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CATASTROPHIC WILDFIRE IN CALIFORNIA
THE SEARCH FOR SOLUTIONS

National Park Service fire restoration, policies versus results: *What went wrong*

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Abstract

In the 1960s the US National Park Service developed a policy designed to restore the natural ecological role of wildland fire. The policy was driven by growing understanding of ecosystem management benefits, as reflected in the 1963 Leopold Report on wildlife management in national parks. The new policy was designed to reverse decades of aggressive wildfire suppression that had caused disruptions in habitats and vegetative communities, and unnaturally high wildland fuel accumulation. More than 50 years later, the policy has largely failed to achieve its goals. This failure is due not just to climate change and the rise of new fire regimes dominated by mega-fires. It also was due to a lack of clear and unified organizational commitment by many parks, along with continued administrative comfort with fire suppression-oriented thinking, particularly during the window of opportunity between 1970 and 2000. During this time program emphasis shifted from ecosystem restoration to hazard fuels reduction, and program direction from Natural Resources staff to Emergency Services personnel. Efforts to establish a balance between emergency response thinking and resource management thinking largely failed due to institutional barriers and funding/staffing decisions driven by the threat of large wildfires. Park managers became wary of natural fire regime restoration efforts after the 1988 Yellowstone fires and the 2000 Cerro Grande Fire. This accelerated the demise of the Leopold Report vision of restoring and maintaining the ecological role of natural fire. In its place, wildfire suppression philosophy again became predominant, as reflected in the National Fire Plan with its focus away from ecological fire use and toward hazard fuel reduction in support of protecting the wildland urban interface. Restoring the Leopold Report vision requires an interdivisional commitment by Park emergency response and resources management organizations, guided by leadership at all organizational levels. It now may be timely to establish an NPS advisory board on wildland fire management similar to the one that produced the Leopold Report. This Board should review wildland fire policy implementation over the past 58 years, determine whether the ecosystem restoration paradigm is still valid, and if so, then the types of leadership and organizational changes required to achieve it.

Origins and evolution

In the 1960s, the National Park Service (NPS) began efforts to restore the natural ecological role of fire after decades of fire suppression, in response to recommendations in the 1963 Leopold Report (Leopold et al. 1963), which specifically mentioned

the Sierra Nevada of California. The report stated that “a reasonable illusion of primitive America could be recreated, using the utmost in skill, judgment, and ecologic sensitivity,” and that “a national park should represent a vignette of primitive America.” A

substantial body of scientific literature on fire history and ecology in the Sierran parks was developed by many researchers in the 1960s and 1970s, including Harold Biswell, Richard J. Hartesveldt, David Parsons, Jan van Wagtenonk, and Bruce Kilgore (Pyne 2015: 46–49).

A common theme can be found within this research, as well as research conducted by many others to the present time: the restoration of fire was important not only for ecosystem structure and process, but also for preventing catastrophic wildfire impacts driven by unnatural fuel accumulations.

In response, resource managers, working with fire science research staff, developed a dual strategy to accomplish the goal for the reintroduction of fire: ecosystem restoration and maintenance. For restoration, natural fires, such as caused by lightning, were allowed to burn in plant communities where the natural fire regimes were still largely intact. These areas tended to be above 7,000 feet in elevation and often in remote wilderness.

For maintenance, both small and landscape-scale prescribed fires were ignited to mimic, and to begin to restore, the role of natural fire in plant communities where natural fire regimes had been significantly altered by decades of fire suppression. These areas tended to be in lower elevations and closer to developments where fire suppression had been more effective.

From the beginning of ecological restoration efforts in the late 1960s and early 1970s, resource managers recognized that multiple prescribed fires over several years would be required to restore natural fire regimes and associated vegetative communities within each burn unit. Through the Fire Return Interval Departure (FRID) system, along with its fire effects monitoring program, NPS was able to document the extent to which fire suppression had changed vegetative communities and the ecological landscape.

In mixed conifer forests in particular, it was generally impossible to reverse the effects of fire suppression

Mariposa Grove, Yosemite National Park | STEVE BOTTI



with a single-entry prescribed burn. Restoration was expected to take decades, covering tens of thousands of acres. After some 50 years of work to restore the natural role of ecological fire in mixed conifer forests of national parks in the Sierra Nevada, one would expect to see substantial progress on a scale like this. Yet the accomplishments have fallen short of program goals.

The reasons for the failure to achieve these goals will be discussed in this paper. The failure was due not just to climate change and the rise of new fire regimes dominated by mega-fires, although that certainly has exacerbated the problem. The lack of clear and unified organizational commitment by many parks, along with continued administrative comfort with fire suppression-oriented thinking, resulted in failure to aggressively pursue restoration, particularly during the window of opportunity between 1970 and 2000.

It is important to note that during this 1960s to 1980s period, NPS had a very small fire management staff. Only four parks nationwide had full time fire management officers (Sequoia-Kings Canyon, Yosemite, Grand Canyon, and Everglades). Fire suppression programs were usually managed by collateral duty employees, often within the Visitor Protection division at the park, regional, and national headquarters levels.

