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# Wilderness Science in a Time of Change Conference

## Volume 1: Changing Perspectives and Future Directions

Missoula, Montana  
May 23–27, 1999



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## Abstract

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Ten papers presented as plenary talks at the conference, “Wilderness Science in a Time of Change,” are included. Topics include: the influence of global change on wilderness and its management; contemporary criticisms and celebrations of the wilderness idea; the capacity of science to meet the challenges and opportunities wilderness presents; wilderness in relation to biological conservation and the human experience of wilderness; and fundamental dilemmas of wilderness management.

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Keywords: conservation biology, global change, societal change, technology, trends, wilderness management

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# **Wilderness Science in a Time of Change Conference**

## **Volume 1: Changing Perspectives and Future Directions**

**Missoula, Montana  
May 23-27, 1999**

### **Compilers**

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# Wilderness Science in a Time of Change: A Conference

David N. Cole  
Stephen F. McCool  
David J. Parsons  
Perry J. Brown

At the dawn of the twenty-first century, environmental, social, and technological change continues to accelerate, creating new challenges and opportunities for humans and the world they inhabit. In the latter half of the last century, one of the important responses to these rapid changes has been the preservation of wilderness lands. In the Wilderness Act of 1964, which codified wilderness preservation in the United States, there is tension between challenge and opportunity, and between wilderness as reaction and wilderness as proaction. That wilderness designation was reactive in nature is clear in the Act's purpose statement, "to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all lands." Wilderness was viewed as a refuge from human-caused change, and managers must meet the challenge of protecting wilderness from the changes going on around it. But the Act also speaks proactively—to the use and enjoyment of wilderness and to opportunities for wilderness lands to provide important and unprecedented values to our ever-changing society.

Science is critical to meeting the challenge of preserving wilderness resources for future generations. It is equally critical to realizing the opportunities that wilderness provides for unique human-nature relationships, for the acquisition of certain types of information and understanding, and for enriching the world in which we live. The relationship between science and wilderness should be viewed as symbiotic. Our capacity to preserve wilderness is enhanced by application of the results of scientific studies, and basic scientific understanding is enhanced by research conducted in wilderness.

Given the importance of wilderness in society and the importance of science to wilderness, in early 1996 a small group of people began planning for an international conference on wilderness science. As conceived, the conference was to be both a followup and an expansion of the first National Wilderness Research Conference, held in Fort Collins, Colorado, in 1985. That conference brought together many of the scientists in the world working on issues related to the

management of wilderness and resulted in literature reviews and compilations of research that remain critical references today (Lucas 1986, 1987). Our intent was to bring scientists together again, along with wilderness managers, to produce an updated compendium of the current state-of-knowledge and research. In addition, we sought to increase the array of scientific disciplines represented at the conference and to expand the range of topics beyond the challenges of managing wilderness. Finally, we hoped to use plenary talks to highlight controversy, divergent viewpoints, and management dilemmas—to challenge participants' belief systems—in the hopes that this would stimulate interaction and personal growth.

## Conference Organization

The conference consisted of plenary talks presented before the entire conference, as well as more narrowly focused presentations organized around three conference themes and presented in concurrent sessions. The conference's plenary talks were organized into four sessions. The first session was devoted to global trends and their influence on wilderness. In separate talks, Peter Vitousek and George Stankey discussed important environmental and social and technological trends, respectively. Both papers explored the influence of global change on wilderness and its management, as well as on the values and meanings of wilderness. The second session was devoted to contemporary criticisms and celebrations of the idea of wilderness. Baird Callicott explored a variety of recent criticisms of the wilderness idea, challenging the traditional belief systems of many wilderness advocates. Dave Foreman provided an alternative perspective, both promoting the value of traditional wilderness concepts and suggesting ways in which the wilderness idea has evolved over time. The third plenary session was devoted to exploring the capacity of science to meet the challenges that wilderness faces and to realize the opportunities that wilderness presents. Jill Belsky and Dan Botkin provided thoughtful talks from the perspectives of a social scientist and a life scientist, respectively. The final plenary session was devoted to concluding talks related to conference themes. Reed Noss talked about wilderness in relation to biological conservation. Dan Dustin discussed the unique human experience of wilderness and the challenges to understanding it. The paper prepared by David Cole and Bill Hammitt explored fundamental dilemmas facing wilderness management. The final talk, prepared by Perry Brown and Dave Parsons, challenged attendees to work to further increase the capacity of wilderness science in the twenty-first century.

