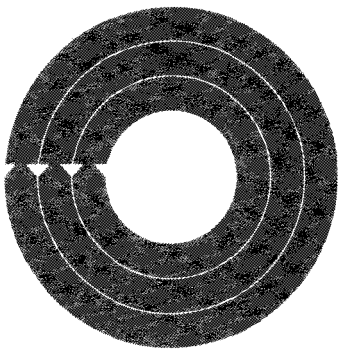
RENEWABLE NATURAL RESOURCES FOUNDATION



WORKSHOP ON NATIONAL PARKS FIRE POLICY: GOALS, PERCEPTIONS, AND REALITY

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NATIONAL PARKS FIRE POLICY: GOALS, PERCEPTIONS, AND REALITY

A RENEWABLE NATURAL RESOURCES FOUNDATION WORKSHOP

FOREWORD: HARDIN R GLASCOCK

As November's deepening snow pushed another wildfire season into history, more than 50 respected resource scientists and professionals gathered high up in Utah's Wasatch Range. It was 1991, three years after the mega-event in Yellowstone when fires burned through almost half of our country's first national park. The built-in management dilemma presented by the 19 16 Organic Act that created the National Park System was never more apparent: how to conserve natural ecosystem values and at the same time provide for human enjoyment of those values.

The time seemed right for interdisciplinary reviews of the goals and policies driving the National Park Service's fire-management decisions; the conflicts in balancing ecological and land-use goals with those associated with scenic values; the degree of success in implementing difficult congressional mandates; and the public perception of fire policy. Could an interchange involving an appropriate mix of scientists, professionals, and park managers reach agreement on recommendations for improvements?

The Renewable Natural Resources Foundation (RNRF) thought a unique, useful contribution could be made by convening a two-day workshop with attendance limited to experts in the various disciplines pertaining to tire policy. A major purpose of RNRF, a consortium of 18 professional, scientific, and educational organizations, is to advance the sciences, public education, and sound management and conservation practices in renewable natural resources. RNRF's founding premise is that the resolution of most resources issues requires interaction of the relevant scientific disciplines. Fire policy in our national parks is a natural for applying this interdisciplinary approach.

The theme for the workshop, which took place at Snowbird, Utah, on November 15-16, 1991, was "National Parks Fire Policy: Goals, Perceptions, and Reality." Internationally recognized experts from a number of the most relevant professions participated. The list of invited participants included foresters, wildlife biologists, fisheries biologists, range scientists, landscape architects, tire ecologists, soil scientists, botanists, historians, sociologists, anthropologists, national park and national forest managers, congressional policy staff, and others.

After an opening overview, the program consisted of four sessions focused on subthemes. Each of the first three had a moderator, one or two presenters for each of several topics, and extended open discussion. For the fourth session, the participants divided into six groups to try to agree on solutions to the problems discussed in the previous sessions.

Session I: Goals of the National Parks focused on three topics: the need for increasing specificity in the national parks' natural resources goals; real and perceived conflicts in managing national parks; and the extent to which conflicting goals can be, or are being, reconciled.

Session II: Fire Policy and Reality featured discussions of the history of fires in the West; perspectives on whether an attempt should be made to duplicate the pre-settlement fire regime; and evolution of park fire policy, including changes following the 1988 Yellowstone fires and the ecological rationale for current policy. Also discussed were challenges to implementing that policy and the question of which park goals are advanced by current fire policy and which are not.

Session III: Public Perception of Fire Policy versus Reality considered the issues of visual management of park resources and redirection of policies to protect scenic values; how scenic appearance and ecological knowledge influence the public's view of fire policy; the extent to which managers allow public reactions to affect the management of fire; and the impact of professionals' backgrounds on fire policy.

Session N: Where Do We Go From Here? charged each of the concurrently meeting groups with selecting an issue of concern; closely defining that issue; and attempting to reach consensus on concrete suggestions for the National Park Service and Congress regarding fire policy, and the steps that need to be taken and who should implement them. Leaders appointed by each group reported at a final plenary session. The groups arrived at remarkably similar recommendations.

Appreciation is due to the members of the Steering Committee who planned the workshop, as well as the moderators, speakers, and participants. Special thanks are extended to John C. Billing, who chaired the workshop and edited its proceedings. Thanks are also due to Frederick H. Wagner, who saw to it that the tapes were transcribed. «

Hardin R. Glascock is a public interest member and former chairman of RNRF's Board of Directors.

SESSION I: GOALS OF THE NATIONAL PARKS

MODERATOR DAVID J. PARSONS, NATIONAL PARK SERVICE

OVERVIEW OF GOALS FOR NATIONAL PARKS

FREDERIC H. WAGNER

The spirited, often rancorous, debate over the natural-resources policies and management programs of the National Park Service is well known. For decades arguments have raged over fire policy, control of animal population, buffer zones, wolf recovery, and numerous other management questions. Although these discussions are useful for bringing out the complexity of the issues and thus advancing our thinking, I would argue that the debates cannot be resolved at this time and to that extent are premature. My rationale is that policies are established to achieve goals, and I maintain that the Park Service's natural-resources goals are too imprecise to permit management policies that are sufficiently explicit to allow resolution of the arguments.

I am not alone in this view. In a 1987 symposium on Ecosystem Management for Parks and Wilderness, Johnson and Agee commented that "... park and wilderness preservation goals will have to be stated in more precise terms..." And the Gordon Commission, in its 1989 NPCA study, recommended that the Park Service establish "preservation and visitor impact management goals." As one member of the Commission told me, "They've got to decide what they want."

We are all aware of the decades-long argument over the dual, and somewhat conflicting, goals of preservation and public use of national parks. This has become almost a confrontation between ecological and landscape-architecture goals. But beyond this, the great variation in management policies one sees across the park system must result in part from this lack of exactitude in goals. Some parks engage in prescribed burning; others eschew it even though advocates do exist. Some parks control animal numbers, others do not. One Park Service official commented to me, "We don't have one Park Service, we have 350."

In fairness, we all know park settings vary, and different policies may be appropriate for different parks. The Service's 1988 Management Policies document discusses servicewide policies, but then goes on to talk about park-specific purposes and management directions. But there have been abrupt reversals during the past 25 years within individual parks: first fire control, then prescribed burning in Sequoia-Kings Canyon; first fire control, then Let Burn, now fire control in Yellowstone; first ungulate control, then natural regulation in Yellowstone.

Policy analysts are also suggesting that the lack of strong, explicit, nationwide management goals makes the system vulnerable to ad hoc political interventions. A number of NPS officials with whom I have spoken concur in this view. And in an excellent book entitled *Islands Under Siege,* John Freemuth documents in great depth how the original congressional intent can be evaded when general legislative language is interpreted into management policy by an executive with a political agenda. As examples, Freemuth discusses the failure of the Park Service in the 1980s to act on a tar sands leasing proposal in the Glen Canyon National Recreation Area and on the visibility problem in the Colorado Plateau parks.

So if there is a need to articulate a set of more explicit goals for the parks, how and by whom should this be done? Consensus is growing in the natural-resources field that policies are set to satisfy social values, an evolution away from the earlier view among professionals that their commitment should be to the resources *per se*. Whether resources are managed for preservation or consumption, the management is done to satisfy some set of societal values. As Bonnicksen and Stone state, "Goals are value judgments that describe the ideal or preferred condition. Therefore goal setting is a social or political decision, not a professional decision."

We have moved away from an era when policies were set by agency fiat into a time when legislative and executive branches are developing formal policy-setting mechanisms and structures that provide for broad public input. The National Forest Management Act with its public involvement in forest planning, the Coordinated Resource Management Planning procedure adopted by the Bureau of Land Management in several western states, and the board or commission structures that set wildlife policy at the state level are but a few examples.

As one looks at the Park Service, one is struck by how internalized its policy

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setting is compared with that of other federal land-management agencies. The public is represented in the original enabling legislation that establishes each area, but the subsequent operational policies have commonly been set internally. This was true of the 1972 change in fire policy and of the changes in ungulate-management policies in the late 1960s.

In recent years, solicitation of public input has increased. Opinion was widely sought during the process of developing the Greater Yellowstone Vision for the Future plan and the Service's 1988 *Report on Fire Management Policy*. The NPS manual *Natural Resources Management Guideline NPS-77* specifies (chapter 4, page 5) that "in some cases, management actions needed will be so complex and/or controversial that they ... require .. extensive public and peer review." But all of these tend to be ad hoc, there being no formal structures or mechanisms for public participation in goal and policy setting.

It was in recognition of this internalism that the Gordon Commission recommended that the Park Service "provide access to the scientific, scholarly, and user communities through establishing national, regional, and park Ecosystem Management Advisory Panels."

As one looks at the Park Service, one is struck by how internalized its policy setting is compared with that of other federal land-management agencies.

Such panels might serve to buffer some of the ad hoc political interventions that redirect policy.

Elsewhere I have proposed that each park with significant biological resources impanel an advisory group of top ecologists familiar with that area who would define its ecological purposes or goals. The procedure would include definition of such ecologically ambiguous terms as *natural*.

The word *natural* is used ubiquitously in park-management deliberations and is a virtual cornerstone of Park Service goals and policies. Yet there is no agreement even among NPS personnel as to its meaning. One can find it variously defined as "ecosystems ... not altered by man," "natural processes minimally influenced by human actions," and "conditions ... that would have existed today in the absence of the effects of European man." The distinction is important because, if the goal of NPS resource management is to manage ecosystems in the conditions that prevailed before European contact, an explicit decision needs to be made on whether that goal is to include the effects of Native Americans on the land. In some parks (e.g., Sequoia-Rings Canyon), this decision has already been made with the application of prescribed burning to simulate pre-Columbian fire effects.

Archaeologists and anthropologists the world over are forcing on ecologists the realization of something that we have dismissed too lightly out of hand: the ubiquitous and profound effects of pre-industrial cultures on the landscape. Steven Simms, anthropologist and archaeologist at my own university, has generalized that "the evidence suggests that simple societies may be as susceptible to causing significant environmental damage as more complex societies ... [although on a] different scale."

A set of explicit goals, developed with public and professional input, would then serve as a firm foundation for the Park Service's management policies and for the expanded educational effort recommended by the Gordon Commission.

So, in closing, I suggest that we explore the need for more explicit goals for managing the biological resources of the park system, particularly fire management. How and by whom should such goals be set? Is there a need, as the Gordon Commission suggests, for advisory boards or commissions at the national level to particularize and firm up the general language of Congress, and boards at the regional level, and at the park level? What should be the role of professional ecologists, landscape architects, archaeologists, and anthropologists in the goal-defining process? «

Citations are available upon request.

A PRIMER OF FIRE-MANAGEMENT TERMS

- *Natural Fire:* Any fire of natural origin (e.g., lightning, spontaneous combustion, volcanic activity), which is allowed to burn because it is accomplishing one or more resource-management objectives.
- *Wildfire..* Any fire occurring on wildland that is not meeting management objectives and thus requires a suppression response.
- *Prescribed Fire:* A tire that is burning within prescription. Prescribed burning is the controlled application of fire to wildland fuels under specified conditions that allow the fire to be confined to a predetermined area and to produce the intensity and rate of spread required to attain specif resource-management objectives.
- *Prescribed Natural Fire:* A fire resulting from a natural, unplanned ignition that is designated and managed as a prescribed fire.
- *Management-Ignited Prescribed Fire:* A prescribed fire resulting from a planned, deliberate management action.—*Ed.*

FIRE ECOLOGY AND THE MANAGEMENT OF WILDERNESS ECOSYSTEMS

NORMAN CHRISTENSEN

I would like to review a few basic ecological principles concerning the relationships between fire and ecosystems and human activities and tire. I will then consider the implications for the management of wilderness preserves.

ECOLOGICAL PRINCIPLES

For many landscapes, particularly those that have favorable climates and fuels, tire is inevitable. The question is not whether an area will bum, but when and in what manner. Secondly, fire regimes (i.e., fire intensity, frequency, seasonalness, and predictability) vary among and within ecosystems. The remarkable extent of variability is illustrated in the complex of tires that took place in Yellowstone in 1988. Recent research in a number of fire-prone ecosystems suggests that the fire regimes of some landscapes have shifted with changing climates over the past millennium. It was once fashionable to speak of "fire cycles" as if they occurred with a highly predictable periodicity related to successional patterns and climate. We now know that fire cycles are quite irregular.

A third point is that organisms, ecosystems, and landscape processes do not simply *survive* fire but in fact *depend* on it. Where fire has been an important force over long periods of time, a variety of fire-dependent life-history characteristics have evolved, such as heat-stimulated seeds, closed cones, and sprouting. A number of ecosystem processes also depend on fire. In some southwestern ecosystems, for example, nearly 50 percent of the total decomposition that occurs is a consequence of periodic fires.