This created an organizational and functional split in the NPS fire management program. Fire suppression tended to reside in Visitor Protection, while the restoration of fire sometimes resided in the Resources Management side.

In some cases, rangers and wildland fire staff actively opposed efforts by resource managers to allow natural fires to burn. In others, the staff was supportive. Interestingly, at that time none of this work was viewed as “hazard fuels management,” which is a common term used today for fire management restoration and maintenance programs. The ramifications of this term, which are significant to NPS, will be explored below.

The first NPS fire policy manual, released in 1977 (NPS-18; later DO-18/RM18), established the basis for restoring the ecological role of natural fire. Actual program initiatives, however, came from individual parks; there was no coordinated national program.

In a sense, the programs established to allow natural fires to burn in high elevations, such as in Yosemite and Sequoia-Kings Canyon National Parks, drove the development of national policies to codify such programs.

To support NPS-18, a four-person NPS Washington office-level fire management staff was created at the National Interagency Fire Center (NIFC) in Boise, Idaho. This office (also called the NPS Fire Management Program Center) expanded the rudimentary park fire suppression programs (largely staffed by rangers) and the incipient attempts to restore natural fire regimes (largely staffed by natural resource managers) into an integrated wildland fire management program. Some natural resource managers began taking leadership positions in that office to help guide this process.

Throughout the 1980s and 1990s, the NPS-NIFC fire management office recognized that the center of gravity in NPS and interagency wildland fire management was tilted in favor of emergency operations/fire suppression, and that the interagency wildland fire community largely supported this view.

In response, the office developed a strategy to provide balance by attempting to remove all the impediments to establishing vigorous prescribed fire/natural fire (also called at various times “prescribed natural fire,” “wildland fire use,” “wildland fire for resource benefits,” or “wildfire for multiple objectives”) programs. For example, to signal clear intent, the office created separate budget line items for suppression and for prescribed fire/hazard fuel reduction operations and staffing.

Funding and political issues

Adopting the term “hazard fuel reduction” was a double-edged sword. On one hand it created a more receptive audience in the Department of the Interior (DOI), Office of Management and Budget (OMB), and Congress for funding the program. Appropriators could understand how “hazard fuels” could be a problem in wildfire suppression, while the ecological benefits of restoring natural fire regimes were still poorly understood in Washington.

The very active 2000 fire season resulted in the establishment of the National Fire Plan, which included a large federal appropriation on the order of



Giant sequoia groves burned during 2020 Castle Fire, Sequoia National Park | TONY CAPRIO / NATIONAL PARK SERVICE

\$1 billion for the federal fire management agencies. This increase greatly benefitted the wildland hazard fuels program and, for the first time, directed federal agencies to define the extent of wildfire threats to the Wildland Urban Interface (WUI, defined as up to 1.5 miles beyond the edge of developments) and develop programs to mitigate those threats. By 2006, the NPS hazard fuels budget rose to approximately \$33 million. In contrast, the 1998 fuels budget was \$7 million.

Congress and the Executive branch (represented through OMB and DOI) are political entities. Their policies and funding priorities are driven by the need to deal with urgent political issues. This context explains why the wildfire emergencies in 1988 and 2000, for example, produced the largest interagency wildland fire program funding increases in modern times. This also explains why the initially successful NPS efforts to codify the use of “fuels management” funds in support of its ecological restoration program in congressional appropriation language would fail to deliver the desired program benefits.

Congress and the Executive branch never viewed ecological restoration as an urgent political issue, certainly not on par with wildfire emergencies. Their expectations, along with those of DOI and US Forest Service, were always that the funds would achieve reductions in wildfire suppression costs and damages. Their increased focus on wildfire threats to the WUI pushed ecological restoration efforts further down their priority lists. The die was cast for the path toward current programs driven by a fire suppression-dominated philosophy and supported by hazard fuels reduction.

Adopting the term “hazard fuels,” and later “fuels management,” became a problem for NPS, as doing so obscured its goals of ecosystem restoration and maintenance through the use of fire. NPS fire leadership attempted to explain that the increase in living and dead “fuels” resulting from decades of fire suppression was hazardous to naturally functioning ecosystems, not just to infrastructure. However, after the 2000 fire season, and especially faced with growing congressional and OMB priority to protect

communities threatened by wildfire, that message was lost. The hazard fuel reduction program largely became viewed as existing to support aggressive expansion of emergency wildfire suppression.

Consequently, the value of the hazard fuels program tended to be viewed predominantly as its ability to reduce wildfire suppression costs. If these reductions did not occur over time, then the perception by appropriators was that the hazard fuels program was not of much value, and subject to budget cuts and to direction by them on how the funds must be spent.

This is exactly what occurred in the hazard fuels program. Prior to around 2010, fuels funds could be spent on projects near developments (that is, WUI) and also in non-WUI. This flexibility allowed NPS to conduct prescribed fires for hazard reduction purposes, as well as for ecosystem restoration and maintenance.

By 2010, OMB, dissatisfied that the fuels program funded after the 2000 fire season was not reducing wildfire suppression costs as they had been told it would, cut the hazard fuels budget and directed that 90% of the remaining fuels funding be spent in WUI. The effect of this direction was immediate and significant to the NPS.

