

# Beyond Naturalness

## *Adapting Wilderness Stewardship to an Era of Rapid Global Change*

BY DAVID N. COLE

Climate change and its effects are writ large across wilderness landscapes. They always have been and always will be (see Figure 1). But contemporary change is different. For the first time, the pace and direction of climate change appear to be driven significantly by human activities (IPCC 2007), and this change is playing out across landscapes already affected by other anthropogenic stressors – pollution, invasive species, altered disturbance regimes, and land fragmentation (Cole, Millar, and Stephenson 2010). This raises serious questions about how wilderness stewards should respond to climate change and other anthropogenic stressors.

Much has been written about the nature of climate change and its current and likely effects (IPCC 2007), including effects on parks and wilderness (Saunders et al. 2007). The importance of wilderness and large-scale conservation to both climate change mitigation and adaptation has been asserted (Locke and Mackey 2009). This article explores the need for change in traditional notions about appropriate wilderness stewardship, one of many profound implications of climate change. The article is most directly relevant to wilderness and national parks in the United States and other places where the concept of maintaining naturalness is central to stewardship goals. But many of the recommended adaptations are relevant to protected areas with other stewardship goals.

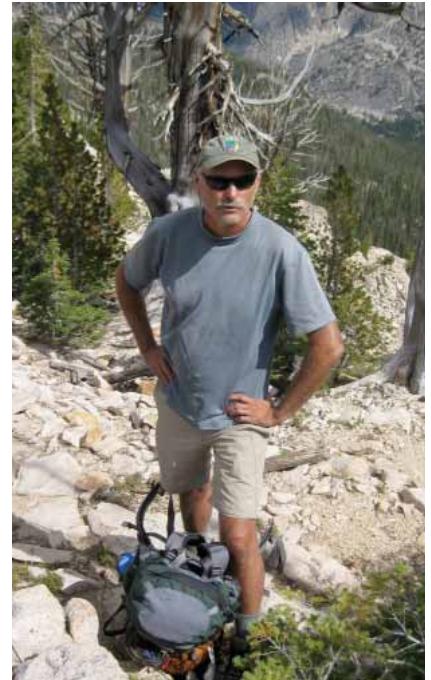
### Naturalness and Wilderness

There have been several phases in the evolution of wilderness areas in the United States and how they are managed. The first phase involved defining wilderness, articulating its purposes and values, and establishing a national system of wilderness areas. From the start, the concept of naturalness has been central to the mission of wilderness, and it is relied on heavily to this day as a guide for wilderness management. The first

sentence of The Wilderness Act (Public Law 88-577) states that its purpose is to ensure that some lands are designated “for preservation and protection in their natural condition.”

For the purpose of establishing wilderness areas and communicating their values, the concept of naturalness worked well (see Figure 2). The concept is consistent with characterizations of nature being apart from humans and a black-and-white contrast between human-dominated lands and places where nature dominated. The goal of wilderness is to ensure that some lands are protected from human domination – in a natural state. Naturalness has also been helpful in clarifying some of the most fundamental aspects of wilderness management, identifying things we do not want to allow, such as commodity extraction and excessive development. It provides a clear rationale for why preference is given to native species over nonnative ones, and why external threats, such as air pollution and invasive species, should be guarded against.

But today’s stewardship dilemmas are much more nuanced. No longer black and white, current dilemmas come in shades of gray. Should we perpetually dump lime into bodies of water to compensate for high pH due to acid precipitation, as is being done in the Saint Mary’s Wilderness? Should we cut down, pile, and burn trees to bring back a more



David Cole. Photo by Liese Dean.



Figure 1 – Wilderness landscapes have been forged by past climate change. Glacial features in the Sawtooth Wilderness, Idaho. Photo by Liese Dean.

complete groundcover – one capable of carrying more frequent fire and deterring soil erosion, as has been proposed in the Bandelier Wilderness (Sydoriak et al. 2001)? Should we plant tree seedlings bred for resistance to nonnative pathogens to replace decimated forests, as is one possible intervention strategy for much of the northern Rocky Mountains (Schoettle and Sniezko 2007)? Should we help species move in response to climate change (Schwartz et al. 2009)? The concept of naturalness is much less helpful in making these sorts of decisions and, consequently, policy manuals provide little guidance regarding how such decisions should be made. Preserving the natural is a great rallying cry for why wilderness is important, but it is a poor basis for making difficult decisions about how to actually go about the business of preservation.

