Restoration of Natural Fire to United States Wilderness Areas

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Abstract—The restoration of fire to its natural role in wilderness has proven to be a significant challenge to the United States Federal wilderness management agencies. Although both natural (lightning) ignitions and management-ignited fires have been generally accepted as appropriate wilderness management tools, the implementation of wilderness fire management programs has been incomplete and inconsistent. Program constraints and consequent emphasis on fire suppression have limited accomplishments to date. The fact that even the most successful wilderness fire management programs have been largely unable to restore presettlement fire regimes raises serious questions about future program needs and priorities. Issues and challenges in need of attention are identified.

The traditional view of fire, as a force to be eliminated from wildland ecosystems, has been largely replaced with a recognition of the important role of natural fire in sustaining healthy native ecosystems. Yet, the restoration of fire to its natural role presents a significant challenge to United States wilderness management agencies. Following nearly a century of aggressive fire suppression, wilderness managers in the Bureau of Land Management, Fish and Wildlife Service, National Park Service, and Forest Service are now struggling with how best to restore fire to at least a semblance of its natural role. This struggle involves questions of policy, public perception, management, and science. In this paper, I review the status and accomplishments of the wilderness fire management programs of the four United States wilderness management agencies. I specifically address the challenges facing efforts to restore natural fire to United States wilderness areas.

Background

From its inception in the latter half of the 19th century, park and wilderness management in the United States has emphasized the protection of scenery and recreational opportunities (Graber 1995; Sellars 1997). This strategy has been likened to museum curation, with an emphasis on the protection of desirable vignettes of primitive America. It failed to recognize the importance of ecosystems as dynamic entities, dependent upon natural ecological processes that constantly change the landscape. Fire was considered an enemy, a destroyer of wilderness resources and values, including animals, vegetation, and scenery. The elimination of fire was considered essential to the protection of park and wilderness values. This thinking was largely consistent with the understanding of ecosystems as static entities that characterized ecological thinking of the times (Christensen 1995).

Passage of the United States Wilderness Act in 1964, codified the protection of "an enduring resource of wilderness" to be "protected and managed so as to preserve its natural conditions." Wilderness was to be managed so as to be "affected primarily by the forces of nature." Yet, although some observers had recognized the role of fire as an important "force of nature" decades earlier (Chapman 1912; Weaver 1943), the 1964 Wilderness Act only addressed the need for "the control of fire." Early wilderness policies of the four Federal wilderness management agencies mirrored this concern.

The latter decades of the 20th century have seen widespread recognition of the importance of fire and the effects of fire exclusion on natural ecosystems. The elimination of fire has been recognized as a cause of increasingly hazardous fuel accumulations and shifts in vegetative cover and succession that threaten to change the very nature of many native ecosystems (Brown and others 1995; Kilgore 1987; Leopold and others 1963). This understanding has led to a shift in the emphasis of wilderness fire management from fire exclusion to restoring fire to its presettlement role (Parsons and Botti 1996). Although fire exclusion is now recognized as one of the leading threats to the preservation of wilderness ecosystems (Cole and Landres 1996), acceptance of the use of fire as a management tool has been difficult. Despite the fact that current management policies of the United States wilderness agencies recognize the importance of fire as a natural ecosystem process, implementation of wilderness fire management programs is lagging and has varied greatly among the agencies.

Wilderness Fire Management

Wilderness fire management may include: permitting natural ignitions to burn (fires traditionally called prescribed natural fires, or PNF's—beginning in 1998, terminology was changed to "wildland fires managed for resource benefits;" however, in this paper I use the traditional terminology of PNF; the use of management ignitions (traditionally called management ignited prescribed fires, or MIPF's); and the suppression of unwanted fires. Natural

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fires (PNF's) that are permitted to burn only when specific, prescribed, conditions are met, are generally accepted as the preferred means for restoring fire in wilderness. Management ignitions (MIPF's) are most often used to accomplish specific objectives, such as fuel reduction, habitat improvement, or simulation of the effects of natural fire where lightning ignitions cannot do the job (Brown 1992; Mutch 1995). Management ignitions are often controversial because they are seen by some as human-caused intrusions in wilderness. Suppression remains the preferred option in those cases where the use of PNF or MIPF may cause unacceptable social or economic risks, or resource damage. Continued suppression of fire in areas adapted to periodic burning generally leads to increasingly hazardous fuel accumulations and loss of natural vegetative patterns (Christensen 1995), conditions that, in turn, only increase the dilemma of how to manage fire as a natural process.