For example, in 2009, the NPS treated approximately 89,000 acres with prescribed fire in WUI, and 137,000 acres in non-WUI (all prescribed fire acreage figures courtesy of NPS NIFC). Following the direction from OMB to emphasize WUI projects, by 2011, approximately 124,000 acres of WUI and 51,000 acres of non-WUI were treated with prescribed fire. By 2015, the figures were approximately 112,000 WUI and 2,265 non-WUI.

Parks that had used the funds to treat non-WUI grasslands with prescribed fire were especially devastated. In 2004, approximately 41,000 acres of non-WUI and 1,600 acres of WUI were burned in the Midwest Region. By 2019, those ratios had flipped, with approximately 680 acres of non-WUI and 37,494 acres of WUI burned. In the Pacific West Region, in which much of the prescribed fire activity is in California forest and grassland vegetation types, 3,662 acres of WUI and 4,376 acres of non-WUI were burned in 2004; in 2019, 4,889 acres of WUI and 140 acres of non-WUI were burned.

Cuts in, and redirection of, the NPS fuels budget translated beyond a reduction in acres. Reductions in fuels-funded staffing also occurred, from a Full Time Equivalent count (with one FTE equaling one full-time employee) of 353 in 2003 to 244 by 2011. Staffing cuts contributed to a reduction in acres treated, which led to continuing low return on the investment of fuels funds relative to the expected reduction of wildfire size and costs.

By contrast, the other major wildland funding category, preparedness, which is used to support wildfire suppression staffing, changed little over this period: 389 FTE in 2003 to 380 FTE in 2011. In recent years, wildland fire program funding cuts have, unsurprisingly, been taken from the fuels program, which uses fire, rather than from the preparedness program, which suppresses wildfire. (But to be fair, preparedness funds can also be used to manage wildfires allowed to burn for resource and other objectives).

Interestingly, throughout this period, the total area treated annually by NPS with prescribed fire remained relatively constant, typically ranging from around 120,000 to 200,000 acres (WUI and non-WUI together). For example, the total for 2017 was 200,333, composed of 136,984 acres of WUI and 63,349 acres of non-WUI.

However, of this 2017 total, three parks accounted for most of the WUI acreage: 40,759 acres from Big Cypress National Preserve, 62,808 from Everglades National Park, and 6,873 from Buffalo National River; for the non-WUI figure, 56,631 acres were from Everglades National Park.

This pattern of the majority of acres treated occurring in the grassy and lighter fuels of the southeastern and midwestern states happens annually not only in the NPS program but also other federal and state fire programs. A much smaller amount of burning occurs in heavier forest fuels found in western parks and national forests, even though these areas generally are in greater need of natural fire regime restoration than are parks dominated by grasslands.

As an example, in 2017, 148 acres of Yosemite WUI, 1,179 acres of Sequoia-Kings Canyon WUI, and 65 acres of Lassen WUI were treated with prescribed fire. These treated acres were far below the number

needed for restoration and maintenance identified in park fire management plans. The amount of non-WUI prescribed fire acreage in these parks for 2017 was zero.

The number of acres treated with prescribed fire can vary widely from year to year for a variety of reasons, including environmental compliance requirements, smoke management, funding, weather, and personalities of those involved. In the case of Sequoia-Kings Canyon, over 4,000 acres were treated in 1979 with prescribed fire, over 8,000 in 1995, and over 5,000 in 1999 (figures courtesy of Sequoia-Kings Canyon National Parks).

Interestingly, the use of prescribed fire in Sequoia-Kings Canyon during these early years was accomplished safely with a far smaller staff and fewer funds than were available post 2000 under the National Fire Plan. Similar results, with similar staffing, were accomplished during this period in Yosemite National Park.

While Sequoia-Kings Canyon treated over 5,000 acres in 2005, and over 2,000 acres in 2014, the acreage trend in the Sierran parks, and the NPS trend in general, has been downward for over 20 years. This is especially true for ecosystem restoration in western forest vegetation types.

The establishment of the term “hazard fuels” marked the genesis of the program failures that plague NPS wildland fire management today. The fact that this program is now referred to as “fuels management” reveals an important point about how the program evolved, and why it has failed to achieve the original vision and policy direction.

Risk aversion issues

An additional factor for the declining use of fire by NPS, and reduced support for ecological restoration with fire by the public, government officials, and the interagency fire community, was the memory of natural fires “running amok” in the Yellowstone area in 1988. Unsurprisingly, NPS superintendents, as well as line officers in other agencies, became wary of allowing natural fires to burn over long periods of time.

Managers’ unease with fire increased after the 2000 Cerro Grande prescribed fire at Bandelier National Monument, which escaped control lines and burned

into Los Alamos, New Mexico. Several Bandelier fire and resource management staff, and the park superintendent, were punished, despite being exonerated by the incident investigation report. This further reinforced the view among land managers and fire suppression personnel that managing large and long-duration fires for either ecological or hazard fuel reduction benefits threatened protection mandates and their careers.

