



David N. Cole

# Management Dilemmas That Will Shape Wilderness in the 21st Century

David N. Cole

## ABSTRACT

How we resolve two management dilemmas will determine the future nature and value of wilderness. The first dilemma is providing for use and enjoyment while protecting wilderness conditions. The second is whether wilderness ecosystems should be left wild and “untramed” or, paradoxically, be manipulated toward a more natural state. Alternative solutions are explored. Because compromises between value systems will tend to homogenize wilderness areas, such that no area will fully meet any goal, we should consider allocating separate lands to each goal. Expanding our conception of wilderness will help us develop a diverse system that satisfies multiple needs.

**Keywords:** ecological restoration; management; recreation; wilderness

In the 35 years since Congress passed the Wilderness Act, wilderness areas have increased in both acreage and diversity. Recreational use and the resulting biophysical impacts—vegetation loss, trail erosion, wildlife disturbance—have also increased. Moreover, recreation and asso-

ciated impacts are not the only threat, or even the primary threat, to wilderness preservation. Wilderness conditions are influenced by numerous internal uses and external influences, from livestock grazing and suppression of lightning fires to the introduction of exotic species and global climate change (Cole and Landres 1996).

Wilderness management used to be largely confined to clearing trails, greeting visitors, picking up trash, and cleaning up campfire rings. Today, wilderness managers must respond to the challenges of an increasingly large and diverse wilderness system, an ever-increasing demand for wilderness recreational experiences, and the pervasiveness of anthropogenic influences on wilderness. Responsible wilderness management now includes developing standards for wilderness conditions,

**Above: In many wilderness areas, recreational access must be limited so that visitors can experience solitude and pristine ecosystems. One challenge facing wilderness managers is finding the balance between access and preservation that maximizes those values.**

monitoring conditions, implementing restricted permit systems or other visitor management techniques, educating visitors in the use of low-impact practices, controlling exotic species, and restoring damaged or altered sites.

Scientific and experiential knowledge about how to manage wilderness has increased greatly; however, application of this knowledge is inadequate for at least two reasons. First, funding and resources for wilderness management have never been commensurate with the magnitude of the task (Vento 1990). Less obvious but equally limiting is lack of clear policy on how to resolve two fundamental dilemmas resulting from vague, conflicting language in the Wilderness Act. One dilemma—and it is not new—involves conflict between providing access to wilderness for its “use and enjoyment” and protecting the biophysical conditions and visitor experiences that constitute wilderness but are degraded by recreational use. The other involves conflict between two desirable attributes of wilderness ecosystems: wilderness, the relative lack of intentional human manipulation; and naturalness, the relative lack of human influence. The future value of wilderness will largely be determined by how these dilemmas are resolved.

### Access, or Protection?

Starting in the late 1960s, when recreational use was increasing 10 percent annually (Lucas 1989), numerous wilderness regulations were imposed, including limits on the amount of overnight use. Concerned that the *wild* would be regulated out of *wilderness*, influential researchers and managers urged nonregulatory management and avoidance of use limitations wherever possible (Hendee et al. 1990). Hopes that tight regulation could be avoided were buoyed by data suggesting that by the 1980s, wilderness use levels were no longer increasing (Lucas 1989). However, studies conducted in the 1990s indicate that wilderness recreational use continues to increase (Cole 1996). Moreover, studies of participation rates report that hiking and back-

packing are the second and third fastest growing types of human-powered outdoor recreation (Cordell et al. 1999).

Recreational impacts have also increased over the past several decades despite considerable progress in educating visitors in the use of low-impact practices. Studies report that although many long-established campsites have been relatively stable over time, the number of affected campsites has increased dramatically, and increases in impact have been most pronounced in lightly used portions of wilderness (Cole 1993). Studies of wilderness visitor trends indicate that perceived crowding has increased along with actual use (Cole et al. 1995). Particularly troubling is the increased traffic in many lightly used portions of wilderness, because this trend diminishes the availability of opportunities for the low encounter rates that most wilderness visitors prefer (Stankey 1973; Cole et al. 1995).

Ironically, permit systems and other well-intentioned attempts to reduce problems in popular wilderness locations are among the primary causes of impact proliferation and increased crowding in lightly used areas (Cole 1993). Displaced visitors have been encouraged to select trailheads and destinations that are less frequented—vulnerable areas where even small increases in use cause dramatic increases in impact (Cole 1997) and visitor dissatisfaction (Stankey 1973; Cole et al. 1995).