In 1988, extensive fires (including some that started as PNF's but were later declared wildfires) burned more than 1.5 million hectares (3,706,500 acres) throughout the Western United States. These fires had a significant and immediate impact on the wilderness fire programs of the Federal agencies. All wilderness fire plans were suspended as an interagency Fire Management Policy Review Team reviewed program objectives and implementation. Although this review endorsed the major policy objectives, it also recommended changes in implementation strategies. No PNF's were permitted, and few MIPF's were conducted in 1989. Increased operational constraints resulting from the review limited the re-establishment of PNF programs, in part, by limiting those fires permitted to burn to situations where risks to social and natural values were minimal (Botti and Nichols 1995; Parsons and Landres 1998). Such restrictions are likely to eliminate those fires that would have the greatest ecological effect. Even a 1990 United States General Accounting Office Report (U.S. General Accounting Office 1990), criticizing the limited progress in restarting the prescribed fire program, seems to have had little impact. Despite concerted efforts to cooperate in the implementation of new coordinated wildland fire management policies (Glickman and Babbitt 1995), each of the wilderness management agencies continues to largely pursue their individual approaches and strategies for managing wilderness fire.

National Park Service

The National Park Service first formally acknowledged the detrimental effects of fire exclusion on natural ecosystems by recognizing fire as a natural process in its 1968 policy revision (van Wagtendonk 1991). Later that year, two lightning fires were permitted to burn and a 600 hectare (1,485 acres) prescribed burn (MIPF) was carried out in the subalpine forest of California's Kings Canyon National Park (Parsons and van Wagtendonk 1996). These actions initiated the first natural fire management program in the United States. By 1988, 26 National Parks had operational prescribed natural fire programs (so called because lightning ignitions were only permitted to burn under prescribed conditions). Interestingly, this is the same number of parks that had approved PNF programs in 1997. In contrast, the number of parks using prescribed fire (MIPF's), the number of fires, and the acreage burned by them has continued to expand in recent years (Botti and Nichols 1995).

As of 1997, 26 National Parks had approved PNF programs (this excludes the Alaskan wilderness parks that use a limited suppression strategy). These programs included 17 of the 36 parks (excluding Alaska) with designated wilderness, meaning nine nonwilderness parks also use the PNF strategy, while 19 wilderness parks do not use PNF's.

Sixty-two parks conducted MIPF's during either 1996 or 1997, including all of the 17 wilderness parks that have PNF programs. National Park Service policy approves the use of MIPF's for the "protection and preservation of wilderness character and resources," and the use of management ignitions is widespread within the agency, including within designated wilderness (Botti and Nichols 1995).

The National Park Service maintains the most complete fire records of the Federal wilderness agencies, including by year since inception of the program in 1968, the number of fires and total area burned by fire type (PNF, MIPF, or wildfire) for each unit in the system. Unfortunately, NPS fire records do not distinguish between wilderness and nonwilderness lands, a practice reflecting both the fact that many large natural area parks have never received Congressional designation as wilderness (such as, Glacier and Yellowstone National Parks), and a general perception by some NPS managers that wilderness designation is an unnecessary duplication of the agency's mission as expressed in the 1916 Organic Act (Sellars 1997). Because PNF programs are limited to large natural area parks that the NPS manages essentially as wilderness, I have included all National Park Service PNF programs in my analyses. The lack of distinction between wilderness and nonwilderness areas in the fire records presents a more serious problem for MIPF's because many of these prescribed fires occur in or around developed areas that are likely not to be designated wilderness or on lands that do not contain wilderness characteristics.