Fourth, organisms do not depend on fire in a generic fashion. Rather, some depend on high-intensity, long-return-interval fires. Others require low-intensity surface fires, and still others respond to intermediate conditions. Thus, from the standpoint of fire's effects on biodiversity, the mere occurrence of fire may not be as important as its variability.

Perhaps one of the most sobering lessons from recent studies of ecosystem dynamics is that certain events are beyond our ability to predict.

HUMAN ACTIVITIES

The question of whether humans should intervene or manage fires is moot. The fact is that we knowingly or unknowingly have always managed fire. The historic and prehistoric use of fire by Native Americans has been widely documented and has occurred over a sufficiently long time as to be of evolutionary significance.

Recent human activities are ubiquitous and pervasive. Even if tbe current increase in atmospheric carbon dioxide causes no change in climate, it will likely influence patterns of forest growth in ways that will change fire behavior. Moreover, human activities have fragmented landscapes, with profound effects on patterns of fire movement.

A third point is that the borders of our major wilderness preserves were set with little or no thought given to natural processes such as fire. The significance of this lack of congruence between preserve design and natural processes was seen in the behavior of the 1988 Yellowstone fires.

A fourth point is that interventions in one fire-regime component almost always affect future fire events. Exclusion of fire in fire-prone landscapes will generally result in the accumulation of fuel and more intense future fires.

Finally, the range of fire-management options is highly variable. The extent of our ability to suppress, prescribe, or augment fire regimens varies. In prairies, fire can be manipulated with great control and high precision. No such control or precision is possible in heavy forest fuels under dry conditions.

ECOSYSTEM MANAGEMENT

The 1916 Organic Act entreats the National Park Service to "conserve the scenery and natural and historic objects" for the enjoyment of the people. Although seemingly self-evident, these words have occasioned considerable debate over interpretation. First, all definitions of *scenic are* arbitrary and value laden. Second, although natural processes often create scenic views, this is not always the case. Intensely burned forests are rarely considered scenic but are nevertheless important "natural objects." The connection exists only if one defines "scenic" and "natural" tautologically: i.e., if one defines scenic beauty as that which is natural.

Third, given constraints on management, poor design of our preserves, and fragmentation character of our landscapes, that which is natural is not necessarily prudent or desirable wilderness

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management. We have preserved very little of the original wilderness, and the borders of what we have preserved are arbitrary relative to landscape processes such as fire.

MANAGEMENT GOALS

Fire should not be the end product of fire management. We did not set aside wilderness preserves so that we can burn them. Rather, we allow, augment, or suppress fire in order to preserve critical ecosystem processes and elements. We must articulate our management goals in terms of those ecosystem elements -chemical processes, biodiversity, scenic and historic values, etc. These elements are not necessarily congruent. For example, *historic values are* often in conflict with what one might call *natural values*. I would simply point out that where such conflicts exist, compromise is not always desirable.

Management goals must be made operational. That is, we should state goals in ways that allow us to evaluate or monitor the success or failure of fire management. The issue of setting goals has been much argued, and some fear that managers might establish rigid goals. In setting operational goals, we must acknowledge that our wilderness preserves are not museums and should not be treated as such. These landscapes are obviously dynamic, and fire plays a critical role in that dynamism. Given the variety of landscapes comprising our collection of wilderness preserves, it is unlikely that there will be any universal management protocol or universal way in which such protocols are made operational.

Finally, when setting management goals, we must acknowledge our ignorance. If we knew more, we would undoubtedly manage better. It would be a mistake, however, to think that with enough knowledge, we could make perfect predictions and management decisions. Perhaps one of the most sobering lessons from recent studies of ecosystem dynamics is that certain events are beyond our ability to predict.

Wilderness managers cannot claim perfect knowledge, nor should the public expect that. The recognition of our ignorance should strengthen our commitment to research and monitoring programs. Nevertheless, our knowledge base will always be imperfect and our ability to predict the outcome of management interventions uncertain. The only antidote for this situation will be humility and prudence.«

CONSERVING SCENERY AND ECOSYSTEMS: CONFLICTING GOALS

JOHN C. ELLSWORTH

As a landscape architect, my professional orientation focuses on a general understanding of the way people perceive landscapes and specifically on how to manage the national parks for scenic quality. From my professional point of view, the National Park Service is faced with addressing some major conflicting goals.

The 1916 Organic Act states that the mission of the National Park Service is "... to *con*serve the scenery and natural and historic objects ... [and] ... to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." That part of the Organic Act is unambiguous. The primary reason that people visit national parks is the scenery: be it wildlife, geysers, or other natural features. Is there a conflict between achieving the goals of visitor use and preservation of ecosystems, between the scenic experience and ecosystem health? I think the answer is yes.

Historically, the National Park Service has failed to define scenery. The Park Service may assume that scenery somehow flows from healthy ecosystems and natural processes and is most often place-specific. Look at the way the Park Service identifies scenic overlooks, scenic drives, scenic trails, scenic geyser basins, scenic mountain valleys, scenic campgrounds, scenic fill-in-the-blanks. It is easy to identify a scenic place; therefore we are going to somehow preserve, protect, and conserve that place. There is, however, more to scenery than single places. Yellowstone National Park and the fires of 1988 provide an excellent example.

The park's fire-management plan talks about fire-management zones—particularly within Yellowstone-and about wildland fire-management policy guidelines for the National Park Service as a whole. It also discusses how prescribed fires may contribute to the park's resource-management objectives. The questions that I would like to consider are: Does the plan provide for the management of scenery? Is scenery a natural resource? I would argue that scenery *is* a natural resource, but it is dependent upon human interpretation.

The Yellowstone fire-management plan addresses scenery in a marginal way and only on five occasions, most notably on page 11. The plan reports recent data indicating visitors' primary activities—before and after the 1988 Yellowstone fires-as being, first, viewing wildlife and thermal features and, secondly, photographing the parks resources. It is clear that those two types of activities are related to scenery.

In producing the Draft Environmental Assessment for the plan, 150 respon-

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dents were asked to identify 10 significant concerns about the management of tire in Yellowstone. Nowhere in those 10 concerns was scenery listed as an important component. We then have to ask: Do park visitors really care about the effects of fire on scenery, or is there something we are missing? Are people talking about scenery but using the word in a different way? They are not saying preserve *scenery*; they are saying preserve the *elements* that comprise scenery.

The Draft Environmental Assessment *does* address scenery. On page 27, eight sentences focus on visual quality (scenery). A section on the consequences of fire notes that evaluation of visual quality is a subjective measure. I would agree that it is in some ways subjective; however, in many ways it is not. I realize that landscape architects and environmental psychologists may be the only ones who believe this.

The draft assessment also states that the public's response to burned areas varies widely. This statement must be based upon anecdotal evidence because no surveys have been conducted to establish it as fact. Granted, while some individuals are disturbed by the burned forest, others take the opportunity afforded by recent fires to observe natural processes at work and to view the newly opened vistas. However, these are generalized observations not based on empirical research.

The environmental assessment process has not resulted in a systematic measuring of fire's impacts on scenery, unlike the systematic evaluations that have been done of the impacts on wildlife, vegetation, and other natural resources. Neglecting scenery impacts ignores more than 30 years of research on visual quality by landscape architects and environmental psychologists.

"Wildfire" does not discriminate for scenery, whereas prescribed fire does if it is properly managed and controlled. We can manage fire and prescribed fire to give just about any effect that we desire. If that is the case, the question then is: Can we manage fire to give certain acceptable levels of scenic impact?

We can agree that the dynamics of ecosystems require fire. But does scenery require fire? Some areas that have been burned are considered more scenic than areas that have not been burned. The National Park Service must manage fire both in terms of ecosystem dynamics and in terms of scenery. In order to do that, the Park Service has to understand how fire affects scenery, and it must integrate this understanding into its fire-management plans.

This requires research that deals specifically with fire and scenery. In preliminary studies undertaken in Yellowstone National Park, Robert King and I are trying to understand how people react to the impacts of the 1988 fires. Using photo-realistic computer simulations of Yellowstone scenes with various levels of burn, we gathered measurements and other data from respondents on visual preference, familiarity with the park, knowledge about fire ecology, and demographic variables. Preference is a multidimensional variable that has been used for 20 years in conducting research on how people react to particular landscapes. Knowledge of fire ecology was defined in terms of an individual's understanding of accepted theory. The survey was developed from information provided in National Park Service entrance-gate handouts.

Respondents liked areas with approximately 10 percent burn more than they liked areas with no burn. ..

The images used in this research were typical landscape scenes in Yellowstone and special scenes such as the Midway geyser basin and the Grand Canyon of the Yellowstone River. Preference decreased at 60 percent burn level and above in most scenes. Knowledge of fire ecology did not affect preference at specific burn levels in either the typical landscapes or the special landscapes. This conclusion is counter-intuitive for most park managers and deserves further study.

This research provides some specific implications for fire management. According to the park's fire-management plan, suppression is the strategy for special areas such as Old Faithful. Our study identifies these areas as less sensitive to the visual impact of burn. People can look at scenes of Old Faithful or the Grand Canyon of the Yellowstone River and essentially not notice burned areas.

Low levels of burn increased preference. Respondents liked areas with approximately 10 percent burn more than they liked areas with no burn, which is quite interesting.

In many national parks, especially Yellowstone, the visitor experience is a series of views from the road. These views can be managed and controlled and manipulated. This is a major difference between a national park and a wilderness area, where driving is not allowed. In terms of scenery in national parks, fire may be acceptable and even preferred at low levels. If a low level of bum is visible from the road, it may actually improve the scenery. This brings up an interesting question: If low-level bums improve the scenery, should the National Park Service consider burning to achieve scenery goals regardless of whether that improves ecosystem goals?

Our research indicates that if scenery conservation is a major resource-management goal, then consideration should be given to using fire to increase scenic values for the visitor. Fire is a necessary element in ecosystems, and fire-management decisions will affect scenery. We need to increase our understanding of the relationship between fire and scenery in national parks and wilderness areas. «

SUMMARY I: CAN CONFLICTING GOALS BE RECONCILED?

JOHN C. BILLING

If the primary goal of the park system is to preserve, protect, and conserve public lands and their resources, then discussion of the role of the national parks of the 21st century should focus on evaluating that role instead of debating what is "natural." The public most likely perceives the "natural" as those elements that are non-humanly created. The national parks therefore represent a sharp contrast to the humanly created environment.

The 1988 Yellowstone fires were no doubt the first large-scale forest fires played out on national television. This media coverage demonstrated the powerful role that television can play in affecting public opinion, which may help determine our national goals for the parks of the future.

Since passage of the Organic Act in 1916, social values have changed, as has as our understanding of ecology and ecological processes, and these changes have influenced the role played by the national parks. One aspect of the Organic Act that may need clarification revolves around the term *scenic* and the role of the scenic in future management decisions. A second issue, involving both the Organic Act and the enabling legislation for each park, focuses on our lack of knowledge of interactions between organisms and biological processes at the time of enactment. Decision makers must realize that even the Leopold Commission Report of 1963, with its excellent articulation of problems facing the parks, pointed out that our understanding of biology, ecology, and ecosystem processes is changing.

The vast quantity of new knowledge leads one to question whether it is now appropriate to commence a new discussion of the Organic Act and its relevance in the 21st century. A critical issue that requires debate, analysis, and evaluation is the question of understanding what the public wants from the national parks and national forests. A healthy debate is critical for establishing goals for the parks of the 21st century.

We must recognize the fact that a blanket set of goals no longer works; goals must be tailored on a park-by-park basis.

In determining the role of the national parks of the future, an evaluation of the Organic Act in terms of the vast array of overlapping legislation would also be useful. Extreme care should be taken, however, in interpreting the language of past legislation. The secondary legislation mandated at either the national or state level exerts a significant impact on determining goals for the parks.

An excellent example is the California Air Pollution Standards and their impact on fire policy and application to maintaining biodiversity. A number of scientists and professionals from the National Park Service, the U.S. Forest Service, and the California Department of Forestry are concerned about smoke management and air quality issues as they relate to the use of prescribed burning. In a state like California, policy should be tailored to allow prescribed burning in moderation, with the understanding that a small amount of smoke at an appropriate time is more desirable than the massive amount produced by a large fire event.

Sequoia-Kings Canyon national parks are another good example in which air pollution problems may be responsible for changes in fuel condition that could drastically affect fire policy. Compounding this is the fact that the western United States has been in a sustained drought, thus increasing competition for available moisture. In determining goals for the parks and the role of the park system, fire policy can no longer be separated from the wide range of other dynamic factors influencing the system.