This incident, combined with the mega-fire season throughout the West in the same year, and the “after-burn” memory of 1988, accelerated the demise of the Leopold Report vision of restoring and maintaining the ecological role of natural fire. In its place, wildfire suppression philosophy again became predominant, as reflected in the National Fire Plan with its focus away from ecological fire use and toward hazard fuel reduction in support of protecting WUI.

Suppression seemed a much safer choice for many managers, further bolstering the suppression community as the predominant voice in fire management. The use of fire to restore and maintain fire-dependent ecosystems became more difficult to do. This was especially detrimental to NPS since it was uniquely charged among all agencies with maintaining ecosystems in an unimpaired state, which requires the incorporation of natural and prescribed fire.

Staffing issues

Prior to the 2000 fire season, and especially after the advent of the National Fire Plan, NPS-NIFC had continued to press forward with establishing an expanded and professional fire management organization. The 1988 Yellowstone fires had also resulted in a budget increase, which allowed establishment of approximately 100 new fire management positions in the NPS, including the shift from collateral-duty to full-time fire management officers.

Within parks, the office funded dedicated prescribed fire crews, wildland fire use monitoring crews, fire effects monitoring crews, GIS technical support, fire education specialists, and planning staff using hazard fuels funds. It encouraged long-term prescribed fire planning rather than one-off projects by committing to multi-year funding priority for parks that developed five-year prescribed fire plans.

For about a decade (1990–2000), NPS made significant progress toward implementing its new policy and vision. But the seeds of failure were already germinating. Other agencies began committing to fuels management in the suppression sense, but lacked the NPS commitment to restoration of natural fire regimes. Their view greatly influenced budget justifications and program implementation.

Another somewhat subtle outcome of the budget increase was that NPS superintendents generally wanted fire management funding to be united in one place, and that was in ranger activities, not resources management. Also, there was a tendency of park fire management leadership to want to unify and to move the ecological and hazard fuel reduction dedicated personnel (also known as “wildland fire use,” “prescribed fire personnel,” “fire ecologists,” or “fire effects monitors”) into the suppression organization.

This decision stemmed from the legacy of wildland fire as an “emergency response” activity in contrast to an “ecological management” activity. In addition, the NPS policy direction to balance suppression of unwanted wildfires with restoring the ecological benefits of wildland fires was not generally supported by other federal land management agencies, with the exception of the US Fish and Wildlife Service.

NPS’s minority view within the interagency fire community gradually and steadily diminished its ability to influence interagency fire policy at state, regional, national, and congressional levels. Park managers felt isolated from interagency partners who became hesitant to commit “emergency response” resources to support the NPS ecological restoration mission.

Consequently, NPS wildland fire management programs today largely exist within ranger activities divisions, which are primarily emergency response organizations. Concentrating wildland fire management in emergency operations sent a strong message to natural resource managers, who felt excluded, and who lacked an effective avenue to direct the program to achieve ecological goals. Without any control over funding and staffing, they were marginalized, and decided to focus on other resource programs where they could be effective.

As a result, the strongest aspect of the early NPS fire program, which was the involvement and

interdivisional cooperation of resource management, ranger, and fire management staffs in planning and implementing fire-dependent ecosystem restoration and maintenance, was broken. With some exceptions, this break largely continues to this day at the park, regional, and national level.

After 1995, part of this break was driven by the new Interagency Fire Program management job qualifications. More stringent job qualification requirements gradually pushed fire management personnel into more wildfire suppression assignments to meet training and experience requirements, and away from wildland fire use/prescribed fire.

Many NPS ranger and resource management staff could no longer meet the stricter fire management training and experience requirements, especially as funds and backfill staffing were reduced and it became more difficult for an individual to break away for a two-week fire assignment. Consequently, they were not able to qualify for and participate in fire management operations, further weakening interdivisional participation in NPS fire operations.

More subtly, opportunities for young NPS staff to gain experience in fire management operations as they constructed a career portfolio were also reduced or eliminated. Such opportunities were traditionally an important part in the development of NPS staff, and in particular for those individuals who one day would find themselves as a superintendent or chief ranger managing a fire program.

Thus, both the interagency fire community generally, and many NPS units, almost universally viewed the goal of restoring natural fire regimes as subservient to the goal of suppressing unwanted wildland fire. Most park superintendents generally supported this view, although there were, and are, notable exceptions around NPS.

Interagency issues

After 2000, a major change occurred that significantly affected NPS fire budgets. The DOI interagency wildland fire congressional budget justifications and appropriations became largely unified, and the NPS share of that program was only about 15%. It is important to point out a critical consequence to NPS which occurred, and continues to occur, because of this unification.

The interagency fire management community is strongly unified in policies, operations, training, qualifications, and many other facets. Indeed, the strength of this program is due to the common standards and procedures that exist to facilitate sharing fire management resources across agency boundaries. This is especially true for wildfire suppression operations, which is the bulk of its work and is the common dominator of fire management policies among local, state, and federal fire agencies.

By contrast, there is no “interagency resource management” community as a counterweight for the use of fire. While all agency managers are required to follow air quality, cultural resource, and endangered species laws, for example, each agency has its own natural and cultural resource management mission and policies.