The area burned by natural fires in National Parks since the inception of the PNF program in 1968, shows a gradual increase through 1988, followed by a dramatic decrease (fig. 1). A reduction by over 50 percent of the mean number of PNF's per year since 1988 (154 PNF's per year in the 5 years prior to 1988 and 71 per year between 1993 and 1997), further dramatizes the effects of the post-1988 constraints on the wilderness fire program of the Park Service. Because PNF's are the preferred means of restoring fire to wilderness, this failure to recover to pre-1988 burning accomplishments is of great concern. Comparison of area burned by PNF's to that which fire history records (Swetnam 1993) indicate would need to be burned to approximate presettlement fire frequencies, suggest that even the pre-1988 fire management accomplishments were well short of that required (Parsons 1995; van Wagtendonk 1995). The lack of clarity (wilderness versus nonwilderness) in the MIPF records makes it difficult to evaluate the extent to which prescribed burns may have made up for the lack of PNF's. No effort has been made to evaluate differences in intensities or ecological effects of those fires that have occurred in recent years, compared to those that burned under presettlement conditions.

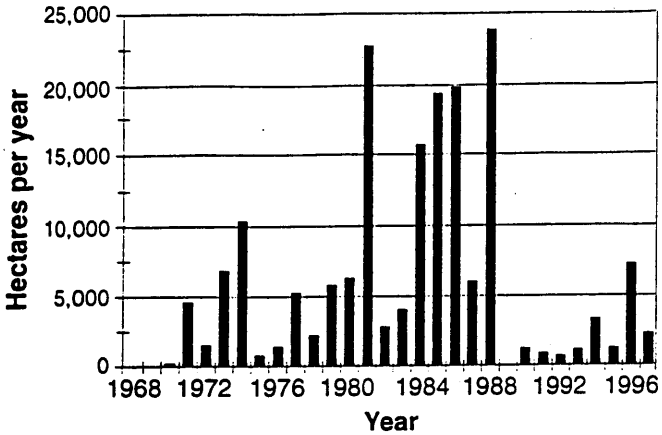

Figure 1—Number of hectares burned by the National Park Service by prescribed natural fire, 1968 to 1997.

Forest Service

The Forest Service first revised its policy of total fire suppression to permit natural fires in wilderness in 1971. The first lightning-ignited fires permitted to burn on Forest Service land were in the Selway-Bitterroot Wilderness in 1972 (Williams 1995). Although areas such as the Selway-Bitterroot and Gila Wildernesses are notable for their progressive wilderness fire programs, as of 1997, only 58 of 398 Forest Service wildernesses had approved fire management plans that permitted the use of PNF's. Most of the other Forest Service wilderness areas are managed under a total suppression strategy, although some areas practice versions of a confine-contain strategy that incorporates many aspects of a PNF program. The Forest Service makes little use of PNF's outside of designated wilderness, with only one nonwilderness PNF being reported in 1997.

Since 1985, Forest Service policy has permitted limited use of management-ignited prescribed fire in wilderness to reduce unnatural buildups of fuel, but only if:

1. The use of prescribed fire or other fuel treatment measures outside wilderness is not sufficient to achieve objectives within wilderness.
2. An interdisciplinary team of resource specialists has evaluated and recommended the proposed use of prescribed fire.
3. The interested public has been involved appropriately in the decision.
4. Lightning-caused fires must be suppressed to avoid threats to life or property within wilderness—or to life, property, or natural resources outside of wilderness.