It is not surprising that the public is asking critical questions today, given changes in social values. Policies and goals must change to accommodate these new values. We must recognize that our understanding of ecology and ecological processes has also changed. The question today is: How can public policy integrate change into the goals that will guide management of these public lands in the future? We must recognize the fact that a blanket set of goals no longer works; goals must be tailored on a park-by-park basis.

This re-evaluation process should be based on a long-term outlook. The lifetime of the giant sequoia is 3,000 years, and the pines of Yellowstone live 200 to 400 years. We should not establish goals based on human life spans. The challenge is to develop policy and set goals that can be modified or adjusted as society and its values change-a dynamic, living policy for our public lands. «

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SESSION II: FIRE POLICY AND REALITY

MODERATOR: JAMES K. BROWN, USDA FOREST SERVICE

AN HISTORICAL PERSPECTIVE ON THE YELLOWSTONE FIRES

WILLIAM H. ROMME

Clearly 1988 will be a year that will be remembered for the Yellowstone tires. They started early in the season when June lightning ignited a number of small fires in remote areas. The fires did not seem to threaten any lives, property values, or significant resources, so they were allowed to burn under the approved fire-management plan in effect at that time.

The winter had been dry, but previous summers were wet, and it was expected that the summer of 1988 would be similar. However, by late July the usual summer rains had not materialized. By then fires had burnt some 17,000 acres. On July 21, all of the fires were declared "out of prescription," and thus began the largest firefighting effort in history.

It is important to recognize that the Park Service began fire suppression after approximately three percent had burned of the total acreage ultimately ignited. Thus, for some 97 percent of the acreage, the fires were fought under a full suppression mode.

The fires continued burning through August, and by the middle of September they had affected nearly 300,000 hectares. Firefighting efforts were largely to no avail apart from saving life and defending buildings and property. The fires finally died down when precipitation arrived on September 12, but they were not completely extinguished until the heavy snows of November.

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We now have the opportunity to address several important questions raised by these fires, which were the largest in this region during the last century: Why were the fires so big, and, in particular, were the causes natural, or were the size and intensity in some way a result of past human activities? What was the role of a century of attempted fire suppression in Yellowstone and consequent buildup of fuel? Another important question is whether the park was destroyed. How will the biota and ecosystem processes respond to these big fires? The answers to questions like these require a broader perspective than what is offered by a single hot, dry summer.

FIRE HISTORY RESEARCH

I began studying fires in Yellowstone in 1977. I was concerned with two questions. First, what were the characteristics of the presettlement fire regime in Yellowstone? How big were the tires, how often did they occur, and what were their effects? I addressed these questions by documenting the fire history of a study area comprising 129,000 hectares of Yellowstone's subalpine plateaus—about 15 percent of the park. By dating fire-scarred trees, we were able to determine individual fire years. Taking increment cores from trees that germinated after those fires permitted us to map the extent of past fires.

The second question concerned the extent to which the landscape mosaic has changed over the last 100 years. By *landscape mosaic,* I am referring to the pattern of plant communities that occupy the subalpine plateau. For example, low-lying areas with deep alluvial soils favor meadow communities, whereas coniferous forests grow on the drier, rocky uplands. I was interested in whether this mosaic was influenced by fire-suppression activity.

To reconstruct past mosaics, it is necessary to classify the stages of regrowth after a fire. The best means for illustrating regrowth is a whirlwind tour of sites on Yellowstone's high plateaus that have burned at different times in the past. I will focus on lodgepole pine forests that were burned in intense canopy fires that killed all above-ground vegetation.

The earliest response is resprouting from roots and rhizomes and other below-ground structures that survived. A plant community dominated by resprouting vegetation is seen one to four years after a fire. The scene still contains abundant evidence of the past fire in the form of dead wood and charcoal. Tree seedlings are beginning to appear, but they do not become conspicuous until after about three years. Lodgepole pine has a remarkable fire adaptation in that some of the cones are serotinous; that is, they remain sealed when they mature and do not drop their seeds for as long as 20 or 30 years. The stimulus is the high temperatures of a fire.

Ten years after a fire, young lodgepole pines are conspicuous and the burnt area still has visible remnants of the fire. This early stage of regrowth I refer to as "LPO." The LPO stage usually persists for about 40 years after a burn. Once the lodgepole pines become large enough to

form a closed canopy, we enter the LP1 stage, which is a young stand of vigorously growing trees. This stage extends from 40 to 150 years after a fire. Once the closure of the canopy occurs, the abundance and diversity of the ground layer drop off due to reduced light levels. Because of the small accumulation of dead wood and other potential fuels, this kind of forest does not bum readily. Fires actually go out when they reach the LP1 forest in normal years.

The next stage is LP2, which extends from about 150 to 250 years. In this stage the lodgepole pine trees are at their maximum size and maturity. Eventually, as the trees begin to fall, gaps develop, introducing a second generation of trees consisting of lodgepole pine on drier sites, and spruce and fir on wetter sites. This final stage in succession is classified as LP3. This type of forest persists until the next destructive fire comes along, starting the cycle again. In fact, these communities often do not persist for long because of the fuel load that develops, especially in spruce-fir forests.

In addition to changes in the plant communities, changes in the wildlife species occur as succession proceeds. In a sample of lodgepole pine forests ranging from very young to very old, the data indicated that some kinds of breeding birds are associated mainly with recently burned forests. Others are found primarily in old-growth forest, while still others are found in forests of all ages. The point is that a mosaic of different age classes enhances overall biodiversity.

Our reconstruction of the fire history from 1690 to 1988 indicated that fires occurred in every decade during that 300-year period. But they occurred very unevenly. In most decades, the fires were small and did not spread over a large area. This was true not only during the recent period of fire suppression, but also in the 1700s when there were no Europeans anywhere in the area. The major reason may be that no severe dry years occurred comparable to what occurred in 1988. I have not yet determined a way to test that theory directly, but it may have played a role.

Another part of the explanation may be that, following the extensive fires that occurred in the early 1700s, much of the landscape was dominated by LPO and LP1, the young, less-burnable forest types. As succession occurred, the LPO and LP1 gradually gave way to LP2, which in the 1900s began to mature into extensive areas of LP3. Not until well into the 20th century did the old-growth forest (LP3) begin to cover a substantial portion of the landscape. This created a nearly continuous cover of forests in their most flammable stage. After 1930 or 1940, an extensive fire was perhaps inevitable given those fuel conditions.

. . . Fire suppression in Yellowstone clearly had some effect on the behavior of the fires in 1988, but not a major effect.

Fire suppression in Yellowstone began in 1886 and was probably very successful in the grasslands at the northern end of the park. In analyzing the fire records, however, the data suggest that fire suppression was not effective or consistent on the high plateaus until after World War II. Prior to 1945, fires would grow to an uncontrollable size or would naturally extinguish themselves before being detected or reached by firefighters on foot. The advent of helicopters, smoke jumpers, and other modern technology vastly improved firefighting ability. In the 1970s, the park began allowing some lightning-caused fires to burn. Thus, the period of consistent fire suppression lasted only 20 or 30 years. I would submit that fire suppression in Yellowstone clearly had some effect on the behavior of the fires in 1988, but not a major effect. Rather, the data indicate that fires in the early 1700s initiated a wave of succession, and these areas were coming into the most flammable stage in the late 20th century. Thus, whether or not fire suppression occurred, we probably would have had a tremendous increase in flammable old-growth forests simply because of what happened 250 to 300 years ago.

The composition of this landscape mosaic has changed continually for at least 300 years. These dynamic changes have important policy relevance. Some observers have suggested that our goal in Yellowstone ought to be to recreate the landscape scene that the Hayden expedition experienced in 1871. Actually, there was nothing special about what Hayden saw in 187 1. Had his expedition occurred 50 years earlier, however, he would have seen a very different landscape. Rather than trying to preserve a particular scene, it would make more sense to preserve the processes that generate this ever-changing mosaic landscape.

Three factors came together in 1988 to account for the size of the fires that year. The first was that the landscape was covered by an extensive forest in the most flammable stage of succession. Secondly, 1988 was an unusually dry and windy year. Third, multiple ignitions set off fires in a vast area both inside and outside the park boundaries. In this sense, I think the fires in 1988 were more or less a natural event in the ecological history of this region.

The area that burned was comparable to what was burned in the early 1700s. In terms of fire behavior, the two periods must have been similar because the earlier fires initiated even-aged stands of lodgepole pine similar to what occurred following the 1988 fires.

Half of the area that burned was ignited through human-caused fires. However, once those fires started, they behaved pretty much like lightning-caused fires. Chances are that, if we had prevented all of the human-caused fires and

allowed all the lightning fires to burn, we would have seen an area burned similar in size to what actually burned. However, the pattern and distribution most certainly would have been different.

One important difference between the fires of the 1700s and 1988 is that the Rocky Mountains were a wilderness at the time of the early fires. Today, however, Yellowstone is surrounded by forested lands that are being altered for a variety of reasons. The fires do tend to burn predominantly in the old-growth forest and so the effect of reducing old-growth forest in Yellowstone is proportionally greater in 1988 than it was in 1703. In 1991, a great deal of old-growth (LP3) forest remains in Yellowstone and supports a variety of animals such as the flying squirrels that live only in this kind of forest community. However, if several more tires of this magnitude occur in Yellowstone, we could begin to depress the habitat of such species, and that is a concern.

RESPONSES SINCE 1988

How is the system responding to the fires of 1988? A striking thing about the 1988 fires was not only their size but also the heterogeneity of the burning pattern. The burn was not just a uniform wall of black trees but rather a complex mosaic pattern. The difference in fire severities proved to be extremely significant for the regrowth process. For long-term studies that we have initiated, we have identified four categories of severity. The first is the crown fire in which all of the above-ground biomass is killed, small needles are consumed, and the ground is blackened. A second kind of tire is a moderate burn, which generates sufficient heat to scorch and kill the trees, but not consume the needles. As dead leaves fall to the forest floor, they probably ameliorate the severity of post-fire growing conditions. The third category is that of light fires, which kill few trees and leave much of the forest floor intact. A fourth category is those areas unburned by any fire event.

Analyzing these four classes on a long-term basis, we found that the amount of exposed mineral soil and depth of soil char increases with fire severity. These factors have a profound influence on development of the plant community during the first year. The severity also influences the percentage of cover of forbs, grasses, and shrubs. The values roughly doubled in 1990 and then increased substantially again in 1991. Today, most of the ground layer in the burned forest is dominated by species that grew in the area prior to the fire; seedlings are resprouting and wildflowers are flowering profusely.

A surprising thing that was unanticipated is the response of lodgepole pine seedlings. In seven plots, seedling density was actually greater in the areas of moderate fire severity than in those of severe fire severity. This goes against our textbook expectations. I think the reason for this effect is that much of the seed crop in the canopy was killed in the severe burns. Soil conditions also have a profound influence on post-fire responses. On moist and fertile soil that supported heavy vegetation prior to the fire, resprouting was prolific with good coverage the first year after the fire. Areas with sparse vegetation before the fire also are sparse afterwards.

The abundance of serotinous cones before the fire also is important. In a burned forest with high serotiny, the lodgepole pines are thicker than the hair on a dog's back. By contrast, in an area that had almost no serotinous cones prior to a large crown fire, we found only three to four seedlings per hectare. Herbaceous plants are going to dominate that area for a long time, although lodgepole pine forest will probably reclaim the area after several decades.

My primary emphasis has been forested landscapes on the high plateaus. Grassland areas also burned in 1988 and in general are responding quickly. The fire temperatures were generally not as great, and the grasses have resprouted vigorously. In fact, regrowth is so quick that in many places now, even in 1991, you have to look closely to realize that a fire did occur there in 1988.

Fire has been a part of Yellowstone for a long time. The park was not destroyed, but it was dramatically changed. Just as the tires in the early 1700s introduced patterns into the landscape that were conspicuous for three centuries, so fires in 1988 reset those patterns, and we will see the effects for many decades. «

HISTORY OF FIRE OCCURRENCE IN WESTERN NORTH AMERICA

STEPHEN F. ARNO

Fire has played an integral role in western ecosystems for thousands of years. For instance, pond sediment cores from a subalpine lodgepole pine ecosystem show clear evidence of several severe fires during the past 11,000 years. Each of these events is marked by a layer of charcoal sediments overlain by inorganic material that eroded off the burned slope. The sediment cores also show evidence of a few dozen less severe fires. Studies in ponderosa pine and interior Douglas-fir forests that involved dating scars on stumps and living trees trace frequent fires back as far as the late 1400s. Stumps of giant sequoia logged a century ago in

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California provide a record of frequent tires extending back 2,000 years.