An agency that favors wildfire suppression to support its mission will benefit from the interagency fire management program, which is weighted towards suppression operations. An agency that requires the use of fire to support other aspects of its mission, as NPS does, has a much more difficult time acquiring and dedicating agency and interagency fire management funds and personnel because this use sometimes occurs concurrently with the wildfire suppression season.

As a result, it is not unusual to find the NPS use of fire to be at odds with its interagency fire management partners at the local, state, regional, and national levels, especially for long-duration natural and prescribed fires, since personnel assigned to these fires are unavailable for suppression operations. Prescribed fires are often postponed or canceled, and natural fires in wilderness are suppressed, which, while freeing up fire staff to deal with wildfires elsewhere, results in the continuing degradation of fire-dependent ecosystems. This consequence is not exclusive to NPS.

Some NPS fire staff did attempt to support both the fuels and suppression parts of the program. However, it was not unusual for fire staff to present resource management staff with prescribed burn plans developed in haste after the wildfire season, only to have them rejected because of insufficient time for environmental compliance review. In any case, prescribed fires were not done, the project funding

went unspent, and, once again, acres went untreated with prescribed fire.

Essentially, the policy initiative to restore the natural ecological role of wildland fire never really had a permanent home in NPS. Instead, the “fuels management” program was born. In spite of the budget increase, it was difficult to obtain commitment from emergency services personnel to complete the planning and provide resources for lengthy treatment projects when their first priority was suppression.

Scarce program funds became focused on activities such as short-term mechanical “fuels” reduction to protect infrastructure and WUI via cutting of small trees which are burned in piles rather than on landscape-scale prescribed fire. Large, long-duration prescribed and natural fires were always somewhat problematic, both to superintendents dealing with smoke complaints, and for fire staff who preferred to be available for wildfire assignments rather than planning and executing fuels projects.

Reclaiming the vision

Leadership. The NPS vision of an integrated, science-based wildland fire management program was mostly top down, often without firm commitment and continuity at park level. Consequently, results of the fire program, such as acres restored or maintained with fire, depended on local personalities.

To be successful, the vision and commitment for a program must come from the bottom of an organization, as well as from the top, and be interdivisional. An interdivisional approach ensures cross-connections exist to support the continuance of the fire program as line officers, resource staff, ranger staff, and fire staff change.

A critical lesson learned was that even a fully funded program would not succeed without commitment at all organizational levels to actually do the work. NPS had sufficient funding in the 1990s and even more funding flexibility after 2000, but the result was that as the hazard fuels management budget increased, the number of ecosystem restoration and maintenance projects decreased, and funds turned in unspent each year also increased. In other words, although funding is often cited as a barrier to project accomplishment, often that is not true.

The goal of restoring the natural ecological role of fire will not succeed as long as managers think it's safer to focus on wildfire suppression (bad outcomes can be ascribed to acts of God rather than mismanagement), and riskier to implement landscape-scale prescribed fires, or wildfires allowed to burn for resource benefits.

Program success requires that managers indicate their commitment, establish clear priorities, and send the right signals to staff. As long as managers view fire suppression as the path of least risk, then staff will view it as the path of least resistance.

Federal fire policy: Use its flexibility. Federal fire policy changes around 2009 allowed greater flexibility in the use of wildfire to accomplish resource management objectives. In response, fire managers are using this flexibility to produce a blending of the objectives for a prescribed fire with the operations of a wildfire.

There is also evidence that this change in policy may have inadvertently discouraged the use of fire for resource benefits. The specific classification of “wildland fire use” to indicate fires allowed to burn for resource benefits was eliminated; these types of fires were combined into a general category of “wildfire.” Seielstad (2015) believes that, as a result, the fire use program “lost energy and focus,” and the change “may be discouraging managers from exercising a full range of options.”

This is especially interesting considering that prescribed fire as a planned event is subject to more environmental compliance planning and review than a wildfire, which is an unplanned event. Not surprisingly, wildfires are becoming the path of least resistance as a resource management tool where such fires can be allowed to burn, in part or entirely, with low risk. Indeed, they may be “the best option for fuels reduction and forest restoration over a large proportion of the landscape” (Miller et al. 2012). Of course, for the reasons discussed above, using wildfires as the path of least resistance to achieve ecological restoration objectives leaves program control comfortably under emergency operations, and continues to diminish the role of ecologists and resource managers.

One problem with this approach is that wildfires occur randomly and often under drier conditions

than those required for prescribed fires (especially for restoration projects that require multiple-entry prescribed fires to gradually reduce heavy wildland fuel accumulations). While often suitable for wilderness areas, wildfires are somewhat of a blunt tool to use near developments, where prescribed fire can be used more surgically and with greater precision of location, duration, and effects. It is easier to document the extent to which prescribed fires achieve restoration and maintenance goals than it is to document this for wildfires or for sections of wildfires managed for resource benefits.

Another problem is, during periods of severe national demand for suppression resources, local and interagency fire suppression managers are often reluctant to commit suppression resources for extended periods to permit specific sections of fire perimeters to burn for ecological benefits.