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The bulk of the conference was organized around three themes. The first theme was "Science for Understanding Wilderness in the Context of Larger Systems." Wilderness lands are embedded in larger ecological and social systems. Conditions within wilderness influence and are influenced by adjacent land uses and communities. The contribution of wilderness to maintenance of regional ecological integrity depends on the types of areas designated as wilderness and their spatial distribution and connectedness. In addition, wilderness lands influence regional social systems, such as local economies and life styles. The emphasis of this theme was better understanding of the linkages between wilderness and the social and ecological systems (regional, national, and international) in which wilderness is situated.

"Wilderness for Science: A Place for Inquiry" was the second theme. The unique characteristics of wilderness make it the best place to conduct certain types of science. Relative lack of human disturbance over large areas makes wilderness an important laboratory for understanding natural processes, particularly those that operate at large spatial scales. Remoteness, solitude, and the relative lack of technological intrusion make wilderness a useful laboratory for studying psychological and social phenomena in such situations. The emphasis of this theme was increased recognition of wilderness as a place for scientific inquiry, as well as better understanding of what we have learned from studies that have utilized wilderness as a laboratory.

The third theme was "Science for Wilderness: Improving Management." Wilderness is to be managed such that natural conditions, cultural values, and wilderness recreational experiences are protected and preserved. This is a complex task, requiring knowledge about threats to these wilderness values and the efficacy of management interventions designed to mitigate the impacts of these threats. Although hopefully informed by science, management actions are determined largely by evaluative judgments and the compromises that must be made between conflicting objectives. The emphasis of this theme was better understanding of wilderness visitors, threats to wilderness resources and values, and means of planning for and managing wilderness.

We organized three types of sessions under each of these three themes. We invited 18 speakers to present overview papers on specific topical areas under each theme. Many of these speakers developed comprehensive state-of-knowledge reviews of the literature for their assigned topic, while others developed more selective discussions of issues and research they judged to be particularly significant. In addition, conference participants were given the opportunity to contribute either a traditional research paper or to organize a dialogue session. Most of the research papers (131 papers) were presented orally, but 23 additional papers were presented in a poster session. Fourteen dialogue sessions were organized to promote group discussion and learning about selected topics.

## The Conference

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The conference was held in Missoula, Montana, May 23 through 27, 1999. Well over 400 people participated in the conference, which began on a warm sunny afternoon with a celebration of wilderness, jointly attended by conference

attendees and the Missoula community. A wilderness fair, consisting of environmentally oriented educational activities, musical presentations and displays, was followed by a performance in the historic Wilma Theater. Gary Snyder's remarks and readings from his most recent book of poems, *Mountains and Rivers Without End*, drew over 1,000 people.

Conference attendees included a roughly equal mix of people from federal land managing agencies and from academia. There were also several representatives from state, local, and tribal governments. There were more than 30 attendees from 16 different nongovernmental organizations, as well as a number of private individuals, consultants, and members of the press. About 20 participants were from Canada, with about 20 more participants from other countries. We succeeded in attracting people from diverse disciplines, united in their interest in wilderness. As usually is the case, a large proportion of the researchers who attended specialize in the social science aspects of outdoor recreation. However, attendees also included other types of social scientists, philosophers, paleontologists, and life scientists interested in all scales of analysis from cells to the globe.