In national parks, wilderness, and other natural areas, we are trying to preserve seral ponderosa pine communities without fire because it is inconvenient to burn or because we cannot finance burning. At the same time, many of these stands are subject to a great deal of environmental stress; in some cases, both the large pines and the understory trees are dying. In the Blue Mountains of Oregon, approximately 1.5 million acres are experiencing massive mortality as a result of a decade of drought accompanied by insect and disease epidemics.

These ponderosa pine forests are now developing a different type of fire regime. Attempts to exclude fire during the past century have led to a buildup of conifer needle litter, woody fuels, and conifer thickets (ladder fuels). Thus, when ignition occurs under dry conditions, they tend to burn in severe, uncontrollable wildfires, which kill even the old-growth trees that survived numerous fires in past centuries. This new severe-tire regime in ponderosa pine greatly complicates fire management because an enormous number of people now live in or near these forests. For example, in October 1991 near Spokane, Washington105 homes burned in ponderosa pine forest in an off-season wildfire outbreak.

Inland Douglas-fir communities were traditionally associated with a complex mixed-severity fire regime. At the edge of the forest in high-elevation grassland valleys, such as in the northern part of Yellowstone National Park, tires a20- to 50-year intervals kept conifer invasion in check. With heavy grazing and tire suppression since the late 1800s, tire was largely excluded, and this has led to development of large expanses of Douglas-fir thickets. Douglas-fir also forms much of the mid-elevation forest zone in the interior West. Prior to 1900, these forests often burned in a mosaic of low-intensity surface fire along with mixed-mortality and stand-replacement burning.

A similarly complex fire regime has recently been identified in coastal Douglas-fir forests of Oregon and Washington. Fire burned in a mosaic of various severities, killing most understory hemlocks as well as patches of the overstory. This allowed regeneration of the seral Douglas-fir. Current efforts to reserve remnant stands of old-growth Douglas-fir generally attempt to exclude fire, which ultimately threatens the integrity of these ecosystems.

To understand the natural role of fire, we must observe fires that are allowed to burn freely under a variety of conditions, such as prescribed natural fires in large wilderness areas.

Lodgepole pine forests also experienced variable tire severities. Multiple fire scars on individual trees in some lodgepole pine communities testify to a sequence of low-intensity surface fires. However, when a dense understory offir and spruce or an abundance of heavy fuels created by a pine beetle epidemic is present, stand-replacement burning is likely. Replacement burns generally occurred at intervals between 100 and 300 years in Rocky Mountain lodgepole pine forests. The burn pattern was usually patchy, although the patches were often large, commonly a few hundred acres. Replacement fires at long intervals allowed re-establishment of importantpioneerplants, suchasquakingaspen, willow, and ceanothus shrubs which, without fire, would be lost from the ecosystem. Sometimes 20 to 40 years after a replacement fire, the new stand has developed into a dense fuelbed consisting of young pine, fir, and spruce trees accompanied by a layer of fallen snags from the previous stand. Under dry conditions, this fuelbed can bum severely in a second fire, termed a ***double bum,*** which removes the heavy fuels and renders the site unlikely to support fire for a long time thereafter.

I think that much of our perception of fire on the landscape comes from experience with tire suppression and modem fuel conditions. To understand the natural role of fire, we must observefires that are allowed to burn freely under a variety of conditions, such as prescribed natural fires in large wilderness areas. We must also remember that at one time wall-to-wall fuel prevailed across the western landscape. In contrast, fuel continuity today is greatly reduced by extensive grazing, cultivation, irrigation, logging, roads, and development. The semi-arid intermountain valleys that once could be swept by burns in a short time now have many barriers to the spread of tire.

Another irreversible change in the role of fire on the landscape is the disappearance of aboriginal ignitions, which once augmented lightning ignitions. Native Americans used fire in their daily lives and did not necessarily extinguish fires as we have been trained to do.

Since the late 1970s, the western United States has experienced a marked increase in annual wildfire acreage. I suspect that this trend is linked to fuel buildup and continuing drought. Today's wildfire problem is certainly aggravated by the addition of thousands of new homes each year situated among wildland fuels. I suspect that our wildfire problems will worsen until we develop and implement an extensive program of fuels management, including prescribed fire. «

THE EVOLUTION OF PARK SERVICE FIRE POLICY

EUGENE HESTER

In tracing the evolution of the National Park Service's fire policy, I will try to put events into chronological order. Since 1916, fire policy in the Park Service has changed as a result of increased scientific knowledge, changes in attitudes toward tire, and changes in park management. These factors will continue to serve as the framework for assessing fire policy now and in the future.

Through the 1940s, the policy was to suppress all fires. This policy was increasingly applied as firefighting capabilities improved. In 1928, John Coffman joined the National Park Service from the U.S. Forest Service and promised to oversee fueprotection for the Park Service "as thoroughly as a fire chief in the U.S. Forest Service." Over the next several years, the Park Service exercised aggressive fire suppression and hazard reduction.

About this time or soon thereafter, however, dissenting voices emerged both from within the organization and outside. One was that of George Wright, who was chief of the National Park Service's Wildlife Division. He and his associates emphasized the importance of preserving natural conditions.

As scientific understanding increased, the Forest Service started using prescribed fire in the southern pine forests in 1943, and the Park Service began experimenting with fire in the pine forests of the Everglades in 1958.

In the 1960s, following these tentative beginnings, the Park Service's fire policy began to shift dramatically. The shift came with a change in the view of what a national park is supposed to be.

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In the early years, the parks were generally thought of as scenic areas for public enjoyment, but for some time ecological scientists had been arguing for another way of thinking. In 1963, with the publication of the Leopold Committee's *Wildlife Management in the National Parks,* and its adoption in 1964 as policy, the view of parks as ecosystems began to prevail. The Leopold report recommended "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 the white man." Among other measures, the report called for the restoration of fire where suppression had altered fire-dependent communities.

In 1968, Sequoia and Kings Canyon officially began both a prescribed natural fire program and a management-ignited prescribed fire program. During the 1970s, park superintendents were given leeway to experiment. Finally, in 1978, the specifics of tire management were set forth in a guideline, which was further refined in 1986.

The 1986 guideline required the manager of each park that contains vegetation capable of burning to develop a tire-management plan. The plans varied for different National Park Service units. It is important to keep in mind that, in addition to national parks, NPS units include national monuments, national battlefields, national recreation areas, and other types of areas. So it is not surprising that the plans had different management objectives. Some only addressed suppressing wildfires, others also addressed prescribed burning, and still others included prescribed natural fire.

The fires of 1988, particularly the ones at Yellowstone, called into question the adequacy of federal fire-management policy and plans. In September of that year, the secretaries of Interior and Agriculture established a commission (some members of which attended the RNRF workshop) to identify shortcomings in the existing policies and plans.

After an exhaustive look, the team concluded that the basic objectives of the federal policy are sound. The commission did recommend, however, that the policies should be refined, strengthened, and reaffirmed. Other recommendations included revision of the specifics offire-management plans for individual parks and wildernesses, development of regional and national contingency plans to deal with prescribed fires under extreme conditions, improvedcooperation among federal agencies, and additional research on fire history, fire behavior, and weather. In effect, the commission's recommendations called for a studied and objective judgment as to the proper time to step in and begin fighting a naturally caused fire.

During the Yellowstone fires of 1988, the Park Service halted prescribed management fires and suppressed all natural fires. The two secretaries later directed thatall natural fires should be fought until new fire-management plans are in place that are consistent with the recommendations. Not until those plans are completed could we go back to prescribing fires or allowing prescribed natural fires. These fire-management plans are now underway, and we expect that approximately 20 will be completed by the end of 1992.

In June 1990, new park guidelines on fire management were issued to all 358 units. In general, the guidelines go into much more detail regarding the content of fire-management plans and conditions under which prescribed naturalfires may be allowed to continue burning. For instance, if a superintendent decides to allow a prescribed natural fire to continue, he or she must certify in writing on a daily basis "that adequate fire-managementre-

Citations are available upon request.

sources and funding are available to manage the fire within the prescription approved for that fire."

Public acceptance of fire as a management tool and natural process has lagged behind acceptance by park managers and even farther behind scientists' understanding of tire. But I believe that increased environmental awareness in recent years has helped change the public's attitude. Several studies done in various parks suggest this view. A study at Grand Canyon indicated that, although visitors' knowledge of prescribed burning is not great, their support for a prescribed-burning program is high. Fewer than 14 percent of the respondents indicated lack of support. A study at Sequoia and Kings Canyon national parks found that many of the visitors do understand fires and their role in a natural ecosystem.

The Department of the Interior will continue to refine its fire policy as knowledge about fire expands and our vision of the national parks evolves. That vision has become clarified since the Leopold report called for "vignettes of primitive America." This phrase is now interpreted as referring to the free play of natural processes. In the words of official Park Service policy, managers "will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of the plants and animals. Just as all components of a natural system will be recognized as important, so will change be recognized as an integral part of the functioning of natural systems. The National Park Service will not seek to preserve natural systems in natural zones as though frozen at a given point in time."

Perhaps the biggest issue facing us today is how to use fire to restore natural conditions. To accomplish this, we must first determine the natural fire regime in a park, whether and how it has been disrupted, and how to reestablish it. Part of this is understanding the role of native North Americans in shaping the landscape and deciding whether their fires should be considered part of a natural system or part of a human-induced system.

This discussion illustrates the complexity of fire ecology and policy. We look forward to working with scientists and managers to assure that National Park Service fire policy remains in line with scientific knowledge as it grows and with the mission of the Park Service.«

A CANADIAN APPROACH TO FIRE MANAGEMENT IN NATIONAL PARKS

NIIUTA LOPOUKHINE

Canadian and American National Park Systems developed in tandem, separated by a 10- to 13-year lag. Canada's first national park, Banff, was established in 1885, 13 years after Yellowstone. A number of subsequent parallel events exhibit the same difference in time. For example, the official Canadian policy recognizing fire as a natural process was promulgated in 1979, 13 years after the equivalent U.S. policy.

Parks in Canada, as in the United States, were not initially created for protection: the first vision was pleasuring grounds requiring "improvements." Over time, the scope expanded. Today, the "correct" basis of management focuses on the relationship of the park to the greater ecosystem in which it is situated.

The National Parks Act in Canada gives the Canadian Parks Service the opportunity to concentrate on ecological questions of park management. The 1988 Amendment to the Act mandated that the "maintenance of ecological integrity through the protection of natural resources shall be the first priority when considering park zoning and visitor use in a management plan." The purpose of the parks is "... to protect for all time representative natural areas of Canadian significance in a system of national parks and to encourage understanding, and enjoyment of this natural heritage so as to leave it unimpaired for future generations,"

To carry out the idea of representative natural areas of national significance, 39 Terrestrial Natural Regions (a form of ecological land classification) were identified with the intention of establishing a park within each region. Creation of a park must be followed by a management regime intent on ensuring that natural processes and their effects are maintained over time. In many instances, unfortunately, these processes no longer operate or at the very least have been significantly modified.

The changes affect the ecosystems within the parks and certainly the larger ecosystems surrounding each park. The temporal and spatial scales of natural processes affecting park ecosystems exceed park boundaries. Land uses outside the boundaries are often inimical to the purpose of the parks and to the maintenance of the processes that originally defined these ecosystems. Thus, to retain the characteristics of the natural regions and more importantly the elements of ecological integrity, active management is envisioned.

The question is whether to manage for relatively large units (a sample of the natural region but not necessarily the most representative) or small units (in effect miniaturized) ecosystems. Clearly, in either case, we are no longer faced with protecting natural systems or wilderness in the romantic sense. Where natural processes have been modified, benign neglect

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will yield effects of those modifications and not that which is natural or, in present terminology, would have ecological integrity. This realization has made the Canadian Parks Service step into the era of integrated management, which by definition incorporates active manipulation.

Fire management crystallizes the issues introduced above. For example, the boreal forest which stretches across Canada contains 11 national parks. Historic records of boreal zone tires show that periodic occurrences of one-day fires burned an area equivalent to the 1988 Greater Yellowstone tires. The dilemma for a park manager is how tore-create this phenomena in a park. Do we bum a park in one day? Putting the political ramifications of such a decision aside, let us consider some of the associated ecological questions. Is it appropriate to have but one age class in a park at a time? Will species dependent on older age classes be able to maintain themselves elsewhere, and will they subsequently find their way back with time? The basic question is whether representation means the presence of a full complement of species at all times.

The fire policy the Canadian Parks Service has begun to follow is a practical one with an affinity for the microcosm model. Park managers are striving to represent the greater ecosystem within their parks' boundaries, both in structure and species. A strong orientation prevails towards biodiversity protection, and objectives are being formulated in this context.