Pressures imposed by the increasing demand for wilderness recreation are aggravated by a dwindling supply of places outside wilderness areas that offer similar experiences. Since passage of the Wilderness Act, scientists and managers have stressed the importance of providing high-quality backcountry experiences on lands outside wilderness (Wagar 1974) as a means of relieving demand for recreation in wilderness. These suggestions have generally gone unheeded, and much of the public land that was unroaded a few decades ago has either been roaded or designated as wilderness.

The size of the wilderness system has increased more than expected. It is already twice the “outside maximum”

of 50 million acres projected in congressional testimony by Howard Zahniser, the principal architect of the Wilderness Act (US Senate 1961). This unforeseen growth of the system may result from today’s wider conception of areas that need to be set aside as wilderness, including small, previously disturbed tracts of land and lands that are adjacent to urban areas. A larger system, broader definitions of what wilderness is, and the loss of unroaded lands outside wilderness all suggest that wilderness will have to meet an ever-increasing range of societal demands.

Al Wagar, an early student of recreational carrying capacity, stated, “For wilderness, use limits are inevitable” (Wagar 1974, p. 278). Although continued population growth and increases in participation rates bear out Wagar’s prediction, little progress has been made in preparing for this eventuality. For wilderness use limits, it is not a question of “if” but “when” and “how much.” Frameworks for deriving justifiable use limits have become available with development of the limits of acceptable change (LAC) and visitor experience and resource protection (VERP) processes. The foundation of these processes is quantitative standards (usually minimally acceptable conditions) that reflect explicit decisions about the most appropriate compromise between conflicting goals (McCool and Cole 1997).

The fundamental dilemma is how best to balance responsibility for meeting society’s needs, particularly for backcountry recreation, with the mandate to protect wilderness conditions, both ecological and experiential. Managers need to prescribe quantitative standards for wilderness conditions, recognizing that the more stringent standards are, the lower use limits will have to be and the more demand will go unmet. Even then, questions remain about whether this balance between access and protection should be consistent across wilderness or whether some wilderness lands should emphasize recreational access and some should be more strongly protected, as wilderness advocate Bob Marshall (1933) pro-

posed. The choice is between narrow and wide ranges in standards for different portions of wilderness. Early wilderness use limitation programs tended to reduce diversity, decreasing use and impact in high-use places and allowing some increase in low-use places (van Wagtenonk 1981). Although this traditional approach is a legitimate option, there are reasons to consider a wider range of conditions.

If wilderness was a narrowly circumscribed land designation, and there were substantial public lands in nonwilderness designations providing opportunities for high-quality backcountry recreation experiences, as Bob Marshall and others proposed, there would be little need for a broad spectrum of wilderness conditions. It is worth considering whether substantial acreage should be allocated to nonwilderness backcountry designations. Although President Clinton's recent direction to study roadless lands provided a new opportunity to do so, in the past there has never been sufficient interest from the public or management agencies. Perhaps wilderness has evolved into a large and diverse system that must meet more preservation needs and more recreational demand than Congress, agencies, or early wilderness advocates envisioned.

A broad range of wilderness conditions could be provided by allowing high visitation in carefully selected and delineated wilderness locations, while protecting most wilderness in a lightly used condition. Such a wilderness management zoning approach (Haas et al. 1987) would keep most wilderness close to the low-use ideal described in the Wilderness Act and still meet the increasing demand for wilderness experiences. Costs include acceptance of far-from-pristine conditions in heavily used wilderness locations and the need to restrict access across much of the wilderness system, including places that are still lightly used.

A recent study of several heavily used wilderness destinations in the Pacific Northwest (Cole et al. 1997) pro-



David Spillie

**Increasingly, wilderness ecosystems are being intentionally manipulated to restore natural conditions. On this disturbed campsite, a mulch mat has been applied to protect transplanted vegetation.**

vides some indication of the costs of allowing heavy use within wilderness. Results showed that aside from possible displacement of sensitive animals, the ecological integrity of intensively managed destinations need not be seriously compromised by recreation. Moreover, the experiences these places offered were still reported by visitors to be high-quality experiences, characterized by solitude, primitiveness, and lack of confinement—the words the Wilderness Act used to describe the experiences wilderness should provide. Most visitors to these destinations, even the very experienced, did not support efforts to keep all wilderness locations from being heavily used. Most supported the concept of limiting use if “overuse” occurred but did not feel that even a place like Snow Lake, in the Alpine Lakes Wilderness, where another group is encountered every three minutes on popular weekends, was sufficiently overused to require limits (Cole et al. 1997).