During the first three days of the conference, early mornings were devoted to plenary sessions, with the entire conference convening for two related talks each morning. Late morning was devoted to the invited overview papers organized around each of the three themes. Six overview papers were given each morning, with attendees choosing one of three concurrent sessions. Contributed research papers and dialogue sessions were presented in concurrent sessions in the afternoon. Attendees generally had to choose among six concurrent research and dialogue sessions. Poster papers were presented in a session on the first evening. On the fourth day, research papers were presented in the morning, and the final plenary session was held in the afternoon. Over the four days, 14 dialogue sessions were held, and 131 research papers were presented in 33 1.5-hr-long research sessions.

## The Conference Proceedings

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The proceedings of the conference is organized into five volumes. The first volume is devoted to the papers presented during the plenary sessions. Subsequent volumes are devoted to each of the three conference themes, with two volumes devoted to wilderness management, the theme with the most papers. Within each theme, papers are organized into overview papers, research papers, and papers from the dialogue sessions. The format of dialogue session papers varies with different approaches taken to capture the significant outcomes of the sessions. Research papers include papers presented orally and on posters. Within each theme, research papers are organized into broad topical areas.

We sought to include all papers of interest to researchers working on a focused topical area within the same volume, even if this meant grouping papers from different conference themes. Unfortunately, this also tended to result in separating papers presented by social scientists from those presented by biophysical scientists. For example, all papers dealing with fire are included in one proceedings volume. During the conference, however, papers that contribute to



our basic understanding of fire processes and regimes in natural ecosystems were presented under the theme “Wilderness for Science: A Place of Inquiry.” Papers devoted more specifically to fire management were presented under the theme “Science for Wilderness: Improving Management.” Some of these papers were presented in sessions devoted exclusively to fire; papers on fire restoration were included in sessions devoted to restoration of various ecosystem components.

Each research paper in the proceedings was reviewed by another conference attendee; overview papers were reviewed by a subject matter expert. Dialogue session papers were reviewed by Bill Borrie. Virtually all papers received copy editing by Jennifer O’Loughlin. However, because final revisions were not reviewed, the final content of these papers remains the responsibility of the authors.

## Acknowledgments

Many individuals and institutions contributed to the success of the conference. Most of the conference planning was done by the conference Planning Committee located in Missoula, Montana. Additional ideas and support were provided by the conference’s Steering Committee members and Sponsors. The conference program was organized by the Program Committee. David Cole and Steve McCool, co-chairs of the Program Committee, were responsible for plenary speakers, putting together the final program, and compiling the proceedings. For each of the three conference themes, two other members of the Program Committee invited speakers to give overview papers and organized the contributed papers. Becky Johnson and Reed Noss were responsible for the “Science for Understanding Wilderness in the Context of Larger Systems” theme. David Graber and Marty Lee were responsible for “Wilderness for Science: A Place for Inquiry.” Jan van Wagtendonk and Dorothy Anderson were responsible for the “Science for Wilderness: Improving Management” theme. Bill Borrie and Alan Watson coordinated the poster session. Joan Brehm and Christine Ross from Continuing Education, The University of Montana, handled the lion’s share of detailed logistical arrangements, making sure the conference ran smoothly. The Rocky Mountain Research Station, Forest Service, provided the majority of funding for publishing the proceedings.

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# Global Change and Wilderness Science

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John D. Aber  
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Gregory H. Aplet

**Abstract**—The breadth and scope of human-caused environmental change is well-established; the distribution and abundance of species, the vegetation cover of the land, and the chemistry of the atmosphere have been altered substantially and globally. How can science in wilderness areas contribute to the analysis of human-caused change? We use nitrate losses from forests to evaluate this question. Determining the effects of past land-use change can be done straightforwardly; evaluating regional changes in the nitrogen cycle requires us to go farther in order to find useful comparisons; and no modern comparisons can contribute directly to understanding the possible effects of elevated atmospheric carbon dioxide.