### Problems with Naturalness

One problem with *natural* is that it has multiple meanings (Cole and Yung 2010). Different people use the term

in different ways, often without being conscious that others using the same term might mean something quite different. One meaning of natural is a **lack of human effect**. Places with little apparent human impact have sometimes been referred to as pristine. The goal here is to preserve places where the imprint of human activities is low to nonexistent. A related – but decidedly different – meaning is **freedom from intentional human control**. Where nature is not intentionally controlled it is self-willed, a concept that is often captured in the terms *wildness* and *untrammeled*. Managing for self-willed nature involves human restraint, in that it requires hands-off management and the absence of human manipulation of ecosystems (Cole 2000). Finally, naturalness also implies **historical fidelity** – the idea that natural ecosystems should be preserved in states similar to those that existed in the past, with similar species composition and ecological processes (Higgs 2003). The

goal here is to retain the basic ecosystem features valued when the area was designated as a protected area.

For much of the 20th century, it was assumed that these three meanings were congruent, that ecosystems could be preserved in a pristine state without intentionally manipulating them (at least not much), and that maintaining the pristine was the same as maintaining historical fidelity. But now, given what we have learned about the dynamism of ecosystems (Pickett and Ostfield 1995) and the prevalence of human impact and directional climate change (Vitousek et al. 2000), we know that these meanings are not congruent. We must choose between them.

A second problem with the naturalness concept results from wilderness areas being set aside for diverse reasons. Some of the more important purposes include the protection of

- certain valued species – charismatic, representative, and endangered species,
- nostalgic landscapes,
- all biological diversity,
- scenery,
- ecosystem services, and
- autonomous nature (self-willed, wild nature, not controlled or manipulated by humans).

For much of the 20th century, it was assumed that, by protecting natural conditions, all of these purposes could simultaneously be met. But the same advances in knowledge that revealed conflict among the meanings of naturalness have made it clear that these purposes are also not congruent. Trade-offs must be made among these varied purposes. Management approaches that maximize the protection of biological diversity might do a poor job of protecting a particular species or a nostalgic landscape. Interventions either to protect biodiversity

or to preserve cherished species and landscapes come at a cost to autonomous nature (Cole 2000). In short, wilderness stewards will need to match management approaches to particular park and wilderness purposes.

## Beyond Naturalness

Instead of the single goal of naturalness, multiple goals are needed to match the different wilderness purposes just outlined. It is time to discard some of the baggage inherent to the concept of naturalness, such as its rooting in the untenable view of nature apart from rather than inclusive of humans (Cronon 1995). In addition, it is time to move from a focus on cause to a focus on effect. Decisions about whether an impact is so onerous that it requires management intervention should turn less on whether it was caused by humans – as naturalness implies – as on characteristics of the resultant ecosystems. Managers should base decisions on careful consideration of whether the impact significantly diminishes wilderness values, reduces ecological integrity, or ecosystem resilience.

Society needs to debate and decide what these multiple goals should be. However, some can already be suggested. Although there may be others, four different approaches to park and wilderness stewardship are prominent (Cole and Yung 2010). One approach is to **respect nature's autonomy** by not intervening in ecosystem processes for any purpose – even to compensate for human impact. Other approaches involve intervention for different purposes. So a second approach is to intervene in order to emphasize **historical fidelity** – ensuring that future ecosystems are composed, structured, and look much as they did in the past. A third approach is to intervene in order to emphasize **ecological integrity** – ensuring that future ecosystems

are sound and complete, with functions intact. A fourth approach is to intervene in order to emphasize **resilience** – the ability of future ecosystems to absorb change and still persist without undergoing a fundamental loss of character.