During periods of suppression resource scarcity, park managers can feel pressure to select more full-suppression strategies so fire can be controlled more quickly and resources released for other more pressing assignments. This may be especially true when natural fires are small and can be more easily suppressed. The continued triumph of suppression tactical thinking over resource management ecological benefit thinking in order to avoid fire suppression resource shortages continues to tip the balance away from restoring the ecological benefits of wildland fire.

It is ironic that even though large, long-duration fires burning under variable conditions may have always been more important to ecological health than small, limited duration fires, they continue to be viewed as problematic for emergency response-oriented organizations. Long-duration fires require long-duration commitment of fire staff and resources and because of changes due to weather, fuels, topography, and other wildfire activity.

Mitigate risk aversion through shared participation. As noted by Schultz et al. (2019), beyond funding and staffing issues, “owing to a lack of incentives and the prevalence of risk aversion at multiple agency levels, active prescribed fire programs depend on the leadership and commitment of individual decision-makers and fire managers.”

The downside to this approach is that it concentrates the acceptance of risk of a bad outcome on those individuals, which in turn rests the program and its accomplishments (or lack of them) on a few personalities. Consequently, accomplishment can vary widely as staff changes occur.

The antidote to this variability requires sharing of risk and responsibility by re-empowering natural resource managers as joint partners in setting program goals, managing staff, and implementing projects. This joint commitment is based on knowledge that resource integrity and resiliency will be or may be lost if fire is not used to restore or to maintain fire-dependent ecosystems, and weighs that knowledge against the risk of a bad outcome if a prescribed fire is ignited, or a natural fire is allowed to burn.

The iconic example of this risk are the giant sequoias, which are degraded both by the lack of fire in terms of reproduction and by too much fire if fire exclusion or suppression results in a build-up of hazardous amounts of fuel that cause tree mortality

following intense wildfire, as happened in Sequoia National Park in 2020. While prescribed fire may be postponed, wildfires cannot be, and they will burn severely through whatever fuels have been left untreated.

Re-empowering resource managers will also require re-thinking the incident qualifications system that currently impairs their ability to effectively participate as joint partners. This does not imply that job qualifications and training requirements must be reduced, but rather that they be oriented to the specific skill sets required for planning, conducting, and approving prescribed fires and wildfires managed for resource benefits.

The goal to mitigate risk aversion through shared participation can be achieved by developing interdisciplinary NPS teams, in addition to incident command team resource advisors, to manage these types of fires. In the 1970s and 1980s park natural resource managers were able to successfully manage prescribed fires and natural fires managed for

Coffey Park neighborhood, Santa Rosa, California, burned during 2017 Tubbs Fire. | CALIFORNIA HIGHWAY PATROL



resource benefits that were several thousand acres in size. Combining the ecological and fire behavior/fire effects expertise of resource managers with the suppression response expertise of the emergency response staff would provide a more complete and more effective array of qualifications than the current requirements.

Both fire and resource managers need to agree on the location, objectives, and size of areas subject to restoration and maintenance if the program is to operate at a scale significant enough to deal with the ramifications of climate change in terms of wildfire risk, and build resiliency to this risk. (Note that “risk” cannot be avoided. If management cannot accept the risk associated with the use of fire to reduce wildland fuels, the risk is transferred to the eventual occurrence of a catastrophic wildfire in the untreated fuels).

Funding. It is not commonly known that the NPS fire management program is funded almost entirely by the DOI wildland fire appropriation. While this is the main source of funding, it does not have to be the only source. Indeed, when the NPS FIREPRO funding system was established in the 1980s to distribute the DOI funds, it was never intended to be the only funding source, only a supplement to dedicated agency funding also used for its fire management programs.

Over the years, this distinction was lost; around 2014, it was noted that while hundreds of NPS fire positions were funded via the DOI appropriation, only around a dozen were funded by NPS funds. Consequently, as noted in the OMB direction to focus hazard fuel funding on WUI, the NPS fire program, and, in particular, its ecosystem restoration and maintenance portion—so vital to the agency’s mission—became subject to unpredictable oscillations.

The DOI-level fuels program, and rules under which it accepts, ranks, and funds candidate proposals, change over time. The NPS fuels program can, and has, become less competitive relative to other DOI fire programs over time, especially within those agencies with greater amounts of WUI.

To stabilize the funding oscillations, especially during a period of climate change, increasingly severe

wildfire, and a critical need to build resiliency in ecosystems vulnerable to these factors, NPS must consistently allocate funding to the fire program, at least in its resource management-related aspects.

This idea of diversified funding mechanisms is not new. In 2013, the NPS-NIFC office examined several NPS non-fire funding types as potential opportunities for fuel projects. These included recreation fees and concession franchise fees, as well as various natural and cultural management funds.

In 2020, the NPS directorate contributed funding to the hazard fuels program. Approximately \$3 million was allocated to project work, such as construction of fuel breaks, in Yellowstone and Crater Lake National Parks. While this is a positive step, it still concentrates resources on enhancing wildfire suppression rather than on ecosystem restoration and maintenance. One million dollars was allocated for crews to perform this project.