These conditions have largely restricted the use of MIPF's in Forest Service wilderness to the National Forests of Florida, for which the Chief of the Forest Service granted a 1995 blanket approval for use of MIPF's for resource objectives. Concern over the prohibition of management-ignited fires in wilderness is taken so seriously that a 690 hectares (1,705 acres) 1998 prescribed burn on the Bitterroot National Forest in Montana was suppressed as it spread upslope into the Selway-Bitterroot Wilderness. Recognition of the need to restore fire as an ecological process, coupled with restrictions that continue to require that many lightning-ignited fires be suppressed, has led to increased support for a wider application of management ignitions in Forest Service wilderness (Brown 1992; Mutch 1995). However, a recent proposal for the use of MIPF's in the Frank Church River of No Return Wilderness in Idaho has been stopped by appeals submitted by environmental organizations philosophically opposed to the use of management ignitions in wilderness (Stokes, personal communication).

Although the Forest Service is more diligent than the National Park Service about distinguishing whether individual fires occur within designated wilderness, Forest Service fire records are incomplete and inconsistent. Incomplete fire records and the lack of a centralized record-keeping system make it difficult to assess Forest Service wilderness fire trends. Figure 2 represents our best effort to pull together PNF records from the National Interagency Fire Center in Boise and the fire and wilderness records of each Regional Office of the Forest Service. Although these records show an increase in area burned by PNF from 1995 to 1997, compared to that prior to 1988, virtually all of that area can be accounted for by a small number of large fires in Arizona and New Mexico (1995 and 1997), respectively, and Oregon and Montana (1996). Many of the 1996 fires actually had to be suppressed as they escaped their prescribed boundaries and threatened nearby communities. The Pacific Northwest Region of the Forest Service has been reluctant to restart its PNF program following that experience.

A recent communication from managers of the Bob Marshall Wilderness in northwestern Montana claims that since 1988 the average number of PNF's per year has dropped by over 50 percent, and the average size of PNF's has dropped from 108 to 27 ha (267 to 67 acres). Also, only 19 percent of all eligible fire starts in the Bob Marshall have been managed as PNF's, and 94 percent of the total area burned by PNF's was burned in the single season of 1988

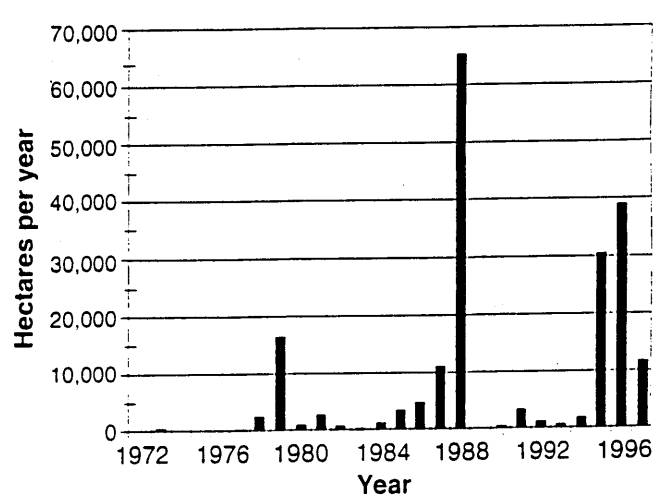

Figure 2—Number of hectares burned in Forest Service wilderness by prescribed natural fire, 1972 to 1997.

(Eckert, personal communication). Another problem with the Forest Service fire data is that area burned under the confine-contain strategy is reported as suppressed wildfires. It is unclear whether the Forest Service PNF program has actually made significant progress in recent years or whether the relatively high amount of area burned in 1995 to 1997 may be more a reflection of a few isolated occurrences (Parsons and Landres 1998).

The limited data available to compare accomplishments of the Forest Service wilderness fire program with what would be required to match presettlement fire return intervals, show that average annual area burned prior to suppression was 1.5 to 1.9 times greater than during recent years (Brown and others 1994) in the Selway-Bitterroot Wilderness. Although data are limited to make similar comparisons for other areas, there is no question that both scientists and managers are greatly concerned about increasingly unnatural conditions under current management practices (Hardy and Arno 1996).