The official Canadian Parks Service policy governing tire management (Directive 2.4.4) favors extinguishing all fires. As a replacement, prescribed burning (irrespective of ignition source) is used to achieve the desired effects of fire. These effects are to be clearly enunciated in a vegetation plan that specifies goals and objectives.

At the time of the RNRF workshop, the Canadian Parks Service was undertaking a policy review. The draft policy underwent extensive public consultation, and the Resource Management clauses that provide the framework for the fire-management directions described above were not challenged. The relevant clauses are reproduced here:

> 3.2.1 Ecosystems within national parks will be managed with minimal interference with natural processes. However, active management may be allowed where natural processes have been altered and manipulation is required to restore ecological integrity, or where a park's significant natural or cultural resources must be protected and the objectives set out for such protection cannot be attained without manipulation of natural processes.
>
> 3.2.2 Where active resource management is necessary and practical, it will be based on scientific research, employ techniques that duplicate natural processes as closely as possible, and be carefully monitored.
>
> 3.2.4 Manipulation of naturally occurring processes such as fire, indigenous insect infestations, and avalanches may take place for reasons other than the achievement of park resource-management objectives when no reasonable alternative exists and it is clear that, without intervention, there will be serious adverse effects on neighboring lands or risk to major park facilities, public health, or safety.«

NATURAL FIRE MANAGEMENT IN THE NATIONAL PARK SERVICE AFTER 1988

RODNEY NORUM

Once philosophers decide what is natural and resource managers set their objectives, the next step is to manage prescribed natural fire. The current Natural Park Service policy reflects the reality of managing naturally burning fires in ways that permit ecosystems to function and yet give assurance of safety to people and public resources.

The NPS attempts to meet the direction and constraints established by the National Fire Management Policy Review Team, created by the departments of the Interior and Agriculture in 1989. The direction received from the review team is genuine, fair, and appropriate, and it has proved to be positively beneficial. However, no national oversite body monitors implementation of the team's recommendations. The only official followup has been fiscal review by the General Accounting Office. But day-to-day implementation and progress in making the recommendations work depend on the professionalism and professional ethics of fire-management leaders across the nation.

The final report, produced in 1989, was jointly accepted without change by the secretaries of Interior and Agriculture. It is important to clarify the timing of the actions taken during late 1988 and early 1989 and the reasons for them.

As early as November 1988, it was no secret to fire managers that the Policy Review Team was committed to presenting a draft of its recommendations by early December 1988. A great deal of speculation was occurring and apprehension that fire managers might lose the option of using prescribed natural fire.

The National Park Service Branch of Fire Management and the USDA Forest Service Fire and Aviation Management jointly planned a task force, which met in Atlanta in February 1989 and addressed

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the December draft with an eye to agreeing on what the recommendations mean in terms of implementation in the field. As it turned out, our faith in the skill of the review team was well founded, and few changes were made to the December 1988 draft. The Forest Service and Park Service's task force gleaned from the Policy Review Team's report the elements necessary to ensure that a prescribed natural fire program would be in compliance. We then went our separate ways to review fue-management plans.

The National Park Service decided to take early action in order to start the long process of putting a prescribed natural tire program back into action. It was clear to the Park Service that all fire-management programs would be shut down and the plans reviewed and revised to meet the recommendations of the review team's report. Since many of the recommendations were new, none of the existing fire-management plans entirely met the recommendations.

The truth was that, across the Park Service, most of the prescribed natural fires had been managed in a few high-occurrence parks. Nevertheless, working teams comprised of experts from across the nation were selected to review the wildland fire-management plans for 29 national parks.

During March 1989, the teams looked for deficiencies in each plan based on the criteria defined by the joint Park Service-Forest Service task force. This review was followed by updating and revising the plans to meet the new criteria.

The first recommendation in the review team's report directed that "fire management policies governing wilderness and parks must be strengthened and reaffirmed to limit their application to legitimate prescribed fire programs." The review team emphasized that Alaska's well-established and successful program of fire suppression should be left unchanged. By July 1989, the National Park Service had its marching orders, and it was time to translate the policy recommendations into procedures for doing business.

I chaired a lo-person task group of fire managers from across the nation charged with the task of developing the policies on managing prescribed natural fires that are now in the Park Service's wildland fire-management guidelines [NPS-18]. After review, these new directives were issued as policy by special directive from the Associate Director for Operations in January 1990. That date is important because it was only then that we had policies to work under-for the first time since the shutdown in 1988—and the fire-management programs could go back on line. Since the 1990 special directive, NPS-18 has been rewritten except for the portion dealing with policy on prescribed natural fire, which remains as issued.

Problems encountered include the need to spell out prescriptions for conditions under which to allow prescribed natural fires. The conditions are not the same for every park. They vary with the park's location; the nature of the terrain, fuels, and resource objectives; and the best proven variables for that location. Since fuels and topography may vary within a large park, the prescriptions also may be different for various locations within that park. In fact, they may even change as a season progresses.

Does this restrict purely natural fires? Unhappily and inevitably, yes. But prescriptions can be made liberal enough to include fires of suitable intensity. Nevertheless, a limit must be specified. Each prescription is tailored to the unique resources, fuels, climate, objectives, and topography of individual parks.

The fire-management plans are required to be reviewed or revised at least once every five years, but parks typically update the operational portions every year. Every plan must include a structured decision tree tailored to the park and possibly to each subdivision within the park. The decision trees identify all areas requiring protection, address local concerns and management objectives, and serve as mechanisms for daily management of prescribed natural fire and for timely conversion, if necessary, to a wildfire.

In revising wildland fue-management plans for parks that have boundaries in common with other areas that also have prescribed natural fires, joint planning and formulation of prescriptions as interagency agreements is required. Some of these agreements were in place in 1991; others were being completed. Varying objectives on the part of different agencies make these cross-boundary agreements and management plans complicated and time consuming, but not impossible. Even in places like Yellowstone where multiple agencies border the parks, agreements have been worked out.

One of the most difficult requirements is completion of interagency regional contingency and preparedness plans. These plans provide procedures, monitoring, and direction, including curtailment of prescribed fires for such reasons as competition for regional and national suppression resources. It was the understanding of the Department of the Interior agencies that we could not reinstate prescribed natural fire programs until these regional preparedness plans were complete. On the other hand, the U.S. Department of Agriculture did not lay down similar restrictions for the U.S. Forest Service. Therefore, the Forest Service did not share the Park Service's urgency for completing the plans. The problems were resolved, however, and the regional preparedness plans are in place and activated.

A significant change from the pre-1988 requirements is that superintendents must certify in writing every day that the fire is within prescription and adequate resources are available to keep it in prescribed boundaries or to take appropriate suppression action. The Park Service clearly will not saddle its superintendents with the responsibility of signing an approval for prescribed natural fires to continue unless the superintendents have the best possible information to substantiate that the fire is

indeed manageable.

Two components are involved in obtaining this information. The first is a complete analysis of the fire and use of the best technology to forecast its day-to-day behavior. Second is a daily tactical analysis to determine just what it would take to make an appropriate suppression response as the days proceed. This Fire Situation Analysis is required for every day in the life of each prescribed natural tire.

The FSA has two parts. Part I addresses current and predicted fire behavior, including all inputs such as spot forecasts. Part I also identifies threats and constraints, such as danger to life and property, natural resources and cultural resources, and concerns over air quality and smoke movement. In Part I, the superintendent receives recommendations regarding park closures, evacuations, holding actions, and the need for monitoring and special concerns. This part of the Fire Situation Analysis is completed each day by the fire staff. It is reviewed, approved, and signed by the superintendent or is rejected, in which case the tire becomes a wildfire under suppression.

Part II is equally important. It is the contingency plan-either holding actions required to keep the fire within bounds or suppression actions to take if it has to be declared a wildfire. Part II is similar to the Escaped Fire Situation Analysis, which defines the required firefighting forces for wildfires. Clearly, with the new requirements, the superintendent must contact tire coordination centers across the country to verify that such forces are available for the next 24 hours.

Regarding the issue of prescribed burning to remove hazardous fuels, it is gratifying to report funding of $1.1 million a year for NPS hazard-reduction projects. In 199 1, we received requests for almost 300 projects, and we were able to fund more than 200. Hazardous fuels have been redefined to include fuel situations that pose a hazard to natural resources in addition to the traditional definition of threats to life and property. Using this new classification, we have removed some key hazard situations around the country and thus freed up a considerable area for safe prescribed natural tire management.

Special attention has been given to the impact of prescribed natural tires on local communities. A key measure is keeping information regarding prescribed natural fires separate from wildfire bulletins because the media and public are not aware of the technical differences. We still hear news bulletins that make us cringe, but we are always developing and refining our public-information programs.

Support for our program since 1988 has permitted staffing of new or upgraded fire-management officer positions. We now have more than twice as many full-time FMO's as we had in 1988, which is very important from a management standpoint.

Prescribed natural fires are funded by a fixed annual allocation, which is decided by the Washington Office's Branch of Fire Management and the regions. The allocation is flexible enough to be moved from region to region as the season progresses or as need arises.

A common allegation is that fire-suppression funds are used to accomplish, management objectives. That is patently illegal. The Park Service is alleged to classify a fire as a prescribed natural fire until we run out of money and then to declare it a wildfire. We supposedly then put it under a surveillance mode and continue to manage it as a prescribed natural fire, but withwildfire funds. This is absolutely false and strictly against NPS policy.

Prior to the current management policy and funding process, the National Park Service funded prescribed natural fires under emergency pre-suppression funds. Until this was changed, we did not have the means or the reason to use wildfire money for natural fire management even if we were so inclined. Now that funding for prescribed natural fires has been changed to a fixed amount, we have never exceeded the allotted funds. If our funds run out during some future season, the existing prescribed natural fires will be converted to wildfire status and appropriate suppression activated to put out the fire.

By the time of the RNRF workshop in 1991, we had 11 parks with prescribed natural tire programs fully revised and back on line. Another 11 were in the final stages of completion and slated to be activated within two years. The remaining seven parks were still considering whether to use prescribed natural fire within their boundaries. In the final analysis, it is up to the individual parks to decide whether a prescribed natural fire program is realistic and appropriate.

The greatest difficulty we face in managing prescribed natural tire is the issue of smoke. New air quality legislation and the advancing degradation of our global air resources will require some tough choices in the future. The question that faces us in many parks is whether we can continue to justify natural tire programs in light of air quality concerns. An excellent example is Grand Canyon National Park, where the mandate is to manage naturally functioning ecosystems. People travel thousands of miles to view the canyon and do not want to look at a huge bowl full of smoke.

It will be interesting to see how the managers of scenic parks make these apparently conflicting management objectives compatible, both within the parks and in conjunction with the parks' neighbors. The prescribed natural fire program of the National Park Service is healthy and is coming back into operation at a steady and well studied, appropriate pace. It is good to remember that the recommendations of the Policy Review Team were not trivial to incorporate. Some parks had an easier time than others because of the nature oftheirplans, resource objectives, and neighbors. They have all worked diligently, with some prompting from the Branch of Fire Management, to turn out plans that we are proud of and meet the requirements of the Policy Review Team. «

PARK GOALS AND CURRENT FIRE POLICY

JAN W. VAN WAGTENDONK

From an ecological point of view, I am concerned about the restrictions that the new fire policies place on fire's natural role. The National Park Service cannot comply with its policy of managing parks as ecosystems within the constraints imposed by the new policies. The conflict occurs because we are being asked to perpetuate natural ecosystem processes while, at the same time, interfering with significant ecological events such as large, intense tires.

Fire is one of the few natural processes that we try to subject to management constraints. We would never think of trying to put limits on hurricanes in the Everglades or at Padre Island National Seashore. Likewise, we would not say, "We are only going to accept 5.2 Richter scale earthquakes; for anything greater than that, we are going to put them out." Similarly, there are no prescriptions for volcanoes specifying the amount of lava that should be allowed to flow downhill.

Perhaps we should have had a prescription for the storm that hit Kennebunkport on the coast of Maine. That same storm blew away the dunes that were protecting Cape Hatteras Lighthouse, even though the Park Service had spent millions of dollars trying to protect the structure. Should we spend money trying to thwart nature when, in the final analysis, nature, not humans, determines policy?

Why is fire treated differently? Why do we establish national monuments to volcanoes and not to tires? Is it because we think that we can put out any fire as long as we have the will or money to do so? Or is it because we do not think we can manage the other processes? I believe it is because we happen to think that we can manage fire and its results. The question becomes, should we?

Maybe there are areas where we should, but there also are areas where it is inappropriate. An example would be in National Park Service and Forest Service wilderness areas. Many of these areas are of sufficient size to sustain large natural events. Fires in wildernesses should be allowed to run their course. If not, we would be prescribing out of the picture significant ecological events that make a difference in these ecosystems. Putting out those tires causes unforeseen consequences in future years. A tire that is extinguished leaves unburned fuels that continue to accumulate and cause subsequent fires to burn more intensely.