The 2020 contribution was a very positive development that will greatly stabilize the NPS fuels program. It’s a mistake for NPS to assume that the DOI wildland fire appropriation is sufficient, or even appropriate, for the type of ecosystem restoration and maintenance program NPS needs to support its mission, on the scale required.

An interesting example of a missed opportunity for joint resource management/fire management cost sharing at the national level was the coincidental creation of the National Fire Plan and the NPS Natural Resource Challenge, both of which occurred around 2000.

The plans were undertaken to strengthen federal agency fire and NPS resource management programs, respectively. Little or no coordination occurred at the time to examine opportunities to mesh together these funds to more efficiently use fire to accomplish resource management objectives.

Nothing prevented this coordination, other than perhaps ingrained institutional thinking and habits, and no reason prevents it from occurring today. Indeed, in a recent conversation with former NPS Director Bob Stanton, who announced the Natural Resource Challenge program in 2000, he stated that

it never occurred to him to incorporate wildland fire into the Challenge program, but, in retrospect, he should have.

The basis of success: Interdisciplinary commitment.

NPS has over 60 years of experience in the use of fire to achieve both wildfire protection and resource management objectives. Especially in western parks, the use of prescribed fire to achieve these objectives has continued to shrink, offset somewhat by a greater use of wildfire to accomplish the same objectives.

Although NPS dedicated staff to manage ecological restoration of wildland fire and hazard fuels reduction treatments, this was never a stable arrangement. The dichotomy of training, goals, and program vision between natural resource managers and science staff on one hand, and fire suppression/emergency response managers on the other, created inherent organizational and program instability.

Successful programs require critical and stable commitments from many levels of a park—superintendents, division chiefs, environmental compliance staff, scientists, resource managers, emergency services staff, etc. If any one of these is removed from the fire management program and organization, then the critical mass cannot be maintained and the program fails.

The complexities involved in the use of both natural and prescribed fire require superintendents to establish interdivisional and interdisciplinary teams, in contrast to placing responsibility for the program within suppression-oriented organizations and emergency operations. Successfully restoring the ecological role of wildland fire will require re-establishing staffing and funding dedicated to this purpose. Continuing to drain fuels staffing and cut fuels funding to support wildfire suppression assignments and avoid cuts to preparedness funding will ensure that the program continues to suffer from lack of timely planning and lack of flexibility to execute prescribed burns when prescription windows are favorable.

Interdisciplinary teams have been successful in other venues, such as NIFC. If agencies with different missions can implement effective, seamless wildland fire planning and operations at NIFC, parks, regions,

and program centers also should be able to make this model work.

Interdisciplinary program success can only be achieved if park staff at all levels recognize a binding commitment to the program planning objectives. This commitment must be supported by performance measures and institutionalized procedures that can survive staffing changes.

But forming planning teams is not enough. Quantifiable objectives defining the desired results of the fire program, stated in a park's Fire Management Plan and accompanied by monitoring that measures progress toward these results, is essential. Effective programs must operate at a significant scale to meet the fire management objectives of both fire and resource staffs. This scale is quite large. The restoration and maintenance of fire in the mixed conifer forests of Sierran national parks, for example, require annual project areas on the scale of several thousand acres. The answer to how this is accomplished is not simply found in the budget. It requires a commitment of personnel to do the work.

A recent George Wright Society prescribed fire workshop was titled "Fire Management 24/7/365: A Workshop on the Mitigation of Wildfire Risk in Mixed-Conifer Forests of California." Likewise, the restoration and maintenance of fire to NPS ecosystems is also a 24/7/365 activity, and must be funded and staffed as such to reach the NPS goals of nonimpairment and establish ecosystem resiliency to the effects of fire suppression and climate change.

Attaining these goals is not a burden that NPS can place solely on its fire staff. Without the quantification of ecosystem restoration and maintenance objectives, workforce development, and joint commitment, all at an interdivisional level, it becomes much too easy to move the goal posts around to arrive at a program which, while perhaps comfortable to management in terms of risk, is woefully inadequate to deal with climate change-driven wildfires and to build ecosystem resiliency to them.

The discrepancy between what needs to be, and what actually is, treated with fire, continues, along with ecosystem vulnerability to wildfire. Recently,



Giant sequoia groves burned during 2020 Castle Fire, Sequoia National Park | TONY CAPRIO / NATIONAL PARK SERVICE

hundreds of thousands of acres of mixed conifer forests in national parks have burned by unnaturally intense wildfires, despite suppression efforts. Understanding the ecological impacts of these events, and incorporating this knowledge into revised fire program goals and objectives, will require the guiding hand of park resource managers and scientists.

The scope of catastrophic wildfire in California national parks. The early research upon which the NPS prescribed fire program was based universally

predicted that if fire was not returned to a more natural ecological role, catastrophic wildfires would occur. This prediction has come true. In 2018, the 97,000-acre Woolsey Fire burned almost all of Santa Monica National Recreation Area, and the 230,000-acre Carr Fire burned almost all of Whiskeytown National Recreation Area.

