Chapter 5

Changing Policies and Practices: The Challenge of Managing for Naturalness

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> It can be safely said that when it comes to actual work on the ground, the objects of conservation are never axiomatic or obvious but always complex and usually conflicting.
>
> —*Aldo Leopold*

Protected area policy and practice have changed dramatically over the past century, in response to shifting societal values, conservation politics, and scientific understanding, and ever-increasing human environmental impacts. Public enjoyment and scenic beauty were once the highest priority in U.S. national parks. At the start of the twentieth century, only the "desirable" native species were protected, while others were exterminated; "undesirable" ecosystem elements, such as fire, were controlled wherever possible. But by the latter half of the twentieth century, parks and wilderness began to embrace all native species and ecosystem processes, and protected areas became increasingly viewed as critical cornerstones of biodiversity conservation. At the same time, conservation advocates argued that active management should be kept to a minimum, to allow nature to take its course free from human intervention.

Chapter 2 in this book examined the multiple meanings of naturalness and how these lead to conflicting goals for protected areas. Chapters 3 and

4 explored how new scientific insights and an expanding global human imprint suggest that protected area stewardship is increasingly complex and challenging and that concepts such as naturalness are inadequate for dealing with the nuances of managing ecosystems in parks and wilderness. In this chapter we explore how protected area policy and management practice have struggled to implement the mandate of naturalness. We argue that management for naturalness has proved particularly thorny, in large part because of vague and ambiguous policy. We focus here on national parks, but the challenges described apply to many protected areas in the United States and internationally.

From Scenery and Spectacle to Biodiversity Conservation

National parks were initially established to protect dramatic scenery and charismatic wildlife from exploitation and modern development (Runte 1979). The National Park Service Organic Act (1916) established parks "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Though a radical notion in the face of development on surrounding lands, the parks were "viewed mainly as scenic pleasuring grounds" (Sellars 1997: 27). Early park management focused on scenery and spectacle for public enjoyment and entertainment (Graber 2003). Because scenery was the primary inspiration for the establishment of early parks, as well as a powerful social symbol, aesthetics were often given priority during the early years. In some places, this "façade management" (Sellars 1997) was highly manipulative and invasive; furthermore, the management of ecological elements in parks was only minimally informed by science or conservation goals.

Throughout the first half of the twentieth century, the Park Service actively managed to enhance desirable fish and wildlife. Predators were controlled to increase deer and elk populations, bears were fed to entertain visitors, nonnative fish were introduced to enhance fishing opportunities, and ungulates were either fed during difficult winters to prevent die-offs or culled to prevent overpopulation. "Undesirable" ecosystem elements, such as predators, pathogens, fires, and floods, were controlled or eliminated where possible. Management intervention favored certain species and ecological processes, with the goal of making parks beautiful, fascinating, and pleasant, consistent with park practices that promoted tourism and encouraged development of visitor facilities. Tracts of undeveloped backcountry

and preservation of scenic beauty were believed to satisfy the Organic Act mandate that parks remain "unimpaired."

By the 1930s, however, park management was expanding to include initial attempts at nature preservation (Sellars 1997). As described in Chapter 2, a National Park Service wildlife division was established, under the leadership of biologist George Wright. Although it was short-lived, Wright and others in the wildlife division argued that parks should promote native species rather than nonnative species, stop controlling native predators, and minimize overly manipulative wildlife management practices (e.g., rearing bison [*Bison bison*] or feeding elk [*Cervis canadensis*] in winter). Of particular importance, they argued that all native species—not just charismatic ones—should be protected and perpetuated.

In 1931, the National Park Service declared that all animals would find refuge in the national parks (Pritchard 2002: 50). However, the wildlife division was largely unsuccessful in its attempt to change park policy and practice. As Sellars points out, there was not yet sufficient public support for such changes.

Expanding Statutory Guidance

By the 1960s, social values were changing, and ecological concepts had gained significant traction in science and society. Public interest in environmental issues had increased, and environmental groups were becoming politically powerful. A growing concern for conservation translated into new goals for parks and wilderness. Environmental legislation from the 1960s and early 1970s expanded park purposes, sending managers in increasingly diverse directions. In 1964, the Wilderness Act established a system of wilderness areas, many of which ultimately were designated within national parks. The language of the act paralleled park policies, stating that a wilderness area should retain "its primeval character and influence." But, as discussed in Chapter 2, wilderness was also defined as a place that was "untrammeled by man," a place where humans did not intervene in ecosystem processes. The Wilderness Act codified the emerging interest in wildness, the desire to protect autonomous nature or self-willed ecosystems (Cole 2000) (see Chapter 6). The act reflected the sentiment that there should be some places where nature is left alone. A hands-off management approach was believed to be both a sign of humility and a tool for nature conservation.