In 199 1, for example, the Ill Fire was burning above Yosemite Valley in the Illilouette Creek drainage where, in 1974, Yosemite had undergone its first large prescribed natural fire. The 1974 fire burned some 4,000 acres before we controlled one side because smoke was moving into Yosemite Valley. We did not have PM10 monitors at that time, so we did not know that we had exceeded ambient air quality standards. In fact, there were no air quality standards at the time. The former director of the National Park Service was present, however, and he wanted something done about the smoke. Had the 1974 fire been allowed to burn to its natural extent, the 1991 Ill fire would not have been as intense, nor would it have produced as much smoke. In all likelihood, we would not have had to extinguish the tire at considerable expense to taxpayers.

The Illilouette Creek basin is a good example of the effects of a long-term program involving minimal interference with natural processes. In 1981, another fire burned to the edge of the 1974 burn and went out. Reburns into the 1974 burn occurred in 1980 and again in 1988. What is developing is a jigsaw puzzle of burned areas.

Over the past 20 years, we have found that prescribed natural tires exhibit a pattern of being self-limiting. Once they reach one of the older burns, because of the nature of the fuels and forests, they drop in intensity and sometimes go out. Suppressing a tire prevents a natural process from running its course. We are fussing with the system and once we start fussing, we are going to have to continue to intervene forever.

Intervening with an ecosystem continues to cause problems. The 1991 Ill tire produced dense smoke when shifting winds caused it to spread rapidly. Unfortunately, it was not allowed to bum into the 1974 tire because the incident commander established the tire line through the old bum where fuels were reduced. The fire would probably have gone out or dropped greatly in intensity and produced less smoke if it had been allowed to go ahead and burn into the 1974 bum.

In large wildernesses, we have an opportunity to see how tire influences ecosystems. We will never find out how these systems truly function if we continue to intervene.

In closing, I would like to read a section of legislation introduced in Congress to create natural ecosystem areas on Forest Service and BLM lands. The bill states: "The secretary shall not undertake any tire suppression activity within an ecosystem natural area except where necessary to protect human life or property within or immediately adjacent to the area or the integrity of the area itself." The bill does not say anything about smoke, resource availability, or contingency plans. We may have to allow large tires to play their natural role in park and wilderness ecosystems. «

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THE STATUS OF YELLOWSTONE'S NEW FIRE PLAN

JOHN VARLEY

The Yellowstone tire plan that was in effect from 1973 through the spring of 1988 had four basic goals. The first was to permit as many lightning-caused fires as possible to burn under natural conditions. The second was to prevent wildfires from destroying human life, property, historical cultural sites, special natural features, or endangered species. The third was to suppress wildfire in a safe, cost-effective, and environmentally sensitive way. The fourth was to employ prescribed burning when and where necessary to reduce hazardous fuels.

During the 15 years that this plan was in effect, we discovered that, of the tens of thousands of lightning strikes that occur in Yellowstone each year, most fizzle out without burning a significant acreage. We also learned that lightning was responsible for only 235 natural fires, which burned 34,000 acres. Only 15 burned more than 100 acres, with the largest igniting 7,400 acres.

During those 15 years, we lost no human lives, experienced no significant human injuries, lost no park structures, and, in fact, improved habitat for threatened or endangered species.

Were park goals acheived by these fires? Well, partly, but not completely. Once all of the 1988 fires were out, we were fully aware that they had altered the existing data set significantly. It appears that the fires of 1988 might best be characterized very simply as a big surprise. Certainly, park managers, their scientific advisors, and the Forest Service and National Park Service planners in greater Yellowstone were taken aback by the sheer magnitude. The 1988 fires exceeded all predicted or imagined scenarios built into Forest Service and Park Service natural fire-management plans.

Most Americans, including then-President Reagan, seemed surprised to discover that a Natural Fire Policy even existed. The electronic and print media were also caught off guard. Their coverage proved to be uneven, inaccurate, and confusing. Post-fire coverage has gone a long ways towards alleviating some of those shortcomings.

Since 1988, more post-fire research associated with greater Yellowstone has occurred than took place in connection with any previous fire. In Yellowstone Park alone, 234 post-fire research projects have been undertaken, and this does not count the substantial work being done at fire labs across the country. The new fire-behavior models being developed will take into account the unprecedented conditions that set the stage for what happened in 1988.

This post-fire research is telling us that ecological factors should be given primacy. If we look at wildlife, for example, it appears that a vast reapportionment of species and habitat is taking place. The proportion of old-growth species has decreased, but early successional species and habitats have been enhanced. As far as threatened or endangered species are concerned, no adverse reactions have been observed.

Yellowstone plant communities are right on schedule in terms of revegetation. One year after the fire, it was hard to tell that the grassland and meadows had burned. After three years, the more productive sites would be expected to have an 80 percent-plus plant cover. At the end of five years, the unproductive sites-the plateaus-will have an 80 percent-plus plant cover. The aquatic ecosystems seem to be improved or enhanced in productivity. On the whole, no detectable effect on groundwater has been observed, suggesting that nutrients from the ash remain in the soil.

Sociologically, the Yellowstone fire illustrates that events of this kind attract visitors rather than repel them. Three studies show an understanding public. Visitors come to learn about fire ecology, either on their own by walking through burned areas or by going to one of the 18 or 20 interpretive areas that have been established. They seem to be fascinated with what they see. Only 17 percent went home angry.

Economically, given three successive years of record-breaking visitation, one can assume that cash registers in the greater Yellowstone region have been very active. As a result of some heroic firefighting, we lost no culturally significant structures, and the number of known archaeological sites has increased thanks to the lack of vegetation.

In discussing the new fire plans, the public should be assured that these plans were not devised in secret behind closed doors. In fact, we did something just as unprecedented as the fires themselves. We created a four-page newspaper synopsis of what is basically a very complex plan. The newspaper supplement was sent out to 150,000 households, institutions, agencies, special-interest groups, and opinion leaders. It described the alternatives we considered and the one we selected.

We received a good response from a clip-out comment form. Between 50 and 60 percent of the respondents agreed with the alternative that was laid out in the draft. I would argue with anybody who feels that public involvement was inadequate.

The new plan does much of what the old plan did, as well as some new things. It includes more and better fuels control around villages and gateway communities, as well as a buffer plan for fuel control in adjacent administrative units. A

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bizarre provision asks the primary land manager to sign a personal bureaucratic note every morning that a fire is burning.

Based on what we know so far, we can assume that we are going to have a similar event in the greater Yellowstone region at some time in the next 150 years-or sooner if climatic conditions continue as they have been. In either case, no plan would have altered what happened in 1988, and no plan will change what will happen in the future.

As for problems and conflicts in resolving park goals, I have several points. The first is that many people unfortunately conclude that doing things differently implies that one party was doing something right and the other was doing something wrong. What we do should not be viewed as right or wrong, but rather as simply different.

It is impossible to have a cookbook recipe servicewide, given the diversity of units in the National Park Service. Each park was set aside because it is unique, and thus requires unique plans to serve its goals. What is good for the Sierra Parks in California is not necessarily good for Yellowstone. What is good for one lodgepole pine forest in one area cannot be universally applied to all lodgepole pine forests in the western United States. Things will be and should be done differently in different park units.

Another overtone that I perceive is the endless argument-although never implicitly stated-over who should be the primary manager of wildlands. I would propose a new acronym to add to the acronym problems that we already have: NPP or Nature Prescribed Policy. Should we not leave some ecosystems on this continent for natural processes to call the shots? This idea certainly would not be acceptable at some "cannonball parks" in the East, but places still exist in the West where we can and should let nature drive most of the processes. Encroaching civilization in the future might require us to reconsider, but we are not convinced, at least in Yellowstone, that the time has come. «

SUMMARY II: LINKING FIRE AND LAND USE POLICY

JOHN C. BILLING

Historically, national fire policy has been directed toward western wilderness landscapes, which vary from hundreds of thousands to millions of acres. In sharp contrast, the eastern wilderness areas are typically much smaller (in the 5,000-acre range). It is these eastern areas that are exhibiting the greatest reduction of biodiversity due to fire suppression. The development and implementation of new policy specifically for these eastern landscapes is urgently required, possibly even more so than for western landscapes.

In western wilderness areas, the reality is that "large" tires are necessary if the public desires a landscape setting somewhat similar to the pre-settlement condition. Low-intensity fires are not normal events in this type of ecosystem.

One can conclude that these forested areas will be relatively nonflammable for the next 100 to 150 years. If public land policy continues to direct the suppression of fire in these newly burned areas, however, a high fuel situation will return and become a problem for future decision makers and managers. And, no matter what fire-management plan is in place, controlling a fire of this magnitude was-and will continue to be-beyond human capabilities.

In reality, even with new fire plans, the potential still exists for a repeat of the 1988 fires because of the massive continuity of fuels that remains in Yellowstone. Even now, approximately 40 percent of the park still consists of "old growth," which is highly flammable. Fire is inevitable in this geographical region, whether it be next year, in several years, or in 150 years. And the public should realize that neither the 1988 fires nor the new fire-management plan will eliminate this potential.

Seepage 9 for John Billing's affiliation.

Current strategies continue to emphasize locating visitor centers, park housing, and support facilities within the large wilderness ecosystems. This philosophy needs analysis and evaluation, especially in association with the development of structures and expenditure of federal dollars in fire-based ecosystems. If fire is to play its role in developing biodiversity within these ecosystems, it should possibly have the ability to move naturally (or freely) throughout the landscape.

Land-use planning along the borders of national parks has a dramatic impact on fire-management decisions. Land-use patterns within the greater Yellowstone ecosystem provide the possibility that an intense fire could wipe out communities such as West Yellowstone, Cook City, and others that are located in a highly explosive old-growth plant community. Even with an intense fuel-reducing program, it is doubtful that communities adjacent to the park can survive if fire is permitted to bum freely in Yellowstone.

In developing fire policy and its implementation, greater flexibility must be included in the budgeting process. Fire appropriations not used in one budget cycle should be carried forward into the next fiscal year. This budget flexibility would allow for decisions to be made when conditions are appropriate to ignite and manage fire. Fiscal policy regarding these types of ecosystems should operate on a decade-by-decade basis or perhaps even a century-to-century basis. This policy would allow for sound long-term decisions and the conservation, preservation, and protection of these public resources. «

SESSION III: PUBLIC PERCEPTION OF FIRE POLICY vs. REALITY

MODERATOR JOT D. CARPENTER

THE PUBLIC AND OUR NATION'S PARKS

JOT D. CARPENTER, FASLA

In 1938, I visited Yosemite National Park for the first time. In the 1950s, I worked for the National Park Service as a trail construction and fire crew member. I hate to admit it but in the 1960s I participated in the development of a master plan for Grant Village in Yellowstone Park. My research over the last 12 years has involved investigating the history of landscape architecture in the U.S. Forest Service and the National Park Service.

As background on the role of landscape architects in fire management in the National Park System, the report prepared in 1865 by Frederick Law Olmsted as chairman of the Yosemite Valley Commission is excellent-and virtually predicted the need for RNRF's fire workshop. Olmsted, the father of landscape architecture and designer of New York's Central Park, was instrumental in developing the concept of national parks. Through his work at the Biltmore Estate and hiring of Gifford Pinchot, he influenced the eventual creation of the U.S. Forest Service. His son, Frederick Law Olmsted Jr., then-president of the American Society of Landscape Architects, worked with the American Civic Association to write the key clauses of the Organic Act of 1916.

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Landscape architecture as a profession was actively involved in the National Park Service and individual parks from their inception. The same was not true for the Forest Service. Under Gifford Pinchot's leadership, the Forest Service saw no economic value in recreation and identified landscape architects as recreation people. The early foresters viewed landscape architects as a threat to the economic development of forest-based resources. The first work of a landscape architect for the Forest Service was Frank Waugh's enlightened and brilliant three-volume report on recreation in the forestlands in 1917. As a result of Waugh's efforts, Arthur Carhart was hired in 1919 as the first full-time landscape architect in the U.S. Forest Service.

My interest in the historical contributions of landscape architects to the management of federal lands led to my serving during the past two years as a volunteer working on planning and design projects in Glacier National Park. Glacier encompasses almost a million acres of wilderness. Within that great track are fewer than 200 miles of road, less than half of them paved. Road corridors and other developed areas occupy less than two percent of the park.

Landscape architects are concerned with the relationship between the public and the parks. In Glacier Park, that concern focuses primarily on the 50-mile stretch of road called the Going-to-the-Sun Highway. From scenic pullouts, visitors see great expanses of mountains and forest mosaic. During the preparation in 1990 of documentation for the National Historic Building Survey and National Historic Engineering Record, it became increasingly clear that scenery and aesthetics are critical, and significant efforts were made to assure that the park remains visually accessible to the public.