Many species modify the environment they inhabit, but humanity does so more broadly, more pervasively and more intensively than does any other species. Human influences are not new—we have long reached into most areas of Earth—but the explosive growth of our population, resource use and commerce in the past few decades has multiplied our influence and expanded the facets of the Earth system that we modify. What can wilderness science contribute to our understanding of a changing Earth, and our influence on it? What does the term “wilderness science” mean on a rapidly changing Earth?

In this paper, we present a brief overview of some components of human-caused global change. We then discuss examples of how little-modified ecosystems can provide a baseline for understanding how the world works and for documenting human-caused change. Finally, we show that assuming that (apparently) little-modified ecosystems provide a baseline may be misleading; there is no true baseline left on Earth, no system that has escaped significant human influence.

## Background

Much of the public discussion and debate concerning global environmental change has focused on changes in climate, particularly global warming. The focus on climate seems particularly strong in discussions of how humanity

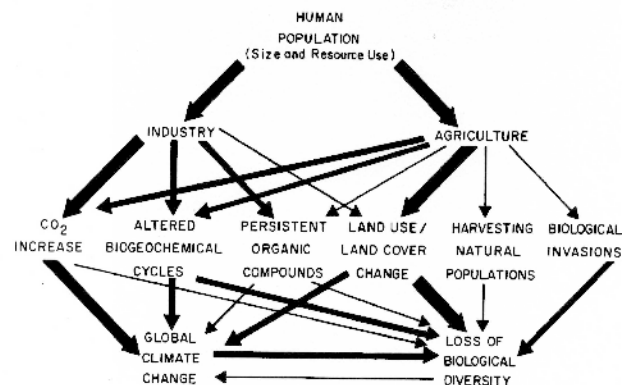
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has affected and will affect wilderness—understandably so, since climate change does not respect the boundaries of designated wilderness areas. However, there is much more to global change than climate change, and some of the other components of change are better documented and, to date, and for some time to come, more important than climate change (Vitousek and others 1997c). Human-caused climate change will occur; it probably has started already (Intergovernmental Panel on Climate Change, 1996)—but it is only one of a large set of global changes.

We view global environmental change as illustrated in figure 1 (Vitousek and others 1997b). Growth in the size of and resource use by the human population is supported by a number of enterprises (agriculture, industry, trade) that alter aspects of the Earth system, including the composition of the atmosphere, the dynamics of the major biogeochemical cycles, land use and land cover, the transport of species to distant biogeographic regions and more. These direct changes in turn drive changes in global climate, by enhancing the greenhouse effect, and in Earth’s biological diversity, most importantly through species extinction driven primarily by land use change. By and large, the direct effects of humanity are better documented and farther advanced than climate change or the loss of biological diversity.

Among these direct effects, the increasing concentration of carbon dioxide in the atmosphere perhaps provides the clearest signal of global change. Carbon dioxide has been



**Figure 1**—Components of human-caused global change. Growth in the size of and resource use by humanity entrains industrial and agricultural enterprises that drive a series of well-documented global changes, including alterations to atmospheric chemistry, the major biogeochemical cycles, land use, and the distributions and abundances of plant and animal populations. These changes in turn cause climate change and loss of biological diversity. From Vitousek and others (1997b).

measured directly since 1957; during that time it has increased monotonically (and at an accelerating rate) from ~315 to ~363 ppm (Intergovernmental Panel on Climate Change 1996). Moreover, analyses of air bubbles trapped in the Greenland and Antarctic ice caps extend the record back into the past. We can use this record to show that the concentration was close to stable near 280 ppm for several thousand years prior to about 1750, at which time it began an accelerating increase to the present.

On longer time scales, carbon dioxide in the atmosphere varies more substantially, with a relatively high concentration (~280 ppm) in interglacial times and a lower concentration (~195 ppm) during full-glacial times. However, the modern increase began at a high point and has increased outside of the range of concentrations over the past 400,000 years, at least. Some of the changes in the prehistoric record revealed in ice cores are fast—but the modern increase is ~10 times faster. Finally, the magnitude of the modern increase is already about as large as the full glacial/interglacial range—and there is no end to the increase in sight.