### **Wild, or Natural?**

The Wilderness Act describes several desirable attributes of wilderness ecosystems. According to the act, wilderness is “an area where the earth and its community of life are untrammelled by man.” An uncommon word, *untrammelled* is often misread as “untrampled” and misinterpreted as meaning undisturbed or uninfluenced. The word is actually synonymous with unconfined and unrestrained. Thus, untrammelled wilderness would be wild, self-organizing, autonomous (Turner

1996), and not controlled or manipulated by humans for any purpose.

Wilderness is also a place where “natural” conditions and processes are preserved. In the context of wilderness, the word *natural* is usually defined by a relative lack of human influence. Ideally, future wilderness ecosystems should be little different from what they would have been in the absence of postaboriginal humans (Landres et al. 1998).

In this article, I contrast wilderness that is “wild” (untrammelled) with wilderness that is “natural” (not influenced by humans). I recognize that these words have multiple meanings and that their use oversimplifies complex phenomena. They are endpoints of a continuum, and it is impossible to precisely define or achieve truly natural or wild ecosystems. My purpose is to illustrate the inherent conflict between wilderness ecosystems that are free from intentional human manipulation and control (wild) and wilderness ecosystems that are free from postaboriginal human influence (natural).

When the Wilderness Act was passed, its proponents assumed that keeping wilderness wild would also keep wilderness natural. Since then, however, ecological understanding has advanced. The result is an unanticipated management dilemma. Metaphors of the “balance of nature” have been replaced with notions of natural ecosystems that change profoundly and idiosyncratically with the climate, are strongly affected by natural disturbance processes, and exhibit multiple equilibria and end points (Pickett and Parker 1994). We have learned that human activities have global effects; even remote wilderness has been altered by modern humans (Cole and Landres 1996). The ubiquity of ecosystem change and human disturbance forces us to confront the fact that we cannot have wilderness that is truly wild or natural—let alone wilderness that is simultaneously wild *and* natural. We must choose between desirable wilderness attributes, at least to some

degree. We can, for example, choose to exert control over wilderness ecosystems to compensate for unnatural effects of human activity. This strategy sacrifices some of the wildness of wilderness to enhance naturalness. Alternatively, we can refrain from exerting control—enhancing wildness—but at the cost of allowing wilderness to become increasingly unnatural.

The appropriateness of certain wilderness management activities is relatively clear. First, minimizing human influence is consistent with the intent of the Wilderness Act if that keeps unnatural influences (e.g., air pollution, fire suppression) out of wilderness. Second, active manipulation causing ecosystems to deviate further from natural conditions (e.g., introducing exotic species or an unnatural fire regime) is contrary to the intent of the Wilderness Act, although for political reasons such actions have been taken. Finally, small-scale, nonrepetitive restorative manipulations (e.g., restoration of campsites, trails, or mines) are seldom controversial. Little of the wilderness is affected and these manipulations need not be continued indefinitely.

Managers face a serious dilemma when assessing the appropriateness of actively manipulating wilderness conditions toward a more natural state, if this affects a large area or must be continued indefinitely. Consider the 13,600-acre Big Gum Swamp Wilderness in Florida, where fires historically burned pine-wiregrass ecosystems every three to five years. Natural ignitions within the wilderness were infrequent but fires, ignited far away, frequently burned into and across the wilderness. Today, developed lands surround this small wilderness. Ignitions on developed lands are quickly extinguished, so fires never burn into the wilderness. Consequently, the only feasible source of frequent fire inside wilderness is deliberate ignition. Managers of Big Gum Swamp Wilderness have decided that active manipulation is necessary because little semblance of natural conditions is possible without intervention and because unnatural fuel accumulations within wilderness increase the threat to life and property outside wilderness when those fuels

eventually ignite. However, this intervention will need to be repeated endlessly and the entire wilderness will be affected, representing a significant loss of wildness and a trammeling of wilderness.

Management ignitions are being considered elsewhere, including the largest wilderness in the lower 48 states, the Frank Church–River of No Return Wilderness in Idaho. Here, frequency of natural ignitions is much higher than in Florida and the threat to lands outside wilderness is less severe. Nevertheless, managers are contemplating intentional ignitions to restore a more natural stand structure, reduce fuel levels, and reduce the risk of losing historic and administrative structures to fire. At Hells Canyon Wilderness in Idaho and Oregon, managers are considering aerial application of herbicides to combat weed infestations. This effort would probably need to be repeated endlessly and may not totally

tionally toward a somewhat more natural state. In some places, for example, management ignitions have been implemented, but not with the frequency or timing needed to mimic natural conditions. Such an approach might be sufficient to protect highly valued ecosystem components and avoid changes that threaten values outside wilderness. Costs would be less prohibitive than if the goal of naturalness were pursued with a high degree of precision. Specification of target conditions could be very general, and monitoring need not be precise. However, the result will be wilderness that is neither very natural nor very wild.