In 2020, the Dome Fire burned 43,000 of prime Joshua tree forest in Mojave National Preserve; the 81,000-acre Caldwell Fire burned 70% of Lava Beds

National Monument; and the Castle Fire Complex burned 174,000 acres, including 18,000 acres in Sequoia National Park, and killed hundreds of giant sequoias in and around the park. In 2013, the 257,000-acre Rim Fire burned into Yosemite National Park, as did the 97,000-acre Ferguson Fire in 2018. In 2015, the 152,000-acre Rough Fire burned into Kings Canyon National Park.

The escalating size and severity of wildfires, as noted by Miller et al. (2009), are reflective of the shortfall between vision, goals, and results that has defined much of the history of the NPS fire management ecosystem maintenance and restoration program. This shortfall will continue to expose park natural and cultural resources to destruction from wildfires that are exacerbated by climate change.

Next steps: An advisory board on wildland fire management

This paper has explored the lessons and history indicating why using fire for ecosystem restoration and maintenance has not happened in national parks in the Sierra Nevada and elsewhere, or at best happened only sporadically over the past 60 years. These lessons provide a solid basis for refining the program so that it can better match planning for the use of fire with accomplishments, for both resource management and hazard fuel purposes. The need to restore and to maintain a more natural role for fire in NPS units has never been greater.

As noted in the beginning of this paper, in the early 1960s the ineffectiveness of NPS wildlife management programs, and the controversy surrounding them, led DOI to establish the Special Advisory Board on Wildlife Management. This board issued the Leopold Report, which revolutionized NPS policy relating to wildland fire management.

It may now be timely to establish a similar advisory board on wildland fire management to explore in more depth the issues discussed in this paper. However, unlike the 1962 board, which focused on scientific and to some extent philosophical issues, a fire program review board should be composed of individuals with expertise in administration, organization, and policy implementation as well as science. Like the 1962 board, the individuals should be independent of the NPS fire program.

The NPS wildland fire policy and program development that grew from the Leopold Report produced a wealth of knowledge about natural fire regimes and associated ecosystem function. However, today large and intense wildfires are a common occurrence within many parks. The size, intensity, and frequency of some of these fires, possibly induced by climate change, are thought to be beyond the range of variability that characterized natural fire regimes, at least for the past few centuries, and raise issues unknown when the Leopold Report was written.

In other words, if the restoration of “vignettes of primitive America” is no longer practical, then how should fire be used as a tool? What do “non-impairment” and “resiliency” mean during climate change, especially given the rise of “megafires” of unprecedented size and severity? These are not issues that NPS fire staff can answer by themselves, and are not issues that affect solely the fire program. But addressing them within the context of the fire program will be useful to many other NPS resource management programs that are faced with similar policy and management questions.

Fire regime changes, along with changes in the structure and composition of vegetation communities, may impact the goals and objectives of prescribed fire programs. This could affect both ecological restoration and hazard fuels reduction goals and objectives. An advisory board on wildland fire management should investigate these questions along with administrative and organizational impediments to achieving program goals and objectives.

The purpose of this paper is to provide a broad overview of these issues. A more detailed review should explore case studies of how wildland fire programs evolved and were implemented in various parks. The Sierra Nevada parks, which were an early focus of the Leopold-induced policy changes and specifically mentioned in the Report, would be logical candidates for this type of review.

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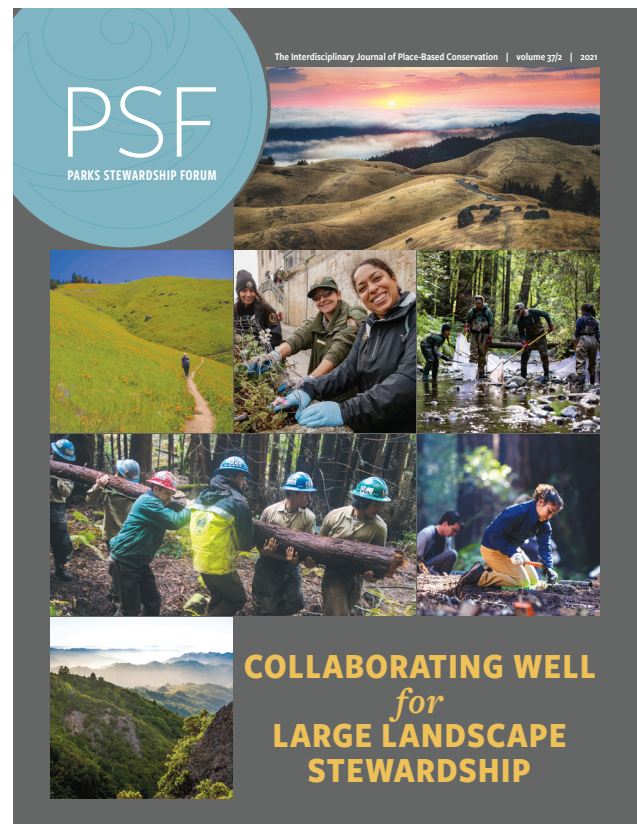
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On the cover of this issue

A montage of images from [One Tam](#), a collaborative partnership to manage the landscape of Mount Tamalpais in California, along with one from Alcatraz Island in Golden Gate National Recreation Area.

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