In the ongoing care of the Going-to-the-Sun road-indeed, on all road corridors in all national parks-landscape architects have a continuing and special role to play. Road corridors represent a disturbance. When park managers, superintendents, and designers make a decision to build a road, they decide effectively to rip up the environment and rearrange it. The landscapes in these corridors are in a stage of rapid change as plant materials respond to disturbed soils, increased light, and new hydrologic patterns.

Consider Going-to-the-Sun Highway. The road is not just a 22-feet-wide paved surface. In some places, it is more than a half-mile wide because we had to go uphill to cut 200 or 300 feet and, on the downhill side, fill 300 or 400 feet. As the knowledgeable visitor drives along the road, it is clear from the raw soil banks, doghair trees, and other visual clues that the roadside is undergoing a disturbance response.

In Glacier National Park, management requested a View and Vista Plan for a lo-mile stretch of Going-to-the-Sun Highway along the shores of Lake McDonald. The resulting plan proposed the removal of doghair and judicious thinning of trees and shrubs, so that two million visitors a year could once again see the lake and tire-influenced scenery beyond-and once again experience the

road as the original designers intended.

To assure easy and economical long-term maintenance, I went to the park's natural science and revegetation staff and asked how we could remove dense disturbance growth in such a way that certain species-willows, birch, dogwood-would not grow back or not return as quickly. "Could we replant with native species that would suppress future development of doghair?" I asked. Their response was, "We are philosophically opposed to removing trees in national parks, and therefore you should simply stop this project." Of course, that did not help. Landscape architects need assistance in finding ways to accelerate succession to establish canopies dense enough to stop the rapid explosion of doghair and shrubs at ground level.

In spaces such as roadsides, we helped create the problem; ask us to participate in its management. Landscape architects also have a role in helping fire-management specialists.

The Forest Service is 25 years ahead of the Park Service in dealing with the aesthetics of fire. In response to public pressure, the USFS developed a dynamic and defensible Visual Resource Management process. Teams that include fire scientists, foresters, recreation and wildlife managers, and landscape architects produced an excellent series of publications. Whereas the Forest Service addresses fire aesthetics on a large scale, most NPS Wildlands Fire Management Plans simply ignore this important concern.

I have been aware for five decades of the U.S. Forest Service fire policy. However, I was not aware that the Park Service had a fire policy except to follow the lead of the Forest Service and extinguish fires. Now, as a member of the public, I am confused by the discussion of NPS fire policy in the media. Some of my confusion revolves around questions such as: How can we prescribe fire in a wilderness area? And how can we conceivably have a "managed wilderness" in Glacier National Park or any park for that matter? Finally, how can we have a Wildlands Fire Management Plan that completely and unequivocally ignores the Organic Act of 1916?

The Glacier National Park's Wildland Fire Management Plan contains absolutely no mention of vegetative patterns, and the role of fire in influencing scenery is ignored. Nor is there any consideration of the relationships between vegetation and wildlife and how fire affects those relationships. When asked about aesthetics and scenery, the officer responsible for Glacier's Wildland Fire Management Plan replied that these issues are not important.

The Forest Service is 25 years ahead of the Park Service in dealing with the aesthetics of fire.

Having attended more than 30 naturalist programs in various parks over the last three years, I can report that the discussions of fire concentrated exclusively on the ecology of fires. Not a single program mentioned National Park Service fire policy or discussed the politics of fire. The Wildland Fire Management plans should address the issue of public education. Of the six draft Wildland Fire Management Plans I have reviewed, only Yellowstone's was written so that the public could read and comprehend it. The others were jargon-filled technical documents that non-fire specialists simply would not understand.

In 1991, I prepared a set of comments on Glacier National Park's Wildlands Fire Management Plan. My comments were reviewed by a number of experts at The Ohio State University for accuracy and appropriateness. Park staff later told me that my letter was simply discarded because, they said, "You didn't know what you were talking about." In essence, in Glacier National Park, the Park Service ignored comments rendered by the public during the Wildland Fire Management Plan's public review period.

On being informed of the treatment my letter received, I sent a copy to 23 individuals in the National Park Service and private and academic communities around the country. Included were professional associates and fire experts. Each recipient was asked to review the content of the letter to determine if it indicated an ignorance of fire policy and secondly, to determine if the language was offensive. Ninety percent of the responses concurred that the points in my letters were well taken and correct. They also suggested that the letter's style and tone might be offensive to some overly sensitive or defensive individuals. Effectively, as a public respondent to an open review, I was ignored because I was an outsider and, possibly, because my comments were offensive to the reviewer.

In such an instance, who is the public that is being represented? Does the NPS simply consider the "public" to be politicians like Allen Simpson or the press? Or is the public only the fire scientist working inside the Park Service?

I have found in addressing the professional audience that landscape architects and planners often do not care about or understand such rural-oriented debates. And fire-management specialists do not seem to want to be bothered with difficult or contentious questions.

More specifically, what professional organizations and specializations should be involved in Wildland Fire policy and management? In the parks where I have worked and studied, a substantial difference exists even among the professionals within the parks over the perception of what fire policy should be. Before we address perception, it seems that we need to know who it is that is doing the perceiving.

MANAGING NATIONAL PARKS

JOE R McBRIDE

The National Park Service Act of 1916 states, "The functional purpose of a national park is to conserve the scenery and the natural and historic objects and wildlife therein and to provide for enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." Regarding tire policy and management, the National Park Service has disregarded this fundamental objective. Interpretive programs in national parks have been co-opted to sell the Park Service's fire policy to the public.

Campfire programs, museum displays, nature walks, and Park Service publications extol the public to accept the new policy as correct and learn to love charred trees and blackened landscapes.

Although not officially adopted, the Forest Service's 10 a.m. policy was adhered to in most national parks. No doubt this policy helped to protect the parks from conflagrations, but it resulted in decreased visual access and enjoyment because of the consequent establishment and growth of shade-tolerant species and forest understories. Not only was the ability to see giant sequoia trees and waterfalls impaired by the 10 a.m. policy, but it reduced visual penetration into the forest understory.

Development of fuel loads during this period also may have reduced the National Park Service's long-term capability of protecting scenery. Under the 10 a.m. policy, park naturalists presented fire as the enemy of the forest in campground programs, museums, exhibits, and publications. Joining the Smokey Bear campaign, the Park Service left little doubt that the right policy was a "no-tire" policy.

In 1968, National Park Service policy changed dramatically. The new policy emphasized that fires of "natural origin" would be recognized as "natural phenomena," and prescribed burning was accepted as a means of achieving resource-management objectives. In the years immediately following 1968, Park Service policy permitted considerable innovation. New fire-management programs were initiated in the absence of clearly stated guidelines. In response to this situation, service-wide management policies were rewritten in 1975.

In 1978, the NPS 18 tire-management guidelines became the first codified instructions for national park fire programs. This new directive resulted in fire policy being tied directly to park-specific management objectives. Revised in 1986, NPS18 states: "The fire management program of all parks must be designed around park objectives." With regard to natural systems, this may require some portions of all parks to proceed through succession towards climax, while others are set back by natural fires. The central concern and focus of the NPS18 guidelines are biological, ecological, and physical problems, with no direct reference to management of scenery or conservation of natural objects. It is not clear how fire policy under the guidance of NPS 18 would address scenic and conservation values.

Depending upon one's interpretation, the NPS 18 guidelines were responsible for the charring of hundreds of giant sequoia treesin Sequoia-Kings Canyon national parks and the extensive area burned in Yellowstone in 1988. Once again, park naturalists were enlisted to propagandize the new policy. Campfire programs, museum displays, nature walks, and Park Service publications extol the public to accept the new policy as correct and learn to love charred trees and blackened landscapes.

The public's perception of the consequence of National Park Service fire policy has in part been molded by the interpretive programs in each park. Quinn's 1980 study of visitors' perceptions of National Park Service fire management in Sequoia-Kings Canyon national parks included the following summary statement: "When visitors become informed of National Park Service activities concerning fire, they readily accept both prescribed and natural fire."

... The national. parks are too serious a matter to be left to the fire ecologists and fire specialists alone.

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A key concern is an effort on the part of some resource managers to disregard the fundamental purpose of our national parks and embrace a doctrine of managing for ecological process. They have used interpretive programs to persuade the public that the parks are well managed, which is subject to debate. In George Orwell's novel *1984*, the Ministry of Truth promotes the party line with three slogans: "War is peace, freedom is slavery, ignorance is strength." The protagonist in the novel was finally convinced by the Ministry of Truth that two plus two equals five. A post-fire study indicates that 17 percent of the people who visited Yellowstone after the 1988 fire went home angry. Thank God that we still have 17 percent of the public who know that two plus two equals four.

Finally, we must address the question of integrating fire policy with the fundamental purpose of the national parks. We need greater citizen input and interdisciplinary teams to address scenic as well as ecological values. Talleyrand said, "War is too serious a matter to entrust to military men." To paraphrase that statement, the national parks are too serious a matter to be left to the fire ecologists and fire specialists alone. The public lands need help from a diversity of professional land managers«

PERCEPTIONS AND PROFESSIONALS: COMING TO GRIPS WITH BOTH

JAMES K. AGEE

Unlike spin masters in national politics, I do not agree that perception is reality, but I think often it can be mistaken for reality. I would like to provide some perceptions in a broader sense of the role of science and the public's perception of science and then tie that to tire policy.

In general, the public seems to hold a high degree of confidence in "science" as broadly defined. The people understand the need for knowledge and the role of science in society. Occasional lapses of confidence occur, but they tend to be temporary. An example might be the debate over whether the French or Americans discovered the AIDS virus. People seem to understand that this is a minor squabble when related to the kind of progress that is being made to control this deadly virus.

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Although the public has a fairly high degree of confidence in science, it has much less confidence in fire policy and its derivative, fire management. First, policy and management both involve more than science; they involve values as well. Secondly, the behavior of natural resources professionals at times exacerbates the problems. When physical scientists are attacked, they tend to circle the wagons and fire outward, whereas natural scientists circle the wagons and shoot at each other. To a national media that thrives on violence and tragedy, this kind of debate tends to be taken out of context and ballooned out of proportion.

A key question is: How does the public view fire management? My sense and perception are that society has pretty consistently viewed wildfire as a threat. We have a long institutional history of trying to remove tire from the landscape, most notably through the Smokey Bear program. The common theme is that not only is fire a threat, but also that we have the capability of managing it. When westarted to change from the concept of tire control to tire management, we were able to adapt much of what we know about fire behavior in order to use fire as well as *control* it.

At the same time, Smokey Bear, even today, still fosters the message, "Only you can prevent forest fires." The Smokey propaganda is well funded and necessary, but it is only part of a much broader institutional role that we ought to take in dealing with fire. Smokey posters show fire-dependent trees with the mistaken message that, in order to save those trees, you should put out fires. On the other hand, when managers start to deal with fire in a broader context, they are accused of something akin to anarchism out of the 1960s ("burn, baby, burn"). Smokey Bear's famous quotation is too simple; no longer can we tell the story in a single sentence. We need to work at a national level to broaden educational efforts in fire ecology and management.

Wilderness and park managers have established a number of locally successful fire-interpretation programs. The level of funding, particularly in parks, for that kind of education is relatively limited. Also, a major portion of tire interpretation is conducted by college-age interpreters who probably are serving their first or second season in a park. Typically, they have little experience in fire policy and management, which means that an unfair burden is placed on them. In their defense, visitor surveys from various parks show that the public comes away with a good understanding of the complexities of fire.

Most of these programs are far too limited and reach far too few people to affect fire policy. We are failing in the larger public arena. One of the reasons was brought up by Stewart Pickett during a symposium at the Ecological Society of America's 1988 annual meeting at Snowbird, Utah. Pickett's concepts received considerable press coverage, including a story in the New *York Times*. His bottom line was that, for many years,

scientists have perpetuated a snow job on the public regarding the concept of a *balance of nature*. In fact, disequilibrium is normal, and only change is constant. Natural disturbances are an integral part of ecosystems. Pickett pointed to the difficulty that natural scientists faced when dealing with the Yellowstone tragedy in the media. The public was so imbued with the balance of nature concept that, during the abbreviated sound bites that media coverage typically allows, most scientists spent their time explaining the reality of the *imbalance* of nature and never got down to the specific issues of the fire.