One cost of this compromise will be diminution of the scientific value of wilderness as a reference area. The ideal reference area would be both wild and natural, both unmanipulated and uninfluenced by humans. Natural wilderness is useful as a reference for highly altered landscapes, such as managed

One cost of this compromise will be  
diminution of the scientific value of wilderness  
as a reference area. Natural wilderness is useful  
as a reference for highly altered landscapes,  
such as managed forests.

eradicate targeted species. In the Saint Mary's Wilderness in Virginia, managers are considering periodically liming the Saint Mary's River to raise pH levels that have been lowered by acid deposition.

Managers making such decisions must confront the dilemma of choosing between wildness and naturalness. Compromise seems inevitable. It is unrealistic to think that all wilderness can retain a high degree of either naturalness or wildness. And the cost of implementing restorative manipulations to approach natural conditions everywhere is prohibitive. Conversely, there are wilderness areas where the values within and adjacent to wilderness are so threatened by unnatural conditions and processes that manipulation seems the only responsible course of action.

The most common compromise has been to manipulate ecosystems occa-

forests. The value of wilderness for this purpose would be determined by the knowledge and skills of restorationists. However, once extensive restorative manipulation has occurred, it will be impossible to evaluate the success of future restorations. All wildlands will be consciously constructed artifacts, and wilderness manipulation will be an experiment without a control.

Wild wilderness is useful in reference to manipulated landscapes, either within or outside wilderness. Wild ecosystems would diverge, perhaps substantially, from their projected uninfluenced state. However, they would provide controls for interventions within wilderness and give scientists a place to monitor the dynamics of unrestrained ecosystems.

Both wild and natural reference areas seem scientifically worthwhile. Either type, in the absence of the other,

seems inadequate. Reference areas managed for naturalness will have been manipulated for so long that it will be unclear how natural they are. Reference areas left unmanipulated will become highly unnatural. The combination of some reference areas managed to be uninfluenced (natural) with some unmanipulated (wild) areas to serve as a means of calibration seems preferable to the scientific value of reference areas that are slightly natural and slightly wild—the likely result of traditional compromise.

### A Proposal

In attempting to resolve the dilemma posed by restorative manipulations, perhaps we should consider a solution in which some wilderness is managed for naturalness and some wilderness is managed for wildness. Botkin (1990) has pointed out that the need for intervention is greatest in smaller wildernesses. Small wildernesses surrounded by more developed lands, such as Big Gum Swamp Wilderness in Florida, would be good candidates for manipulative management programs intended to restore a high degree of naturalness. Large remote wildernesses, such as the Frank Church–River of No Return Wilderness in Idaho, would be the best candidates for nonmanipulative programs emphasizing wildness.

In seeking resolutions to emerging management dilemmas, perhaps it is appropriate to expand our notions of what wilderness should be. Traditionally, dilemmas have been resolved by compromise. The result of this approach, 100 years hence, might be a system of wilderness lands that are all moderately used and impacted, somewhat wild and somewhat natural, with no lands close to the ideals of pristine, either natural or wild. This result is likely, given the federal land management agencies' decentralized decision-making tradition. In this tradition, conditions are shaped by countless independent decisions made over many years by hundreds of individuals. Buffered by the polarized arguments of opposing sides on each issue, the system gravitates toward mediocrity and homogeneity.

One alternative is not to compromise—to decide for one opposing goal and against the other. With this approach, one value system wins and other value systems lose completely.

Another alternative is compromise by allocating separate wilderness lands to each opposing goal. This approach maintains diversity and outstanding examples of all wilderness values, providing something for all legitimate viewpoints. Some wilderness lands would emphasize access, making it feasible to protect more of the wilderness system in a near-pristine state. Some wildernesses could be managed for a high degree of naturalness, others could be left unmanipulated.

Decisions about how to compromise between recreational access and wilderness protection and between wild and natural ecosystems will determine the future value of the wilderness system. Managers have been encouraged to base difficult decisions on science. Although better scientific understanding will make future decisions more informed, the likely outcomes of alternative decisions can already be described. Choices between homogeneity and diversity, access and protection, wildness and naturalness are value judgments that should reflect society's needs and desires. Postponing these decisions will simply foreclose our options.

