Natural Fire Management in National Parks

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ABSTRACT / An evolving understanding of ecological processes, together with ambiguities in National Park Service policy, have led to multiple interpretations of the role of management in our large natural area National Parks. National Park Service management policies must be dynamic and responsive to changes in scientific knowledge and societal values. We propose that the principal aim of NPS resource management in natural areas is the unimpeded interaction of native ecosystem processes and structural elements. The case of the changing role of natural fire management is used as an example in developing this rationale.

Policies that direct management of national parks and other large natural areas must be dynamic. As knowledge accumulates and ecological models are refined, goals and objectives that once made sense may appear irrelevant, self-contradictory, or inappropriate. Policy dynamics should reflect changes in societal values, changes in models of the natural world, and interactions of those elements. The policy analysis of vegetation management in US National Parks provided by Bonnicksen and Stone (1982a) effectively illuminates this process and reveals what they see to be significant flaws in National Park Service resource management policy. The conclusions they draw from their analysis, however, are undermined by the ambiguous use of such terms as "state" and "scene," by an incomplete appreciation of the role of national parks, and by disregarding some important ecological principles. In the response to Bonnicksen and Stone that follows, we recognize that the body of Park Service policy to which we (and they) refer is subject to a variety of interpretations. By utilizing the developing body of literature on wilderness management and a few basic ecological postulates, we offer a reasonable resolution of policy ambiguities and propose a coherent direction for natural resources management in the large wilderness national parks.

We propose that the *principal aim of National Park Service resource management in natural areas is the unimpeded interaction of native ecosystem processes and structural elements.* Both structural elements (including plants and animals, soil and parent material, water, and air) and system processes (such as photosynthesis, wildfire, and erosion) are protected, as are interactions among them. While, over the years, National Park Service policy has variously compelled, encouraged, and permitted intervention in ecosystems in order to enhance or inhibit different structural elements such as scenery or wildlife by influencing processes such as wildfire, predation, or erosion, the changing role of national parks and more sophisticated ecological understanding have reduced the perceived need for intervention to a limited set of cases:

1) To reverse or mitigate anthropogenic factors where knowledge and tools exist. Such factors may include loss of native species or introduction of exotics; alterations in vegetation caused by burning, fire suppression, logging, and so on; and physical alterations of the landscape. This management function is addressed most specifically in Leopold and others (1963).
2) To protect a featured resource. Policy makers and managers may elect to place protection of a particular system element, such as endangered species, a valued spectacle, or an historic scene, above protection of wild ecosystem interactions where the latter threatens the former. In some cases an entire park may be managed to protect the historic scene while in others such may be applicable only to localized areas.
3) To protect life and property. Wildfire, large predators, and insects or disease, for example, may be controlled or excluded from a zone that is dedicated to intensive visitation or development, or that borders land dedicated to conflicting uses.

KEY WORDS: Fire history; Fire management; Natural fire; National Park Service; Resource management policy

In the particular case of fire, a proposed goal for wilderness ecosystems has been clearly stated by Heinselman (1978) as "to restore fire to its natural role in the ecosystem to the maximum extent consistent with safety of persons, property, and other resources." He continues, "Note that the goal is *not* to produce any specific mix of vegetation types, to create desirable wildlife habitat, to reduce fuels . . . but the objective is to restore the naturalness of the environment and let natural processes take over." This goal is applicable to most national park wilderness fire management programs. This approach appears in conflict with that suggested by Bonnicksen and Stone (1982a), who state "fire is a tool that is used to produce some desired state in the condition of an ecosystem." While we recognize that fire may be prescribed as a short-term management tool to reduce unnaturally heavy fuel accumulations, its long-term use to create specific ecosystem states is appropriate only in historic or developed areas.

National Park Service policy recognizes fire as a natural part of many ecosystems. In large natural area parks, the goal is to allow lightning fires to burn as freely as possible as long as "unacceptable" impacts do not occur. Unacceptable impacts will differ depending on the area, but might include threats to visitor safety, damage to facilities, production of unacceptable quantities of smoke, or fires of greater intensity than would have occurred under natural conditions (for example, an unnaturally intense crown fire caused by unnatural fuel buildup that drastically changes a community type adapted only to frequent low-intensity surface fires). In some areas of Sequoia, Kings Canyon, and Yosemite National Parks, prescribed burning is used to reduce heavy fuel loads that have accumulated during the last 50–60 years of effective fire suppression, before lightning fires can be allowed to burn (Bancroft and others 1985). The strategy in such cases is to use localized prescribed burns to break up large areas of homogeneous heavy fuels, thus reducing the chances of a high intensity wildfire. In addition, such burns set the stage for fuels to reaccumulate at their own rate. The resulting subsequent fire behavior should consequently be less anthropogenically influenced. We consider prescribed burning to be a precautionary step that is necessary at least until there is better understanding of fire behavior and ecological impacts of varying fire intervals and intensities. Once these preliminary burns are accomplished, natural (that is, lightning) ignitions will be allowed to burn within the constraints we have listed. This will accomplish our goal of restoring fire as a natural process to as large an area as possible. It is not designed to first recreate any particular historic scene or vegetation structure, a goal no longer in keeping with the principal role of national parks management of natural areas (Graber 1983). In historic or developed areas where protection of resources and property do not permit a natural fire program, continued prescribed burning will be necessary, although, for aesthetic and ecological reasons, fires should still mimic the effects of natural fire as much as possible.