Each of these approaches is an effective means of protecting one or more of the purposes of wilderness, but not all of them. Some of them overlap and are similar in some ways; others are in direct conflict. Used together, in ways that complement each other, this suite of approaches can optimize the preservation of wilderness values, achieving much of what was intended with the more simplistic and vague notion of preserving naturalness (Cole et al. 2008).

Of particular importance, each of these approaches can be clearly operationalized. Each can be defined in such a way that it is clear when intervention is appropriate and, where it is, what actions should be taken. Outcomes of interventions can be specified that are measurable, attainable, and desirable.

## A Way Forward

To meet the stewardship challenges of the 21st century and beyond, a number of changes in park and wilderness policy and practice are needed. First, as noted above, the concept of naturalness needs to be supplemented by defining in as specific terms as possible **multiple goals** related to the varied purposes of parks and wilderness (see Figure 3). More societal debate is needed regarding which of these purposes, goals, and objectives (and

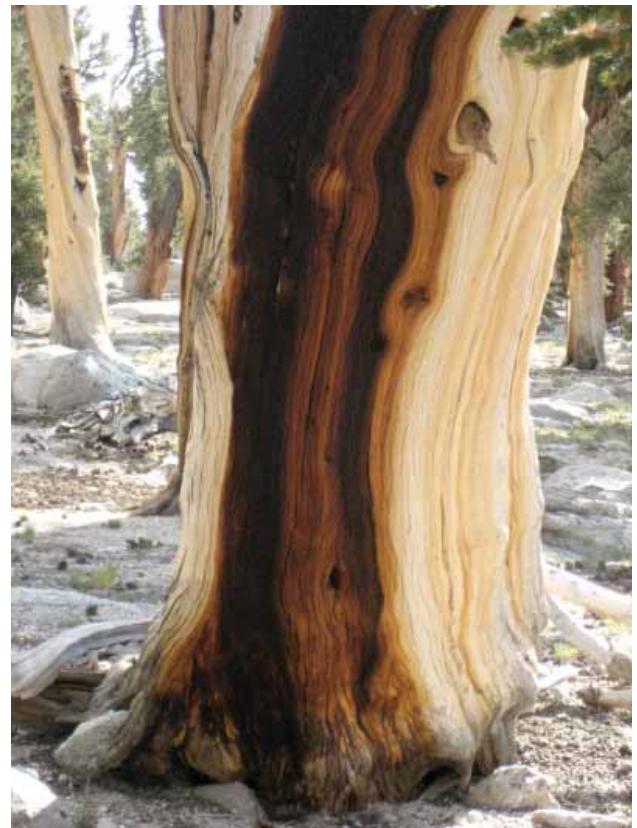


Figure 2 – Naturalness, like wilderness, embraces many values, including scenery, nostalgia, autonomous nature, and biodiversity conservation. Foxtail pine forest in Sequoia-Kings Canyon National Park. Photo by David Cole.

possibly others) are appropriate and where. Recognition of conflict between goals and the need for trade-offs among them should be surfaced and confronted rather than obscured, as they have been with the concept of naturalness. Clear statements of purpose should help stewards make better decisions about whether to intervene in response to anthropogenic impacts and, if they do intervene, whether to emphasize restoration of historical fidelity, maintenance of ecological integrity, enhancement of resilience, or some other attribute.

Other necessary changes reflect the fact that profound and directional global changes are leading to an unprecedented future for park and wilderness ecosystems – a future for which there are no analogs, now or from the past (Williams and Jackson



Figure 3 – Extensive wilderness landscapes provide opportunities to manage wilderness for diverse goals and purposes, using varied management strategies. Looking across a portion of the Sequoia-Kings Canyon Wilderness, California, from near the top of Mt. Whitney. Photo by David Cole.

2007). And in addition to being unprecedented, the future will also be largely unpredictable, full of uncertainty and surprise (Baron et al. 2009; Millar et al. 2007).