A few years later, the National Environmental Policy Act (NEPA) (1969) codified a broad public interest in environmental protection. NEPA required that agencies consider the environmental impacts of federal

decisions and, as part of the planning process, commit to a specific course of action for the foreseeable future. NEPA also mandated public participation and empowered citizens to challenge agency decisions. Thus, the public began to play an increasingly important role in park and wilderness planning, and a much broader set of values and interests were considered in decision making. The shift toward increased public participation in many ways challenged the notion that decisions about public lands should be made by professional experts housed within the agencies and empowered the public to participate in a planning process designed to implement broad policy guidance in particular places.

In 1973, in response to growing public concern over species extinction and loss of habitat, the Endangered Species Act (ESA) was enacted. The ESA directed the federal government (and some private landowners) to preserve habitat for and recover populations of threatened and endangered species. Although parks continued to emphasize scenic beauty and public enjoyment, both parks and wilderness now played a critical role in biodiversity conservation, providing habitat for efforts to recover threatened and endangered species. Parks had always been about conserving select elements of biodiversity (hence the focus on "wild life" in the Organic Act); increasingly, parks were seen as places that should conserve all native biodiversity, from the smallest thermophilic bacterium to the tallest redwoods.

For example, the ESA was instrumental in enabling the reintroduction of wolves (*Canis lupus*) in Yellowstone National Park and central Idaho wilderness areas in the 1990s. Science provided insights into the ecological role of predators in ecosystem structure and function, which in turn improved public understanding of predators and contributed to public support. But public support for wolf reintroduction has been far from unanimous, and wolf management continues to be controversial, especially in the rural West. Sociopolitical factors, such as livestock producers' experience of predation and hunting outfitters' concerns about declining elk populations, continue to influence how predators are managed in and adjacent to protected areas. Emerging conservation values, as expressed in new policies such as the Wilderness Act or ESA, continue to be contested and challenged, both in broad public debate and in policymaking circles.

Park Service Natural Resource Management Policy

The social, political, and scientific changes that inspired new environmental laws eventually catalyzed changes to National Park Service policy. For decades, National Park Service management practices and policies evolved in

a largely ad hoc manner. In 1962, however, amid ongoing controversy over elk reductions in Yellowstone National Park, Secretary of Interior Stewart Udall commissioned wildlife biologist A. Starker Leopold to lead a panel of scientists in a formal review of national park wildlife policy. National Park Service historian Sellars (1989) argues that the Leopold report (Leopold et al. 1963) was the most influential policy statement on park management since the 1916 National Park Service Organic Act.

The Leopold report affirmed that the objects of preservation in national parks were native ecological systems in all their complexity—not nonnatives and not just certain native species but entire systems, including ecosystem processes. More specifically, the report advocated the restoration of native species and the removal of exotic plants and animals. It suggested that historic sources of disturbance, such as fire, insects, and disease, were critical ecosystem elements that should be embraced. The report also argued that, to be successful, park management must be supported by a strong base of science and research. The report said that "the maintenance of naturalness should prevail," that many park ecosystems were damaged and in need of restoration, and that restoration would require active intervention and could "not be done by passive protection alone" (Leopold et al. 1963: 34–35). The report reflected contemporary ecological thinking, recognizing the importance of disturbance processes and the dynamism of ecosystems.

But the Leopold report sent a mixed message on a number of important issues. Although it noted the dynamism of ecosystems, the report recommended that national parks represent a "vignette of primitive America" and that parks should preserve or recreate "the condition that prevailed when the area was first visited by the white man" (Leopold et al. 1963: 33). This left individual park managers to decide whether it was sufficient to simply allow for the free play of ecosystem processes or whether they should more aggressively intervene to restore structural elements or even some past state. Although it advocated active habitat manipulation, the report noted that artificiality should be minimized, that regulation should be as much as possible "by natural means." Again, individual managers were left to decide when the need for active manipulation justified increased artificiality. Indeed, the report states, "The major policy change which we would recommend to the National Park Service is that it recognize the enormous complexity of ecologic communities and the diversity of management procedures required to preserve them" (Leopold et al. 1963: 34). In essence, the report did little to resolve the divergent meanings of *naturalness* discussed in Chapter 2 of this book. It argued that park managers needed flexibility and individual discretion to address the stewardship issues unique

to their park and situation, but it provided little guidance beyond general notions such as maintaining naturalness. The Leopold report assumed that a higher level of scientific sophistication in itself would guide managers to the actions needed to maintain desired conditions. But as the management struggles outlined in this chapter demonstrate, this was not the case.