Bureau of Land Management

Despite recognition in Bureau of Land Management policy that "Natural fire (such as, lightning-caused) is normally part of the ecology of the wilderness..." and that "...it may be appropriate to allow natural fire to burn...," fire has not generally been considered a significant concern in Bureau of Land Management wilderness management and has received little planning attention. The first Bureau of Land Management wilderness fire management plan permitting natural fires to burn was approved in 1990 for two wilderness areas in northwestern Arizona. As of 1997, six of the 131 Bureau of Land Management wilderness areas had approved PNF plans. However, due to conservative prescriptions and low natural fire frequency in these areas, no PNF's had occurred as of early 1998. The Bureau of Land Management has made extensive use of what it calls an "Appropriate Suppression Response strategy," under which some naturally ignited fires are contained within defensible boundaries. Although this strategy is similar to a PNF strategy, the fact that fires permitted to burn under Appropriate Suppression Response are recorded as wildfires makes it impossible to assess their contribution to the agency's wilderness fire program. The lack of a wilderness/nonwilderness distinction in Bureau of Land Management fire records further complicates efforts to assess wilderness fire programs. Most Bureau of Land Management wildernesses are managed under a suppression strategy with emphasis given to minimizing impacts of suppression activities.

The Bureau of Land Management makes extensive use of management ignitions within designated wilderness. MIPF's are used to reduce hazards, improve range, benefit wildlife (including threatened and endangered species), and restore natural fire regimes. Again, the lack of a wilderness/nonwilderness distinction in Bureau of Land Management fire records makes it impossible to assess accomplishments within Bureau of Land Management wilderness. No effort has been made to evaluate the divergence between presettlement and recent fire frequencies, intensities, or effects on Bureau of Land Management lands.

Fish and Wildlife Service

Other than recognizing fire as a natural force in wilderness and that burning may be desirable "to restore, maintain, protect, or preserve the wilderness resources and values," the Fish and Wildlife Service has not developed a specific strategy for dealing with wilderness fire. The Fish and Wildlife Service has not recognized the need for permitting lightning fires to burn, and thus has not developed a PNF program, other than what it calls a Limited Suppression program, that is practiced in Alaska. Suppression remains the principal response to lightning ignitions. However, the Fish and Wildlife Service makes extensive use of management ignitions, including within wilderness, to reduce hazardous fuels and to further specific refuge objectives. The small size of most refuges outside of Alaska is particularly conducive to prescribed burning. Records for both MIPF and wildfire within Fish and Wildlife Service units do not recognize whether the fires occur on lands designated as wilderness, making it impossible to compare current fire frequencies with presettlement frequencies on Fish and Wildlife Service wilderness lands.

Assessment

Although all four wilderness management agencies recognize the natural role of fire in determining ecosystem structure and function, they have chosen dramatically different approaches to restoring fire to their wilderness lands. Comparison of the number of approved PNF programs, number of PNF's, and area burned by PNF's in 1997, clearly demonstrates the emphasis placed by the Forest Service and National Park Service on the management of natural ignitions in wilderness fire restoration (table 1). The Bureau of Land Management and Fish and Wildlife Service, on the other hand, rely primarily on prescribed burning to restore fire to their wilderness lands, a strategy also employed by the National Park Service, but to date, largely avoided by the Forest Service. The lack of wilderness/nonwilderness distinction in the fire records of all but the Forest Service, together with the lack of an effective centralized reporting

Table 1—Number of approved prescribed natural fire programs, number of prescribed natural fires, and number of hectares (acres) burned by prescribed natural fires by agency for 1997.

Agency	Prescribed natural fire programs	Prescribed natural fires	Hectares (acres) burned
Bureau of Land Management	6	0	0
Forest Service	58	51	11,577 (28,607)
Fish and Wildlife Service	0	0	0
National Park Service	26	95	2,352 (5,812)

system by all but the National Park Service, makes it impossible to fully assess the effectiveness of any of the agencies in restoring presettlement fire regimes to wilderness lands. Inconsistencies in available data make it even more difficult to make comparisons among agencies.

