for burning, and Mountain Home State Forest, where there was considerable T.S.I. work going on in their Sequoia Groves.

We decided we needed to know how to reduce the fuel, fire and etc. underneath the Sequoias, how to use Schmike's prescription formula for burning and how much actual manipulation was needed to burn safely. To find these things out in 1968 a 1,100 acre plot in Rattlesnake Creek at about the 9,000 foot elevation in the Middle Fork of the Kings River drainage was picked to burn in. It was surrounded on three sides by rocks and composed of basically a fir stand. Mr. Schmike gave us a prescription to burn within, and we actually burned out the basin in 300 foot wide burns starting at the top and burning down. We then took what we had learned here and **set** up a burning project in the Redwood Mountain Grove in Kings Canyon National Park.

To start the project we picked a mile long area 300 foot wide on top of a ridge and prepared and burned this in 1,000 foot sections. First we trimmed up all fir and cedar foliage to a height of 9 foot and dropped anything under 9 foot and all snags. We then built a fire break 2 foot wide and down to mineral soil and had fire hoses charged with water completely around each section. When we got into the prescribed prescription we burned each section. This was started in August of 1969 and finished in September 1969. We waited for each section to burn itself out before we started the second one. The next phase was to burn in 1,000 foot section 300 foot, but from the ridge top down to the creek bottom. In this though we did very little preparation except for dropping snags and used charged hoses with spray nozzles every 50 foot as control lines. The hose and nozzles were placed and let run all night before the burn and worked very well and saved a lot of line construction. We burned 7 sections starting 22 September and finishing 9 October 1969. Total acreage burned was 100 acres at an average cost of \$120 per acre. (First 5 sections). Second 7 sections, 100 acres burned at a cost of \$25/acre.

North Fork – Crystal Cave – Marble Fork Area. From 29 October 1969 until the snow came on 15 December we burned approximately 6,140 acres without too much intensive preparation in the brush and pine oak types. When there was danger of the fire getting out of the Park bulldozed fuel breaks were constructed. Brush areas were sprayed with 2,4T then natural breaks such as roads and trails were used. Total cost was \$21,984 or approximately \$3.60/acre. All of this area was burned in the low part or below prescription. The objective of this burning was to reduce fuel and burn out fuel breaks along the Park boundary and around our high value resource areas.

We also let 13 lightning caused fires burn in areas above 8,000 feet which covered 25 acres, and did some experimental burning in our high country meadows covering 25 acres.

Let burn area was 129,331.2.

1970: We started the year burning in Kern Canyon 7,000 foot elevation in January. Dates were 5 – 13 January 1970, but were driven out by snow.

Objective:

1. Removal of down trees and other debris resulting from exotic beaver activity.
2. Use of prescribed fire to rehabilitate browse ranges.
3. Remove debris resulting from years of trail maintenance. Burning was successful until snow forced us out.

April-May, Cedar Grove. Reduced fuel zone across the Middle Fork of Kings River and around developed areas within Cedar Grove. Very successful burn and objectives realized.

Shepherd Peak, May. Brush type: burned 1,200 acres, but jumped line and burned 22 acres outside Park causing us to take suppression action. (In 1972 we received \$10,000 to rehabilitate this area). Water bars were put along bulldozed fuel breaks, all brush piles burned, and fuel break lines broken up by burning and hard work to make them look natural.

Redwood Mountain, May. Sequoia Forest, fuel reduction zone burned 100 acres between Generals Highway and saddle. Excellent burn. Intensive preparation. Fall 1970. Prepared to burn 100 acres between Generals Highway and Whitaker Forest on north side of ridge, but weather closed in before burn.

Let Burn Area. Increased to 542,000 acres, 24 fires burned total acreage 494.48 and largest fire acreage 460.

1971, Spring. Due to wet conditions did no burning.

1971, Fall. Buena Vista. Fuel break burn acreage burned 100 acres, natural barrier and roads use, medium results.

Redwood Mountain – Fuel break burn – acreage burned 100 acres. Intensive line construction and burned in approximately 10 acre plots.

Let burn area increased to a total of 586,722 acres, 25 fires burned 150 total acreage.

Largest fire acreage 125.

Spring 1972. Hope to burn everything on north side of Redwood Mountain between Whitaker Forest, State of California and U.S. Forest land. Intensive preparation with burn acres broken up into about 20 acre plots.

Middle Fork of Kaweah. Burn approximately 2,000 acres in Ponderosa Pine, bear clover and brush types. Burn in control lines using natural and man made barriers.

Redwood Mountain – Fall 1972. If spring burn objectives reached, center part of grove will be burned. This should be fairly simple as area has been logged and old logging roads and trails can be used for control lines.

South side and head of Middle Fork of the Kaweah.

Plan would be hand construct fuel break between Edison Company Forebay and constructed fuel break along boundary from Milk Ranch and then when prescription is right burn along line, from top down. When line is burned wide enough to prevent fire jumping line, brush area could be set off to burn upward from flume. A fire pump would be placed in flume and used to wet down wood flume braces, then area between flume and river would be burned out with the same precautions, then from there up to the headwaters of the Middle Fork each drainage could be burned out with special restrictions in and around the Sequoia C roves.