In 1967, many of the Leopold report's recommendations formed the basis for a manual of policies for managing undeveloped areas in the national parks (Sellars 1997). Not surprisingly, managing for naturalness proved much more challenging than anticipated by Leopold and fellow committee members.

The Challenges of Naturalness in Practice

Two prominent issues, management of wild ungulate populations and fire, provide insights into the challenges of managing for naturalness. Each of these management dilemmas raises questions about whether and how to intervene when an ecological process has been removed from the landscape—predator–prey relationships in one case and fire in the other. Each case illustrates that social and political factors are major drivers of park practice, despite the Leopold report's assertion of the primacy of ecologically based management. Each demonstrates the ambiguity of park policy, even after the Leopold report, regarding when intervention is necessary, how to balance the dynamism of ecosystems with a desire to maintain historical fidelity (vignettes of primitive America), and whether management outcomes should emphasize state or process. In each case, resultant problems were exacerbated by incongruities between the small size of protected areas and the large spatial scale of many ecological processes (Porter and Underwood 1999), despite the fact that these issues were most hotly debated in some of the largest national parks.

Debate over the management of ungulates and fire grew in the 1980s, just as ecological understandings of protected areas were beginning to shift. As described in Chapter 3, notions of climax ecosystems, homeostasis, equilibrium, and carrying capacity were being overturned, replaced by an increased emphasis on disturbance, heterogeneity, and flux. Ecosystem dynamism meant that the "vignette" that the Leopold report described was, in fact, a moving target. Thus, early efforts to restore naturalness needed to do more than look backward to pre-Columbian conditions. In thinking about ecological processes such as fire, scientists and managers had to grapple with disturbance ecology and consider how an understanding of

disturbance, such as insect outbreaks or flooding, might influence management practice (Christensen 1988). And as research documented the ways in which Native Americans had dramatically influenced certain ecosystems, it became clear that what early European settlers saw as nature free from human impact was often a highly managed system that had co-evolved with human activities (Mann 2005). Thus, managers also had to consider whether some anthropogenic forces should be considered natural.

Management of Wild Ungulate Populations

Wild animals are among the most valued national park resources. For many park visitors, glimpses of free-roaming ungulates rank among the highlights of their trip. However, ungulate populations also cause problems in parks. In some eastern parks, deer populations have increased greatly in response to reductions in predator populations and the elimination of hunting, resulting in dramatic changes to vegetation (Porter and Underwood 1999). In Yellowstone National Park, management of elk has been highly controversial. Elk populations have fluctuated dramatically since the park was established, with resultant effects on vegetation and other animal species (Huff and Varley 1999; Wagner 2006).

There have been several distinct phases in the management of the northern elk herd in Yellowstone (Huff and Varley 1999; Wagner 2006), varying in their degrees of management intervention and desired outcomes. After the removal of Native Americans from Yellowstone and the surrounding area and the creation of the park in 1872, the herd was protected from hunting and predators and provided with artificial feed during winter, which allowed elk numbers to increase from 20,000 to 35,000 animals in the early 1900s (Wagner 2006). By the 1930s, concerns about vegetation damage, attributed to an enlarged elk herd and suggestive of an overabundance of ungulates, led to a reversal of this policy. Managers intervened to compensate for the loss of natural predators by culling or removing elk to reduce numbers. From 1935 through 1967, Yellowstone elk were trapped and live-shipped to other elk ranges or shot by National Park Service hunters, leaving a northern herd population in the late 1960s of just 3,000 to 4,000 (Huff and Varley 1999; Wagner 2006).

Although the influential Leopold report concluded that shooting excess ungulates in Yellowstone was necessary, public outcry over elk reduction operations intensified in the 1960s, leading to congressional hearings on the issue (Sellars 1997). In 1967, the Park Service announced it would

cease killing elk in the parks and adopt a new management approach called natural regulation or hands-off natural process management (Huff and Varley 1999). This noninterventionist approach was predicated on the hypothesis that elk populations are self-regulating (Wright 1999), that herd numbers are controlled by environment and available food.