The risks associated with uncertainty are best managed through carefully **planned diversity and redundancy**. Diversity amounts to not placing all of one's eggs in a single basket, decreasing the risk of failure and maximizing future options by employing multiple management strategies. If one approach proves unsuccessful, perhaps another will succeed (Millar et al. 2007). Diversity is also important given the varied goals of parks and wilderness (Cole 2011). The equally important complement to diversity is redundancy. Diverse approaches need to be repli-

cated in various environments and across the landscape in different protected areas in order to spread risk (Joyce et al. 2009; Mawdsley et al. 2009). If a particular approach fails in one place, either due to a poor match to environmental conditions or just chance, perhaps that approach will be successful elsewhere.

Diversity and redundancy need to be planned for at multiple scales. They can be applied within individual protected areas by pursuing different strategies in different parts of a single park or wilderness. More uncommon, more challenging, and even more important is **planning for diversity and redundancy at a larger scale**,

among protected areas – ensuring that individual place-specific decisions are made in the context of larger-scale regional strategies. Managers of protected areas within the same bioregion need to come together to develop regional plans for conserving biodiversity and responding to threats, such as invasive species and climate change. These plans would “distribute” goals and strategies among individual protected areas in such a manner that when implemented locally they collectively provide optimal diversity and redundancy at the regional scale. Ideally, different public agencies would collaborate across their jurisdictional boundaries and extend the process to include private lands (Hansen and DeFries 2007; White et al. 2010).

## Barriers to Change

There are at least four major barriers limiting our ability to move forward. The first barrier is allegiance, in the United States at least, to the concept of naturalness. The notion of naturalness, if appropriately defined, can continue to have iconic value and serve as a touchstone – an expression of what parks are and why they were designated. But as a guide for stewardship, for deciding whether and how we should intervene in wilderness and park ecosystems, it is time to move to goals and objectives beyond naturalness.

A huge barrier to planned diversity and redundancy is the decentralized decision-making tradition of public land management agencies in the United States. The distribution of power is at a scale that is too small for individual decision makers to either recognize the nature of problems resulting from global change or to develop the large-scale strategies needed to effectively deal with them. In this decentralized tradition, diversity is more the result of personal preference and available resources than a planned and deliberate strategy to minimize risk by hedging bets. Where goals conflict, similar compromises tend to be fashioned everywhere. Case by case, area by area, decision making causes the system to gravitate toward homogeneity and mediocrity (McCool and Cole 2001). Planned diversity means retaining the flexibility to match solutions to situational specifics while ensuring that managerial discretion is directed such that local decisions contribute to regional goals and objectives. Key to success is constraining local decision space while also maintaining the empowerment that results from widely shared power. This might be accomplished through some version of networked governance (Jones et al. 1997).

A related barrier is the lack of institutions that facilitate large-scale planning. Even within agencies, institutions do not encourage regional planning. National policy tends to be extremely broad, perhaps reflecting too much deference to the need for flexibility. There are even more institutional barriers to interagency planning and cooperation between public and private land management. What we need instead is what Karkkainen (2002) calls collaborative ecosystem governance, which emphasizes locally tailored solutions within larger-scale structures of public accountability, recognizing the need for experimentation and dynamic adjustment in response to new learning.

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The final barrier lies with current planning processes that are not flexible and adaptable enough to deal effectively with climate change. Current planning frameworks – such as that articulated in the U.S. National Environmental Policy Act (Public Law 91-190) – were largely built around concepts of dynamic equilibrium and stationarity (Milly et al. 2008; Thrower 2006). Now it is abundantly clear that the most fundamental prerequisite for equilibrium, a stable climate, is no longer met (Baron et al. 2009). These frameworks presume certainty of impacts and outcomes,

when uncertainty is the most predictable future state (Millar et al. 2007). They specify desired future conditions, in considerable detail and for long time frames, something that may be completely unrealistic given rapid and unpredictable change. Planning frameworks will have to develop more capacity to operate at multiple spatial and temporal scales and to embrace uncertainty. They must be able to rapidly and flexibly respond to surprise and to more regularly revisit objectives and management decisions, changing them as knowledge advances and uncertainty retreats.