East Fork Kaweah. Starting at Lookout Point Ranger Station a good fuel break extending from there to the river would be constructed then by drainages the area between the Mineral King Highway and the river could be burned out.

Above the highway the Pine-Bear Clover belt would be burned by prescription paralleling the highway and then the area in between. Again this should be done by drainages. Special precautions would have to be taken around the private lands and buildings and the Sequoia Groves burned similar to how we burned the Redwood Mountain Grove.

South Fork Kaweah River. A line has been constructed from the river north to the top of the ridge along the boundary so a good line should be constructed on the northside boundary. The side drainages areas should be burned. Special burning precautions would have to be taken in and around the Sequoia Groves.

Buffer zones (Western Divide Kern, and Kettle Ridge). The U.S. Forest Service is considering a let burn zone down to 8,000 feet on their adjoining lands so if they do we could include these zones in our let burn area.

1973 – 1974.

Miscellaneous zones between burned areas (North Fork, Hockett, etc.). These areas would be burned by prescription and methods used as in other areas.

SUMMARY

Total square miles, High elevation let burn area, 916.7 square miles or 69 percent of Park area. Total miles – Fuel breaks constructed by hand or bulldozer, or by fire outside of let burn area. 27 miles.

Total miles of fuel breaks still to be constructed or burned around boundary approximately 33.

Total acreage burned, outside of let burn area, 13,000 acres.

The act which established the National Park Service provided that the purpose of Parks is to *"conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."* The Park Service is concerned with perpetuation of a natural environment and this is further brought out in "Administrative Policies for Natural Areas of the National Park System."

What of the effect of a natural fire on a natural environment? For untold years lightning fires have been an environmental factor in the forests of the Sierra Nevada mountains. These fires had important effects on various ecosystems, along with other environmental factors, and contributed to the development of the existing complex of forests and wildlife here when the first pioneers began to inhabit the area. Some of these forest communities now appear to be altered from past conditions. Historical records indicate that many unnatural vegetation changes have occurred because of the effective fire suppression practiced during the past 30 – 40 years or more. Frequent natural fires had the following beneficial effects:

1. Periodic removal of dead fuels, such as needles, leaves, branches, fallen trees, and dead stems of brush.
2. Periodic thinning of young trees by killing those of insufficient size to withstand fire. This lessened competition, allowed more growth for individuals, and produced a more open forest. The resultant condition favored the survival of non-shade tolerant sequoia and pine seedlings over shade tolerant white fir and incense-cedar. Now pine and sequoia seedlings are lacking in some areas and in some areas fir may eventually dominate, radically changing the make-up of plant and animal communities.
3. The effects described in paragraphs 1 and 2 above reduced the ground and understory fuels so that fires seldom developed into - conflagrations destroying entire plant communities.
4. Forest litter was removed which exposed mineral soil, necessary for the germination of seeds of some plants including those of the sequoia.
5. Seeds of many brush plants require heat stimulation in order to germinate in nature. Fire encouraged reproduction while at the same time stimulating sprouting in existing shrubs, thereby providing plentiful and nutritious forage for certain animals.

These are only some of the factors that fire affects. There are undoubtedly many more.

An endeavor to restore more natural conditions in the various ecosystems of Sequoia and Kings Canyon National Parks is underway. In 1968 a long-range environmental restoration program was initiated. A number of management units were established in various vegetative types. Burning under prescribed conditions has been carried out in a number of these units. Additional work is planned.

Inventories are being conducted and comparison with similar control plots will be made to record changes relative to vegetation and wildlife. A Research Biologist is in charge of the research program while management is under the direction of the Chief Park Ranger, the Park Superintendent coordinates their efforts. Information received from this project may be applied in the future to other areas and Parks.

In addition to the use of prescribed fire to restore natural conditions, beginning in 1968 all lightning fires occurring above 8,000 feet elevation in the Middle Fork of the Kings River drainage were allowed to run their course. In 1970 this management unit was enlarged to include virtually all

contiguous Park lands above 9,000 feet elevation from the Kern and Kaweah drainages in the south to the South Fork of the San Joaquin River drainage on the north. In 1971, all of the Roaring River drainage south and east of Sugarloaf Creek and the Hockett Plateau from Cahoon Ridge east to the Hockett Crest were added to the management unit. This unit now includes nearly 70 percent of the area within these parks.

Control measures will be taken only when threat to human life **exists**, where unacceptable loss of natural resource values may occur, or when spread to lands outside the management unit seems imminent. All such fires are under continual surveillance. Progress on these burns is being closely monitored for useful information for possible application elsewhere in the national parks and other wildland areas.

CONCLUSIONS

We now have enough acreage burned under varying conditions to evaluate what has been done and determine methods to complete the job. It is my understanding that there will be approximately \$20,000 for this kind of activity in the 1973 fiscal year budget. If this is true and the appropriation continued for the next 5 years the burning in the critical areas should be completed and the reburn cycle started.

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