Fires are an act of God, but they are also an act of humans. We have the ability to intervene, and we *do* intervene, in fire processes. We must bring in that human element at the park level, but also at all educational levels from kindergarten through college. We are improving the process of integrating ecology into education, but probably no other field in natural resources has such a confusing array of terms as fire management does. To the public, understanding the difference between the Forest Service and the Park Service is hard enough, but when we introduce concepts such as *let bum, prescribed natural fire, natural* fire, *unscheduled ignitions, scheduled ignitions, unplanned ignitions, planned ignitions, prescribed fire, wildfire, manager-ignited fire,* and *category 1, 2, 3, 4 wildfire,* the public understandably becomes confused. When we can hardly talk with each other, it becomes extremely difficult to discuss issues coherently with the public.

The tendency of professionals such as ourselves to build our identity through specialization is exemplified by this kind of unique, specific language. The more unintelligible we become, the more we can defend our particular group as a discipline. We need to understand that the communication of these complex fire issues is not something that can be done with a brochure or campfire program. It will require an involved and repetitive process, and it will take a lot of time away from research and management efforts.

Finally, my perception is that people are skeptical of the friendly flame and view tire as a threat. The Yellowstone fires were a distant event to most people, but they were interpreted by the media as a threat and perceived as such by the public. Threats to resources, property, and people will most likely intensify over time. A couple of years ago, Steve Pyne predicted that the 1990s will be the decade of exurban fires-the wildland-interface tire. Millions of citizens saw the results of the Oakland-Berkeley fire of 1991 on television. Every additional interface fire, whether it occurs in Berkeley, Missoula, or Spokane, will have the same effect. This problem is going to increase, not decrease, during coming years.

When physical scientists are attacked, they tend to circle the wagons and fire outward, whereas natural scientists circle the wagons and shoot at each other.

In general, the public raises fewer questions than our scientific colleagues do. Larry Laudan maintains in *Science and Values: The Aims of Science and Their Role in Scientific Debate* that dissension is important in the development of natural science. Natural scientists have somewhat naively believed that matters of fact are impartially resolved by invoking appropriate rules of evidence. This is not true for wildland ecology, As an example, at a workshop in Seattle on ecosystem management for parks and wilderness, a group of professionals and scientists spent two days arguing over the definition of an ecosystem. We should already have a pretty good idea about how to define that term. We have to let down professional barriers and begin to *communicate*. We must also recognize that science is not value free. As we continue to develop tire policy, we must integrate the social elements of ecosystems into the biological, recognizing that no single set of disciplines trumps over others in this complicated process. It does help to share a common language base—and respect.

The manager must realize that the professional and scientist are not there just for backup. The scientist has to realize that decision making involves consideration of more than ecological processes. The landscape architect's portfolio of landscape types must include the notions that landscape ecosystems change over time and that a natural landscape from a visual perspective can be more or less attractive than a manipulated one. The forester must recognize that blackened trunks and dead white fir trees may not be viewed as desirable by all segments of the public. Foresters should be willing to incorporate visual components into their management strategies and recognize that these visual decisions may last a century or more. The ecologist must realize that ecosystems include people.

Fire management will require many technical advances to solve the problems of today and tomorrow. But perceptions of fire management by the public and by the various relevant professions are a key element in finding solutions«

SUMMARY III: CAN FIRE POLICY ENHANCE SCENIC VALUE AND PUBLIC PERCEPTION?

JOHN C. BILLING

A perception exists among some scientists, professionals, and the public that the current fire policy disregards the 1916 Organic Act. The real conflict with the original legislation is that our understanding of ecology and the principles of ecosystems has changed dramatically. The critical question that needs to be addressed from a policy standpoint is: As social values change over time, how do we get away from a philosophy of managing objects and components in a given park?

To manage the national parks properly in the 21st century, we must first understand the role and purpose of the parks. Are they nature preserves or places for the enjoyment of the public? These varying perceptions of the overall goals of the Organic Act lead to different management directions and in turn conflicting policies.

Much of the fire policy for the parks has been developed by decision makers, professionals, and scientists motivated by a concern for achieving biodiversity. Over the past 75 years, the scientific community has concluded that the absence of fire is a "non-natural" event in a climax vegetation community such as Yellowstone. Recent studies conducted after the 1988 fires by the University of Montana indicate that approximately 80 percent of the public entering Yellowstone National Park believe that fire plays an important role in maintaining forest ecosystems. Yet the public harbors the misconception that a "let-burn" policy is in effect on public lands. In reality, any fire on public lands that is allowed to burn is following a specific sequence of events that is managed with the intent of re-establishing or enhancing a specific biological process or visual component of the landscape.

Seepage 9 for John Billing's affiliation.

In the case of Yellowstone National Park, the public's reluctance to support existing tire policy was probably traceable to being overwhelmed by the enormous acreage that burned. In reality, if the public desires a landscape that is somewhat similar to a pre-settlement condition, large-acreage fires are necessary in certain ecosystems to achieve that end. Also, the public fails to realize that seasonal western fires are more or less equivalent to other major natural events such as tornadoes, hurricanes, and earthquakes, which are impossible for humans to predict, control, or manipulate.

A critical policy component, or goal for managing the national parks, is that of maintaining scenic beauty and the role of fire in achieving scenic diversity. One of the primary reasons for the establishment of the parks was the recognition of their scenic value. The parks' proponents in Congress argued that the proposed park lands had no economic value for agriculture, timber, or minerals, but the scenic importance of the sites was another strong argument. Visual resources (scenery) should be considered of equal importance with other natural resources, such as fisheries or wildlife, or biological, chemical, and hydrological processes. One of the best ways to ensure visual and biological diversity in the national parks is through stand-replacement fires.

To the average visitor, a landscape like Yellowstone is essentially a series of important roadside views. The continuous implementation of prescribed natural fires can be an excellent management tool to enhance the experience of auto-oriented visitors. Once a landscape unit is ignited, by natural or human means, a management decision can be made based on the fire's effect on the landscape's visual diversity and quality, while still taking into account impacts on ecological diversity. The public seems to desire and value visual diversity, but the extent of the Yellowstone fire was just too large to make that mental connection.

A specific perception that needs emphasis and clarification is that each national park is uniquely different. The ecological characteristics of some parks create a finely grained mosaic of fire patches. In other ecosystems such as Yellowstone, fire-whether induced by lightning strikes or by management—creates a sequence of large burned patches. If the visitor's previous perceptions are based on mosaics of fire patches, the experience of seeing large burned expanses for the first time can be shocking. It is extremely important to educate the public to expect that all parks do not look the same.

A critical management component that influences the public's perception is interpretative staff, or the lack thereof. Budgetary priorities must be re-evaluated, especially line items that relate to the hiring and training of seasonal and permanent staff. It is the interpretative staff who have direct access to the public on a daily basis and influence their perceptions of the park's resources.

Budgetary priorities relating to research and cooperative agreements with universities are equally critical, Universities are changing their economic priorities, and their budget structures are providing less support for research. Faculty members and their students are no longer interacting with the National Park Service in the way that Aldo Leopold or Harold Bizwell did. It is only through a collaborative approach that a wide range of research projects can be undertaken and the results be made available to influence public opinion and the public's perception of the national parks. «

SESSION IV WHERE DO WE GO FROM HERE?

WORKING GROUP REPORTS

Editor's Note: At the conclusion of the workshop, the participants divided into six working groups to discuss the challenges raised by the issues discussed during the previous sessions. Byron R. Burnham, an associate professor and evaluation specialist with Utah State University in Logan, Utah, served as a floating facilitator. In a final plenary session, a spokesperson for each group reported on the discussions and recommendations reached regarding the National Park Service's fire policy. The results are reported here.

WORKING GROUP ONE

Group One concluded that a continuing process should be designed that would define goals, policies, and objectives for managing the National Park System in a way responsive to newly discovered knowledge. That planning process would incorporate all resource-management planning and would consist of the following steps:

1. Review existing legislation and policies and their evolution.
2. Within 12 months, define a Park Service process for defining goals, policies, and objectives.
3. Determine a procedure for communicating and educating the National Park Service's many audiences.
4. Determine a process for obtaining inputs from these many audiences.
5. Determine a procedure for monitoring, predicting, and acting upon changes in the parks.

WORKING GROUP TWO

Group Two selected the issue of interpreting the Organic Act in terms of land-management objectives, either structural or process objectives, or both. Fire-policy implications should be examined in light of management strategies, both in the case of suppression and prescribed natural fires.

Group Two concluded that the Organic Act must be interpreted at a micro level, perhaps in terms of zones within each park. The group also suggested the establishment of advisory boards for each park consisting of specialists and members of the public to deal with accountability and feedback issues.

WORKING GROUP THREE

Group Three took up the issue of the lack of clarity in national policy guiding the objectives of individual parks relative to fire management. The group suggested that the Renewable Natural Resources Foundation request that Congress commission a study to clarify objectives and goals. Those conducting the study should include a cross section of relevant professionals and stakeholder groups. Results from this study would be incorporated into the next National Park Service lo-year policy document.

WORKING GROUP FOUR

Group Four selected the issue of resolving the confusion among the National Park Service's goals of management for scenery, management for natural objectives, or preservation of natural processes. The group concluded that this is an over-riding problem and that revisiting the Organic Act would be important in gaining historical understanding.

The group also decided that interdisciplinary teams should establish park-specific objectives, as well as evaluating and suggesting alternative management practices in order to ensure ecological integrity. Moreover, Group Four concluded that the Renewable Natural Resources Foundation should urge Congress to request the National Academy of Science to employ interdisciplinary modeling processes on three or four widely diverse units such as Yellowstone, Sequoia, and Blueridge National Parks.

WORKING GROUP FIVE

Group Five decided that the important issue is defining the goals of the National Park Service. What should be the goal that drives management decisions? The group suggested that the answer lies in maintaining ecological integrity in an historical context. To achieve this goal, five steps were recommended:

1. Provide an operational definition of integrity by identifying biotic elements, scenic elements, and other key components that constitute a park and the processes within a park. Biogeochemical cycles and evolutionary process were offered as examples.
2. Evaluate a sample park to determine which elements or processes are present, which are missing, and which are impaired.
3. Use the evaluation from step

two in order to set specific objectives for maintaining the existing elements, replacing missing ones, or repairing impaired elements.

4. Identify a range of alternatives that would accomplish the task of repairing, maintaining, or restoring specified elements or processes.
5. Select one or more alternatives to achieve stated objectives. This selection process includes consideration of ecological, scenic, social, and other ramifications of each objective.

After the management plan is instituted, a monitoring system would be set up to describe preselected elements and processes. Group Five went on to suggest that models such as nutrient flow models would provide standards and comparisons for determining accountability.

WORKING GROUP SIX

Group Six decided that a clarification of the Organic Act is needed. as well as the process of developing goals for specific fire policy. The group also noted that even though all units in the National Park System have goals, input from the public is insufficient for helping the National Park Service evaluate its goals. Group Six also noted that, after an event takes place, a "drugstore analysis" of what happened is made, as well as an attempt to correct the problems that surface. Members of this group noted that the National Park System needs to get ahead of events and treat them as input into an evaluation process. To aid this process, a hierarchy of goals should be established. Accomplishing this ranking may entail considering unique legislation for each national park.

Group Six made two recommendations to the Renewable Natural Resources Foundation. First, RNRF should suggest that the House Interior Committee's National Parks and Public Lands subcommittee do an analysis of the Organic Act to see whether it meets today's needs. RNRF also should recommend to the Secretary of the Interior that an input process be formally instituted at the park level so that oversight is provided for the process of weighing values and goals to arrive at a realistic fire policy.

SUMMARY

Fundamental to the conclusions of each group was the issue of goal clarification. Some groups noted the importance of reviewing the Organic Act, others decided that constructing models would help clarify goals, and still others noted the importance of including a broad spectrum of professionals and other stakeholders in establishing goals. All groups communicated a sense of confusion over the goals of the National Park Service. Clarification of goals, they concluded, is a crucial first step in the comprehensive integration of land-use and fire policy, both of which are necessary to sustain the biological and visual diversity of each park. The results of this process would be the development of management plans and practices to conserve, preserve, and protect the public lands for future generations.«

National Park Service

Dusk comes early as smoke from the 1988 fires billows toward Yellowstone's famed Old Faithful Lodge.

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The Renewable Natural Resources Foundation (RNRF) was incorporated in 1972 as a nonprofit operating foundation and today 18 s member organizations. The Foundation was established to advance education in renewable natural resources, promote sound, scientific management of resources, foster cooperation among professional, scientific, and educational organizations, and develop the Renewable Natural Resources Center, an office park complex in Bethesda, Maryland, for member organizations.

RNRF conducts conferences, workshops, congressional forums on resource issues, summits of the leaders of RNRF member organizations, and round table meetings on public policy. The Foundation publishes the *Renewable Resources Journal* and makes two annual awards to recognize outstanding achievements in the renewable resources fields.

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