### Stewardship Tools

Two important tools to apply to management planning for parks and wilderness – tools that are more amenable to what we know now about the world of the 21st century and the way ecosystems operate – are **scenario planning** and **adaptive management**. Scenario planning, particularly useful when the future is both uncertain and largely uncontrollable (Baron et al. 2009), is a process of exploring and articulating a set of alternative futures (Biggs et al. 2010). Scenarios can help managers start planning and be more prepared for the future, despite high uncertainty. Scenario planning can help identify trade-offs and conflicts between goals and in establishing priorities. Adaptive management, more useful when the future is more controllable (Baron et al. 2009), is a process for incorporating learning into management practice. Actions are taken, despite uncertain outcomes. Results are carefully monitored, which leads to learning, adjustment, and refinement of management.

Wilderness stewards should always err on the side of restraint, recognizing that human interventions have a history of backfiring even when done for

noble reasons. Caution and restraint are particularly important in wilderness. Nevertheless, boldness will at times be necessary and the onslaught of global change will increasingly force stewards to consider intervention (Lemieux et al. 2011). Cole et al. (2010) provide a list of actions that might be considered. Near-term actions managers of individual areas might take include:

- mitigating threats to resources;
- maintaining natural disturbance dynamics;
- reducing landscape synchrony;
- making heroic but thoughtfully prioritized efforts to rescue highly sensitive species;
- realigning conditions with current, expected, or a range of possible future conditions;
- relaxing genetic guidelines, where risk is low and adaptive management can be implemented;
- conserving refugia;
- allowing and/or actively assisting migration;
- cautiously considering the use of nonnative species where they are the best option for maintaining critical ecosystem functions; and
- protecting highly endangered species *ex situ*.

Longer-term, larger-scale actions include:

- promoting landscape connectivity;
- managing the matrix;
- promoting diversity and redundancy;
- articulating new goals;
- incorporating uncertainty and the likelihood of surprise into planning and management;
- prioritizing and practicing triage;
- increasing interagency cooperation; and
- enhancing flexibility and the capacity to adapt through learning.

## Conclusions

In the past half century we have learned that park and wilderness ecosystems are highly dynamic and that human impact on them is ubiquitous, with unprecedented and uncertain consequences. Although it was once thought that managing for naturalness would serve to protect all wilderness values and purposes, we know now that this is not the case. What is needed is a richer articulation of goals and purposes, using concepts that describe desirable attributes of ecosystems in terms other than the absence of human impact. Policies and institutions need to be developed that allow for more adaptability in planning and that promote large-scale, regional planning of diversity and redundancy. This may mean augmenting a decentralized management tradition with policies and institutions that constrain managerial discretion such that local decisions more effectively contribute to larger-scale strategies.