### Literature Cited

- BOTKIN, D. 1990. *Discordant harmonies: A new ecology for the twenty-first century*. Oxford, UK: Oxford University Press.
- COLE, D.N. 1993. *Campsites in three western wildernesses: Proliferation and changes in condition over 12 to 16 years*. Research Paper INT-463. Ogden, UT: USDA Forest Service, Intermountain Research Station.
- . 1996. *Wilderness recreation use trends, 1965 through 1994*. Research paper INT-RP-488. Ogden, UT: USDA Forest Service, Intermountain Research Station.
- . 1997. Recreation management priorities are misplaced—allocate more resources to low-use wilderness. *International Journal of Wilderness* 3(4): 4–8.
- COLE, D.N., and P.B. LANDRES. 1996. Threats to wilderness ecosystems: Impacts and research needs. *Ecological Applications* 6:168–84.
- COLE, D.N., A.E. WATSON, and J.W. ROGGENBUCK. 1995. *Trends in wilderness visitors and visits: Boundary Waters Canoe Area, Shining Rock, and Desolation Wildernesses*. Research Paper INT-483. Ogden, UT: USDA Forest Service, Intermountain Research Station.

- COLE, D.N., A.E. WATSON, T.E. HALL, and D.R. SPILDIE. 1997. *High-use destinations in three wildernesses: Visitors, conditions, and management options*. Research Paper INT-RP-496. Ogden, UT: USDA Forest Service, Intermountain Research Station.
- CORDELL, H.K., B.L. MACDONALD, R.J. TEASLEY, J.C. BERGSTROM, J. MARTIN, J. BASSON, and V.R. LEEWORTH. 1999. Outdoor recreation participation trends. In *Outdoor recreation in American life: A national assessment of demand and supply trends*, ed. H.K. Cordell, 219–321. Champaign, IL: Sagamore Publishing.
- HAAS, G.E., B.L. DRIVER, P.J. BROWN, and R.C. LUCAS. 1987. Wilderness management zoning. *Journal of Forestry* 85:17–21.
- HENDEE, J.C., G.H. STANKEY, and R.C. LUCAS. 1990. *Wilderness management*, 2nd ed. Golden, CO: North American Press.
- LANDRES, P.B., P.S. WHITE, G. APLET, and A. ZIMMERMANN. 1998. Naturalness and natural variability: Definitions, concepts and strategies for wilderness management. In *Wilderness and natural areas in eastern North America: Research, management and planning*, eds. D.L. Kulhavy and M.H. Legg, 41–50. Nacogdoches, TX: Center for Applied Studies in Forestry, Stephen F. Austin State University.
- LUCAS, R.C. 1989. A look at wilderness use and users in transition. *Natural Resources Journal* 29:41–55.
- MARSHALL, R. 1933. *The forest for recreation*. Senate document. No. 12, separate no. 6. Washington, DC: US Government Printing Office.
- MCCOOL, S.F., and D.N. COLE, comps. 1997. *Proceedings—limits of acceptable change and related planning processes: Progress and future directions*. General Technical Report INT-GTR-371. Ogden, UT: USDA Forest Service, Intermountain Research Station.
- PICKETT, S.T.A., and V.T. PARKER. 1994. Avoiding the old pitfalls: Opportunities in a new discipline. *Restoration Ecology* 2:75–79.
- STANKEY, G.H. 1973. *Visitor perception of wilderness recreation carrying capacity*. Research Paper INT-142. Ogden, UT: USDA Forest Service, Intermountain Research Station.
- TURNER, J. 1996. *The abstract wild*. Tucson: University of Arizona Press.
- US SENATE. 1961. *A bill to establish a National Wilderness Preservation System for the permanent good of the whole people and for other purposes*. Hearings before the Committee on Interior and Insular Affairs. 87th Congress, 1st Session. February 27–28, 1961. Statement of Howard Zahniser on behalf of Trustees for Conservation.
- VAN WAGTENDONK, J. 1981. The effect of use limits on backcountry visitation trends in Yosemite National Park. *Leisure Sciences* 4:311–23.
- VENTO, B.F. 1990. A new wilderness revolution. *Journal of Soil and Water Conservation* 45:359.
- WAGAR, J.A. 1974. Recreational carrying capacity reconsidered. *Journal of Forestry* 72:274–78.

---

*David N. Cole (dcole@fs.fed.us) is research biologist, Aldo Leopold Wilderness Research Institute, PO Box 8089, Missoula, MT 59807-8089.*