Despite 35 years and several million dollars spent on research into the Yellowstone northern herd and the northern range, scholarly accounts both criticize and defend the natural regulation approach to ungulate management (e.g., National Academy of Sciences 2002; Singer et al. 1998; Wagner et al. 1995). In the 1990s, the conditions changed dramatically when wolves were reintroduced to Yellowstone Park. Reintroduction of wolves, it was hypothesized, might result in changes both to the elk population and to vegetation (Smith et al. 2003). Although it is too early to definitively evaluate the effects of wolf reintroduction (Wagner 2006), there is some evidence of positive ecological effects. Studies report that since wolf reintroduction, elk populations have declined somewhat, and growth of both aspen (*Populus tremuloides*) and willow (*Salix* sp.)—trees adversely affected by excessive elk browsing—has increased as fear of predation alters the spatial distribution and foraging behavior of elk, creating local refugia for tree and shrub species (Ripple et al. 2001; Beyer et al. 2007).

The ambiguity of the naturalness concept is apparent insofar as each of these approaches to elk management has been justified in the name of protecting natural conditions. When managers thought elk populations were declining, they intervened to increase herd size. Then, out of fear that natural vegetation was threatened by hyperabundant elk herds, managers intervened to reduce populations. A few decades later, the National Park Service embraced the notion of natural regulation. More recently, managers intervened to restore a missing top predator, the wolf, perhaps increasing the likelihood that ongoing intervention would not be necessary. At the same time, public outrage over shooting elk in Yellowstone may have been more important than ecological science in overturning decades of active ungulate management in national parks (Wright 1999).

Fire Management in National Parks

Since the early twentieth century, most fires in national parks have been suppressed. By the 1960s, there was increasing awareness among scientists and some park managers that suppressing fires eliminated an important disturbance process, critical to ecosystem function. In the mixed conifer

forest of the Sierra Nevada parks, for example, suppression prevented reproduction by giant sequoia (*Sequoiadendron giganteum*) and led to dense growth of shade-tolerant trees, such as white fir (*Abies concolor*). Fuel loads increased, transforming a fire regime characterized by frequent, relatively low-intensity surface fires into a regime of infrequent crown fires, capable of destroying ancient sequoia trees, symbols of the Sierran parks (Graber 1995). In 1968, the National Park Service, in a revision of management policies, recognized fire as a natural process, and, increasingly, lightning ignitions were allowed to burn (Parsons 2000). But as these so-called natural fire policies moved from concept to practical application, questions and controversies arose (see Christensen 2005 for a review of these debates). Such policies suggested that fire be allowed to play a more natural role but failed to specify exactly what that might mean, leaving such decisions to managers at individual parks.

Sierra Nevada park scientists and managers, attempting to balance appropriate mixes of lightning and human ignitions and desirable fire frequencies, encountered several difficult questions (Graber 1983). One question revolved around whether a fire program needed to mimic aboriginal burning. In Sierran forests, for example, Kilgore and Taylor (1979) concluded that past fire frequencies were much greater than could be accounted for by lightning alone, suggesting a substantial role for Native American burning. This forced fire managers to ask whether it was sufficient to allow lightning ignitions or whether they needed to substitute for Native American ignitions as well.

Regarding desired outcomes of fire management policies, scientists and managers (Parsons et al. 1986: 21) proposed "that the principal aim of National Park Service resource management in natural areas is the unimpeded interaction of native ecosystem processes and structural elements." They asserted that this should be done by restoring fire as a natural process rather than using fire to restore particular ecosystem states or structures (Figure 5.1). Bonnicksen and Stone (1985) challenged this approach, arguing that naturalness cannot be restored by allowing fires to burn in forests with tree densities and other structural and compositional attributes that have been altered by years of fire suppression. According to these critics, active intervention is needed to restore ecosystem structure (thinning and perhaps even planting trees) before processes such as fire are restored. In larger parks, they noted, it may be possible to largely allow nature to take its course; however, in many parks ongoing active interventions, such as thinning forests and igniting prescribed burns, are likely to be necessary.