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## References

- Baron, J. S., L. Gunderson, C. D. Allen et al. 2009. Options for national parks and reserves for adapting to climate change. *Environmental Management* 44: 1033–1042.
- Biggs, R., M. W. Diebel, D. Gilroy et al. 2010. Preparing for the future: Teaching scenario planning at the graduate level. *Frontiers in Ecology and the Environment* 8: 267–273.
- Cole, D. N. 2000. Paradox of the primeval: Ecological restoration in wilderness. *Ecological Restoration* 18: 77–86.
- . 2011. Planned diversity: The case for a system with several types of wilderness. *International Journal of Wilderness* 17(2): 9–14.
- Cole, D. N., C. I. Millar, and N. L. Stephenson. 2010. Responding to climate change: A toolbox of management strategies. In *Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change*, ed. D. N. Cole and L. Yung (pp. 179–196). Washington, DC: Island Press.
- Cole, D. N., and L. Yung, eds. 2010. *Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change*. Washington, DC: Island Press.
- Cole, D. N., L. Yung, E. S. Zavaleta et al. 2008. Beyond naturalness: Protected area stewardship in an era of global environmental change. *The George Wright Forum* 25(1): 36–56.
- Cronon, W. 1995. The trouble with wilderness: Or getting back to the wrong nature. In *Uncommon Ground: Toward Reinventing Nature*, ed. W. Cronon (pp. 69–90). New York: Norton.
- Hansen, A. J., and R. DeFries. 2007. Ecological mechanisms linking protected areas to surrounding lands. *Ecological Applications* 17: 974–988.
- Higgs, E. 2003. *Nature by Design: People, Natural Process, and Ecological Restoration*. Cambridge, MA: The MIT Press.
- IPCC (Intergovernmental Panel on Climate Change). 2007. Climate change 2007: Synthesis report. Retrieved October 13, 2009, from [www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf).
- Jones, C., W. S. Hesterly, and S. P. Borgatti. 1997. A general theory of network governance: Exchange conditions and social mechanisms. *Academy of Management Review* 22: 911–945.
- Joyce, L. A., G. M. Blate, S. G. McNulty et al. 2009. Managing for multiple resources under climate change: National forests. *Environmental Management* 44: 1022–1032.
- Karkkainen, B. C. 2002. Collaborative ecosystem governance: Scale, complexity, and dynamism. *Virginia Environmental Law Journal* 21: 189–243.
- Lemieux, C. J., T. J. Beechey, and P. A. Gray. 2011. Prospects for Canada's protected areas in an era of rapid climate change. *Land Use Policy* 28: 928–941.
- Locke, H., and B. Mackey. 2009. The nature of climate change: Reunite international climate change mitigation efforts with biodiversity conservation and wilderness protection. *International Journal of Wilderness* 15(2): 7–13, 40.
- Mawdsley, J. R., R. O'Malley, D. S. Ojima. 2009. A review of climate-change adaptation strategies for wildlife management and biodiversity conservation. *Conservation Biology* 23: 1080–1089.
- McCool, S. F., and D. N. Cole. 2001. Thinking and acting regionally: Toward better decisions about appropriate conditions, standards, and restrictions on recreation use. *The George Wright Forum* 18(3): 85–98.
- Millar, C. I., N. L. Stephenson, and S. L. Stephens. 2007. Climate change and forests of the future: Managing in the face of uncertainty. *Ecological Applications* 17: 2145–2151.
- Milly, P. C. D., J. Betancourt, M. Falkenmark et al. 2008. Stationarity is dead: Whither water management? *Science* 319: 573–574.
- Pickett, S. T. A., and R. S. Ostfield. 1995. The shifting paradigm in ecology. In *A New Century for Natural Resources Management*, ed. R. L. Knight and S. F. Bates (pp. 261–278). Washington, DC: Island Press.
- Saunders, S., T. Easley, J. A. Logan, and T. Spencer. 2007. *Losing ground: Western national parks endangered by climate disruption*. The George Wright Forum 24:1, 41–81.
- Schoettle, A. W., and R. A. Snieszko. 2007. Proactive intervention to sustain high-elevation pine ecosystems threatened by white pine blister rust. *Journal of Forest Research* 12: 3217–3336.
- Schwartz, M. W., J. J. Hellmann, J. S. McLachlan. 2009. The precautionary principle in managed relocation is misguided advice. *Trends in Ecology and Evolution* 24: 474.
- Sydoriak, C. A., C. D. Allen, and B. F. Jacobs. 2001. Would ecological landscape restoration make the Bandelier Wilderness more or less of a wilderness? *Wild Earth* 10(4): 83–90.
- Thrower, J. 2006. Adaptive management and NEPA: How a nonequilibrium view of ecosystems mandates flexible regulation. *Ecology Law Quarterly* 33: 871–895.
- Vitousek, P. M., J. D. Aber, C. L. Goodale, and G. H. Aplet. 2000. Global change and wilderness science. In *Wilderness Science in a Time of Change Conference, Volume 1: Changing Perspectives and Future Directions*, comp. S. F. McCool, D. N. Cole, W. T. Borrie, and J. O'Loughlin (pp. 5–9). Proceedings RMRS-P-15-VOL-1. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- White, P. S., L. Yung, D. N. Cole, and R. J. Hobbs. 2010. Conservation at large scales: Systems of protected areas and protected areas in the matrix. In *Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change*, ed. D. N. Cole and L. Yung (pp. 197–215). Washington, DC: Island Press.
- Williams, J. W., and S. T. Jackson. 2007. Novel climates, no-analog communities, and ecological surprises. *Frontiers in Ecology and the Environment* 5: 475–482.

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