Bonnicksen and Stone are concerned that renewing the fire process will simply perpetuate "unnatural vegetation" instead of producing "some desired state in the condition of the ecosystem." We do not share this concern and, in fact, disagree that it is even necessary to produce "some desired state," especially when that state is defined only in terms of overstory structure (Bonnicksen and Stone 1982a). The communities we are dealing with have evolved with periodic fire for tens of thousands of years. Climatic fluctuations, aboriginal burning, and burning by modern humans have no doubt caused these communities to adapt to wide fluctuations in fire intensity and intervals between fires. We remain unconvinced that 60 years or fewer of effective fire suppression have caused significant changes that fall outside normal variance in ecological times. This assumption, together with the knowledge that these communities are dynamic in terms of age-class distribution and relative species abundance, and that no species appear to be in danger of being lost from the system, makes it unnecessary and, in fact, undesirable to recreate the supposed overstory structure to what it might have been at some specific point in time. Even if such were desirable and possible, we could not assume that other parts of the ecosystem (for example, soil fungi, fauna, and herbs) were also synchronized. The important thing is that fire, as a process and function, is reintroduced to its "natural role." By this, we mean fire of similar behavior and within the interval, intensity, and seasonal range with which the community in question has evolved.

We recognize that our approach to natural area management in national parks is based in part on recommendations made by Leopold and coworkers (1963), who also suggested a management goal "to preserve . . . the ecologic scene as viewed by the first European visitors." It is primarily our interpretation of the relative importance of dynamic "process" versus static "scene" management that differs from that of Leopold and colleagues (1963). Bonnicksen and Stone (1982a), on the other hand, claim early legislation calls for the goal of each park to be "to preserve . . . the same scene that existed when the national park was first set aside by the Federal government." They provide

only speculative evidence to defend their interpretation, and seem to assume that legislators of the early 20th century were using an ecological rationale not developed until many decades later. While we can accept this static "museum" approach for historic areas, we propose that the goal of parks with large natural areas is to allow the perpetuation of natural processes that would be occurring had modern man not come upon the scene (Graber 1983, McCool 1983). This is in direct conflict with Bonnicksen's recent assertion that "national parks are not intended to be wilderness areas" but are "living museums" (Bonnicksen 1983).

In another article, Bonnicksen and Stone (1982b) invoke an elaborate model of forest succession as a necessary tool for the management of sequoia–mixed-conifer forests in the Sierra Nevada national parks. With their model, present forest structure can be back-dated to the year 1890, and then run forward again to produce a picture of a contemporary forest as it would appear had European man never arrived on the scene. They insist that natural ecosystem processes cannot function naturally unless the present forest is first manipulated to match their model run. Even if one assumes the model operates correctly, there remain a number of reasons why it is inappropriate to park natural resource management:

1) While 1890 is the year both Sequoia and Yosemite became national parks (and happens to be the model's limit of resolution), it comes several decades after the disruption of Indian society (and burning) by European settlers and after an equal period of heavy grazing by domestic animals and annual burning (by settlers) in many locations.
2) It is concerned with overstory vegetation only and does not speak to other ecosystem components of equal concern to park managers.
3) It ignores short-term and long-term climatic change, as well as anthropogenic factors other than fire (for example, air pollution or acidic deposition). The influence of these since 1890 is virtually unknown, but could exceed the effect of fire suppression. In the long run, this makes any effort to create a specific structure or scene of questionable value.

In fact, as we have no way of knowing how well the Bonnicksen and Stone model approximates ecosystems, it seems to us more conservative, economical, and instructive to permit process–structure interactions to reequilibrate on their own after one or more prescribed fires.

The question of whether or not aboriginal burning should be simulated in national park natural areas illuminates some of the important distinctions between managing to replicate a particular ecosystem state, on the one hand, and merely mitigating anthropogenic effects and protecting life, property, and selected resources, on the other hand (Arno 1985). Bonnicksen and Stone accept the simulation of Indian burning as a given in the management of Sierra Nevada parks. While the preponderance of evidence suggests that Indian fires were a significant ecological factor during the several hundred years (perhaps as much as a thousand) preceding settlement, that period probably was too short to have affected local plant adaptations or produce wholesale-type conversions (Lewis 1983).

If we had sufficient data to simulate Indian burning accurately, we would nonetheless be obliged to impose a *static* process when, in fact, Indian culture, like all human cultures, was not static and could not be expected to have continued its practices in the same way indefinitely. Moreover, if Indians are taken to be a "natural" component of the primitive landscape at the time Europeans first saw it—the Leopold standard for scene management—then by what logic does one stop at that particular element? One must seek to replicate Indian hunting and acorn gathering, the effect of California grizzly bears, and so on.

The biggest flaw in managing for a particular ecosystem is that it seriously compromises the value of park natural areas as living laboratories of natural ecological processes. As Bonnicksen and Stone themselves point out, any manipulation of the system obscures evidence of past history and likewise the way in which the present system functions. We can learn the most by becoming expert observers, and we can serve the parks as well as humanity best by understanding as completely as possible how these remnants of wild America function.

In summary, we fully recognize that National Park Service resource management policy, including fire management, contains many ambiguities. In addition to a lack of consensus on the role of national park natural areas, there is a lack of basic understanding of the ecology and fire history of many park ecosystems. It is essential that the goals and objectives of park resources management be more clearly articulated. We propose that in most large wilderness national parks it is more desirable to let natural processes operate than to artificially manipulate objects such as vegetation structure. National parks can serve as valuable living laboratories of natural ecological processes in a world where anthropogenic influence is virtually omnipresent. In

those areas where the goal is to preserve the historic scene, a different management strategy is both appropriate and necessary.

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