Vale (1987) points out that the argument over whether natural fire

FIGURE 5.1. Prescribed burning in the Giant Forest of Sequoia National Park. (Photo by Ted Young, National Park Service)

programs should focus on process or state and structure reflects differences in the degree of precision used in the definition of *natural* and the values attached to different ecosystem attributes. Indeed, the "process restorationists," with their less precise definition of *naturalness*, argue that it is inappropriate to define desired ecosystem states because too little is known about past conditions, there is too much emphasis on the single attribute of overstory structure, and it is too arbitrary to select a particular time in the past as a reference (Parsons et al. 1986). But others argue (perhaps for processes other than fire) that it is more difficult to develop process goals than structural goals, because processes are harder to measure and comprehend (Porter and Underwood 1999).

Lemons (1987) points out that although these questions are usually argued on scientific grounds, they are really questions of social values. With a policy based on the concept of naturalness, many of these questions cannot be answered by science alone. Are we concerned with process, structure, or both? What time period should be used as a basis for interventions? How much variability in conditions, due to chance and changing climate, should be allowed (Kilgore and Heinselman 1990)? Should decisions vary depending on whether the intervention is a one-time corrective measure or an ongoing management intrusion?

Despite efforts to restore fire to the large parks in the Sierra Nevada, fires still burn at less than 10 percent of historical frequencies (Caprio and Graber 2000). Often, "safer" surface fires are allowed to burn, whereas large, hot fires are suppressed, despite evidence that infrequent, large, intense fires were historically important to the structuring of ecosystems. So although improved scientific understanding of the ecological importance of fire and the dramatic fuel buildup across western forests spurred policies to allow lightning ignitions to burn in parks and wilderness, popular understanding of fire lagged behind science. Consequently, fire events such as the 1988 fires in Yellowstone were portrayed by the media and political leaders as ecological disasters and policy failures. According to Parsons (2000: 276), "Despite abundant evidence of the importance of fire as a natural process, and legislative and policy direction to preserve natural conditions (including the process of fire) in wilderness, fire suppression remains the dominant wilderness fire management strategy" because of administrative, political, and practical constraints, including concerns about human health and safety and damage to property and timber resources. Thus, like ungulate management, fire management has been influenced at least as much by social and political factors as by science.

The Problem of Broad and Ambiguous Policy

Debate over the management of ungulates and fire continues today, leaving these issues largely unresolved. Naturalness was once believed to provide important and much-needed guidance to managers regarding when and how to intervene to protect park and wilderness ecosystems. But, as demonstrated in the examples just described, policies directing managers to preserve or maintain natural conditions are vague and ambiguous and can be difficult to put into practice.

More recent agency policies, such as the National Park Service's Management Policies (2006), respond to both management challenges and recent ecological research but continue to leave some fundamental questions unanswered. The 2006 policies direct the Park Service to "maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems" and recognize "natural change . . . as an integral part of the functioning of natural systems" (p. 36). Although these policies acknowledge ecosystem dynamism and the need to conserve biodiversity, they offer little specific guidance regarding where and when to intervene and how to define the desired outcomes. National

Park Service policies state that the goal of management is the preservation of all components and processes "in their natural condition," with natural condition defined as "the condition of resources that would occur in the absence of human dominance over the landscape" (p. 36). These policies also state that although intervention should be "kept to the minimum necessary," "biological or physical processes altered in the past by human activity may need to be actively managed to restore them to natural conditions or to maintain the closest approximation of the natural conditions when a truly natural system is no longer attainable" (p. 39).

Although the Wilderness Act is a more prescriptive statute than the National Park Service Organic Act, the Wilderness Act also fails to specify the meaning of naturalness. And like the National Park Service's policies, the Forest Service's Wilderness Management Policy (USDA Forest Service 2007) is broad and vague, directing managers to "maintain wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces" (p. 7) and to "manage forest cover to retain the primeval character of the environment and to allow natural ecological processes to operate freely" (p. 38). In both cases, recent agency policies articulate broad, conceptual goals but, perhaps intentionally, provide little specific direction.

Lack of specificity is typical of natural resource and public land policy. Such policy usually provides a broad conceptual vision. The intention is that specific, actionable plans be developed by individual managers through local level planning. One consequence of this is that individual managers have much discretion to decide how to put the concept of naturalness into practice in a manner that takes into account local social and ecological conditions. The strength of this approach is that managers have the flexibility to tailor practices to fit the local context and respond to change. Potential weaknesses include inconsistency between adjacent units, shifting interpretations of policy caused by personnel changes, and lack of specificity in goals and targets. Cheever (1997: 638–639) suggests that "almost anything can be justified" because many of the statutes governing public lands are broad, offer little direction, and "speak of general values in mandatory terms." Nie (2004: 236) argues that this policy vacuum "has been filled with various agency interpretations and management philosophies."