Carbon dioxide is an important greenhouse gas—it is transparent to incoming visible radiation but traps outgoing infrared—and its increasing concentration will drive climate change. There is uncertainty about how much change, and how fast, but not about whether there will be change. In addition, and perhaps more importantly, carbon dioxide is the basic raw material for photosynthesis. In most plants, rates of photosynthesis are not saturated at the current concentration in the atmosphere, and many experimental studies have demonstrated that an increased CO<sub>2</sub> concentration increases plant growth and often ecosystem-level productivity (DeLucia and others 1999, Hungate and others 1997). However, increased carbon dioxide affects species differently (Curtis and Wang 1998, Poorter 1993), stimulating some substantially (among them the invasive grass *Bromus tectorum* (Smith and others 1987)) and others very little. As a consequence, we must expect that competitive relationships among species will change systematically as carbon dioxide increases; there will be winners and losers among unmanaged as well as managed species.

At the same time, increased carbon dioxide generally decreases the quality/digestibility of tissue in those plants that respond most positively to it; such plants have lower protein and mineral concentrations when grown with increased carbon dioxide (Field and others 1992). Consequently, many herbivores are influenced by increased carbon dioxide; they must spend more time feeding to balance their protein budgets, and growth rates and survivorship often decrease, and the likelihood of predation increases in consequence (Fajer and others 1989). Overall, no plant, no animal on Earth is unaffected by increased carbon dioxide, which human activity already has increased ~30 percent over pre-industrial conditions.

Another significant global change is our alteration of the global cycle of nitrogen. The nitrogen cycle consists of a large, well-mixed reservoir of molecular nitrogen (N<sub>2</sub>) in the atmosphere that is not available to most organisms and a slow, mostly biological transformation of that nitrogen into biologically available forms, in which the nitrogen is combined with carbon, hydrogen, or oxygen. This transformation, nitrogen fixation, is carried out by a range of bacteria and blue-green algae, some of which occur in symbiotic

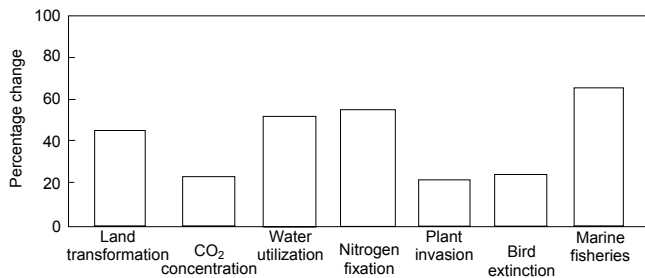
associations with plant roots. Background rates of nitrogen fixation are relatively small on land, totaling about 100 million metric tons/year, and a low supply of fixed nitrogen limits the growth of many plants and ecosystems (Vitousek and Howarth 1991).

Humanity offsets N limitation through industrial fixation of nitrogen from the atmosphere (which now amounts to ~80 million tons/year), and through the cultivation of leguminous crops with nitrogen-fixing symbioses (such as soybeans and alfalfa, which contribute ~40 million tons/year). We also fix and mobilize nitrogen during fossil fuel combustion (~25 million tons) (Galloway and others 1995, Smil 1990, Vitousek and others 1997a). Altogether, our activities fix more N than all natural processes (on land) combined, and the change is surprisingly recent, in that more than half of all N fixed industrially in all of human history has been fixed in the past 15 years (Kates and others 1990, Vitousek and others 1997a).

Most of our fixation of nitrogen is for the benefit of agricultural productivity—and indeed the current human population could not be supported without the use of nitrogen fertilizer. However, nitrogen applied to agricultural systems does not stay where it is applied. Rather, it is transported as trace nitrogen gases through the atmosphere and deposited downwind, it moves in dissolved forms through soils to streams and groundwater, and it moves in agricultural produce through our transportation systems into us and thence (in wealthier societies) into sewage treatment plants.