The limited information that is available comparing historic fire regimes with the results of current fire management activities supports the conclusion that current practices are falling far short of that required to restore presettlement fire regimes. The inability to permit the large majority of natural ignitions occurring in wilderness to burn, coupled with a continued emphasis on fire suppression whenever there is a chance of fire escape, adverse air conditions, or other public or political controversy, is only widening that gap (van Wagtendonk 1995).

The challenges and constraints faced by wilderness fire managers threaten to further reduce the naturalness and wildness associated with our wilderness lands. Unless a way is found soon to increase the effectiveness of programs to restore fire as a natural ecological process in wilderness, continued fire suppression threatens to lead to increasingly homogeneous landscapes, and as fuels accumulate, fires that will be increasingly difficult to control. Such consequences threaten many of the natural resources and social values that characterize wilderness as we know it. The potential effects of such trends on wildlife, vegetation, recreation use, air and water quality, as well as threats of uncontrolled fire (whether the fires are human ignited or naturally ignited) on nearby homes, communities, and other economic interests, require careful evaluation of wilderness fire policies and implementation strategies. The consequences of alternative choices must be clearly understood before they are made. Decisions made in the next few years will influence wilderness and nonwilderness resources and values for centuries to come.

Future Challenges

Significant challenges must be addressed if the United States wilderness management agencies are to be successful in restoring fire to even a semblance of its natural role in wilderness ecosystems. Recognizing that many of the specific issues and constraints that must be confronted will vary depending on the location, size, and other characteristics of the wilderness in question (such as, local political pressures, adjacent land ownership and practices, ecosystem type, historic fire regime), some of the more significant challenges that must be addressed are:

1. Clarification of goals. Public support for wilderness fire management programs will be greatly facilitated if program goals and means for evaluating success are clearly articulated. For example, it must be clear whether a given burn is designed to reduce hazardous fuels, to improve habitat, or to simulate a natural ignition that may have been previously suppressed. Similarly, decisions must be made regarding the appropriateness of management ignitions in wilderness. For example, in areas where natural ignitions cannot be permitted to burn or are suppressed outside the wilderness, are management ignitions more, or less, desirable than a hands-off approach that includes continued fire suppression? The lack of clearly articulated goals leads to confusion and lack of support.

2. Clarification of fire terminology. Periodic changes in fire-use terminology have confused the public and set back efforts to communicate program goals and accomplishments. For example, lightning ignitions allowed to burn within pre-established prescriptions have been variously called "let burn" fires, natural fires, prescribed natural fires, and most recently, wildland fires managed for resource benefits.

3. Reporting consistency. Evaluation of the effectiveness of wilderness fire management programs in restoring natural fire regimes demands consistency in agency fire reporting requirements and record keeping, including distinguishing between wilderness and nonwilderness lands.

4. Improved risk assessment. Assessment of the benefits and costs of all fire management decisions must be based on improved understanding of both the short- and long-term ecological and social consequences of alternative choices. For example, the consequences of continued fire exclusion must be clearly articulated.

5. Increase area burned. Ways must be found to substantially increase the acreage burned. Full consideration must be given to the use of both PNF's and MIPF's as means of both reversing the effects of fire suppression and restoring fire to wilderness. Programs must be effective at larger spatial scales than have characterized past activities.

6. Increased cooperation. Cooperation between landowners and across boundaries is essential to accomplish the landscape-scale fire management programs that will be required to burn larger areas. Interagency planning and programs will be essential to this cooperation.

7. Address constraints. The constraints restricting greater accomplishments in wilderness fire programs include: fiscal (lack of funding), administrative (agency restrictions on number of fires permitted at any given time), political (restrictions on smoke emissions), and human (willingness to take risks). These constraints must be better understood and solutions worked out with the involved interest groups.

8. Improved information base. As management choices become increasingly difficult, it is essential that solid information be available on which to make decisions. This will require an increased commitment to research and monitoring, and improved communication between scientists and managers regarding options and consequences.

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