The concept of naturalness is so broad and vague that a wide variety of policy interpretations and management actions can be pursued and justified. One Forest Service district ranger might decide that allowing a lightning fire to burn preserves a natural process, whereas an adjacent ranger might suppress such a fire to preserve a "primeval" old-growth forest. One park superintendent might decide to poison nonnative fish to restore historic aquatic

communities, whereas another might decide that such an intervention is inappropriate. The resulting lack of coordination and consistency makes it difficult to achieve conservation goals at landscape and regional scales, the scales where many ecosystem processes operate (e.g., restoring fire or native predators is possible only across scales larger than individual parks or national forests). And as Lemons and Junker (1996: 394–395) point out, "ambiguity about the meaning of 'natural' has permitted wide oscillations in National Park Service policy regarding the acceptability of phenomena such as non-human caused fires, floods, and fluctuations in animal populations as well as of human intrusions in park ecosystems." If interpretations of policy fluctuate over time, long-term conservation objectives will be difficult to achieve. Conservation objectives will be better served by replacing the haphazard and random diversity in management practice with diversity that is planned and purposeful, a topic explored in more detail in Chapter 13.

The challenge of ambiguity is compounded by multiple mandates, both within and between protected area policies. Protected area policy expanded in the 1960s and 1970s to include a broader range of social values and political interests, but these new laws and regulations did little to clarify park purposes. Instead, new policies established multiple mandates that sent managers in ever-expanding and often divergent directions, with little guidance regarding how to make difficult decisions. Protected areas are now required to conserve imperiled species, protect air and water quality, provide recreation opportunities, and restore historic conditions. These potentially conflicting mandates are rarely prioritized at the agency, system, or unit level. An exception is the National Wildlife Refuge System Improvement Act (1997), which provides a hierarchy of goals and thus some direction regarding what managers should prioritize (Fischman 2002). Vague and conflicting policy can further politicize the decision-making process (Nie 2004) as agencies must constantly juggle political pressures, scientific uncertainty, and trade-offs between contradictory protected area values and goals. Thus, the administrative discretion that agencies have typically fought to preserve (Sellars 2000) can place them in a difficult position with the public. Managers must make highly political decisions with very little guidance regarding priorities.

Clear, unambiguous policy is critical to effective implementation of policy mandates (Nie 2004), and clear policy must start with well-articulated goals. Managers need to be able to translate policy goals into specific, attainable operational objectives. The need for more specific guidance increases with the complexity of conservation challenges. Responding effectively to climate change and other widespread stressors demands coordinated and thoughtful management strategies, implemented over large spatial scales.

This will not be possible until protected areas have addressed "the central question of what they will try to protect in an era of rapid climate change" (Lemieux et al. 2008: 12). Similarly, Kareiva et al. (2008) argue that the first step toward climate change adaptation is to clarify management goals and to determine whether goals should be adjusted.

Moving Toward More Specific Goals

Conservation of protected areas has evolved since the first national parks were established more than a hundred years ago. Native species preservation is now largely embraced, and sources of disturbance, such as fires and floods, are understood to play an integral ecological role. However, a variety of stressors threaten park and wilderness ecosystems. Such threats raise the specter of more management intervention, while policy guidance regarding management intervention continues to be vague and even contradictory. Lack of specificity and the competing meanings of naturalness make it difficult for managers to translate policy into practice. Therefore, we conclude that it is time for a transparent, public dialogue to carefully consider new guiding principles and management strategies, the role of intervention, and difficult trade-offs.

BOX 5.1. THE CHALLENGE OF PUTTING PARK AND WILDERNESS POLICY INTO PRACTICE

- Multiple and sometimes conflicting policy mandates now govern parks and wilderness. More recent statutory guidance includes the following:
  - Wildness, expressed in the Wilderness Act as "untrammeled."
  - Public involvement in agency decision making (National Environmental Policy Act).
  - Endangered species conservation (Endangered Species Act).
- Increasingly, these park purposes are in conflict, making it necessary for managers to make decisions in the context of trade-offs as they attempt to decide whether, when, and how to intervene in ecosystems and ecological processes.
- Managers have struggled to put policies into practice because
  - The naturalness concept is vague and ambiguous.
  - *Naturalness* has multiple and conflicting meanings.
  - Multiple mandates send managers in increasingly diverse directions with little sense of priorities.
- Management success could be improved by developing goals that are both more specific and diverse.

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