Where fixed nitrogen is transported or deposited, it has many and varied effects on organisms and ecosystems. In estuaries and the coastal ocean, it drives eutrophication, enriching the productivity but decreasing the biological diversity of receiving waters, often leading to algal blooms, some of them noxious, and low-oxygen zones (Nixon and others 1996). On land, added nitrogen similarly increases the productivity but decreases the diversity of many ecosystems (Berendse and others 1993, Tilman 1987); it can also alter ecosystem functioning profoundly through a cascade of effects termed “nitrogen saturation.” These effects include the potential for acidification of soils and streams, and the development of nutrient imbalances and reduced growth rates in forests (Aber and others 1989, 1998; Fenn and others 1998).

Changes in carbon dioxide and in the global cycle of nitrogen are just two of the changes outlined in figure 1; we have described them briefly here because we will explore the implications of these particular changes (and their interactions) for wilderness science. The status of other components of human-caused global change is summarized in figure 2 (Vitousek and others 1997c). Not only has carbon dioxide increased ~30 percent and nitrogen fixation more than doubled as consequence of human activity—nearly half of the ice-free surface of Earth has been transformed by human activity (Daily 1995, Kates and others 1990), more than half of the accessible fresh water is utilized (Postel and others 1996), more than 20 percent of all wild plants in Canada (and many other places) are introduced from elsewhere (Rejmanek and Randall 1994), as many as a quarter of all bird species have been driven to extinction (Barbault and Sastrapradja 1995), and fully two-thirds of all marine fisheries are at their limit of exploitation or already are overexploited and declining (Food and Agricultural Organization 1994). These global changes are not some extrapolation to the future, they are



**Figure 2**—The current extent of human alteration of a number of major components of the Earth system. From Vitousek and others (1997c).

not the predictions of some model, they are not particularly controversial. They are known, and they are with us now.

## Global Change and Wilderness Science

What does the extent and pervasiveness of human-caused environmental change imply for wilderness, and for wilderness science? If by “wilderness,” we mean areas of Earth that are unaffected by human activity, then there is no wilderness left on Earth; every place is affected by increased carbon dioxide and by one or more other changes. Given the history of human presence over most of Earth, and our effectiveness in exterminating or suppressing megafauna, there hasn’t been much wilderness in this sense for a long time. However, modern global change adds new dimensions of human influence across Earth.

On the other hand, we can array Earth’s ecosystems along a gradient from those influenced by distant (in space or time) human activities to those that are wholly dominated by humanity. Systems in which human effects have been relatively small, systems with less rather than more human influence, can then be used to identify and to understand some of the components of global change and their consequences.

We discuss several studies in which little-modified ecosystems have been used to provide a baseline against which the influence of anthropogenic changes can be evaluated. For all of these, we focus on the concentrations of fixed nitrogen, particularly nitrate, in streams that drain forested watersheds. The fixed nitrogen in small streams represents nitrogen that has been lost from forest; it thereby provides information on the ability of forests to retain nutrients. This nitrogen also has the potential to influence the dynamics of downstream ecosystems.

The first example is nitrate in streams draining forested watersheds in New England. In the 1970s, nitrate concentrations were low in streams draining forests that had been logged decades previously. These forests were still accumulating biomass, and nitrogen in that biomass, so nitrogen losses were less than atmospheric inputs of fixed nitrogen to those forests. In contrast, forests that had never been logged had much higher concentrations of nitrate in streams (Vitousek and Reiners 1975). These forests were no longer accumulating much nitrogen in growing biomass or in soils, so losses to streamwater were closer to the inputs of nitrogen

to these forests. Studies elsewhere in New England and the southern Appalachians yielded similar results (Martin 1979, Silsbee and Larson 1982).

More broadly, the forests that never had been logged could be used as a baseline for the others; with them, it was possible to see the legacy of human-caused land-use change, decades after the fact. More recent studies demonstrate that it is possible to trace these effects back nearly two centuries (Aber and Driscoll 1997). The comparison of baseline and human-modified ecosystems shows us something fundamental about the ways that forest ecosystems work and something important about the persistent consequences of a widespread component of global change.

It should be noted, however, that New England is downwind of the agricultural and industrial heartlands of the United States. All of New England is greatly affected by human alteration of the N cycle; atmospheric deposition of fixed nitrogen there is far above background levels, and far above the levels observed in more remote regions of Earth (Holland and others 1997). Do the substantial nitrate concentrations observed in streams draining never-logged New England forests reflect regional human alteration of the nitrogen cycle?

Hedin and others (1995) evaluated this question by measuring fixed nitrogen in the streams draining some temperate forests in Chile. Coastal southern Chile is among the least polluted areas of Earth with regard to anthropogenic nitrogen. The reactive nitrogen gases that contribute to deposition downwind of agricultural/industrial areas have fairly short residence times in the atmosphere (days), most such gases are emitted in the northern hemisphere, and southern Chile is remote even for the southern hemisphere; its rain sweeps in off the unbroken southern ocean.

Streams draining never-logged Chilean forests did not have high concentrations of nitrate; indeed, they had almost no nitrate at all (Hedin and others 1995). The main form of fixed nitrogen in these streams is dissolved organic nitrogen. Northern streams contain about as much dissolved organic nitrogen as these Chilean streams. However, in Chile, this loss of dissolved organic nitrogen may be sufficient to balance the very low inputs of nitrogen to these remote forests and perhaps sufficient to keep the supply of nitrogen to trees low enough to constrain forest growth. In contrast, the northern hemisphere systems are awash in anthropogenic fixed nitrogen, and they lose substantial quantities of nitrate as well as dissolved organic nitrogen (table 1).

In this case, the remote Chilean forests serve as a baseline, and the never-logged northern hemisphere forests (our previous baseline) are shown to be influenced substantially by human activity. It would be hard to characterize this human influence in New England without the little-modified southern hemisphere systems for comparison. Once again, this comparison teaches us something fundamental about how forest ecosystems work and something important about how they are altered by human activity.

So far so good. In both examples, we can use less modified systems to provide a baseline against which more modified systems can be evaluated. More recently, however, nitrate concentrations have been declining in streams draining New England forests — whether they have been logged or not (Aber and Driscoll 1997, Goodale 1999). Aber and Driscoll (1997) showed that while the long-term record of nitrate

**Table 1**—Nitrate concentrations (in  $\mu\text{eq/liter}$ ) in streams draining forested watersheds. In each case, a human-altered situation is contrasted with a reference situation, in which human influence is considered to be smaller or absent.

	Human-altered	Reference system	Citation
<b>Case 1:</b> Successional versus never-logged forests in New England in the 1970s.	8	53	Vitousek and Reiners 1975
<b>Case 2:</b> Never-logged forests in New England versus Chile in the 1990s; Chile received much less anthropogenic N.	17	0.1	Hedin and others 1995, Goodale 1999
<b>Case 3:</b> Never-logged forests in New England in the mid 1970s versus the mid 1990s; the effect of elevated CO <sub>2</sub> could be greater in the 1990s.	17	53	Goodale 1999

losses from the intensively monitored Hubbard Brook Experimental Forest displays substantial year-to-year variability, nitrate concentrations could be predicted quite well by a model that incorporated year-to-year variations in climate. In the mid-1980s, though, observed concentrations fell consistently below predicted ones, and the difference widened in the 1990s. Similarly, the Bowl Natural Area, a never-logged forest near Hubbard Brook, had much lower nitrate concentrations in the mid-1990s than the mid-1970s. Streams in never-logged forests continued to have higher nitrate concentrations than those in forests logged decades ago, but nitrate concentrations in both have declined substantially (Goodale 1999).

What has caused this change? It is not caused by declining inputs of fixed nitrogen; these have been more or less constant. Other possible causes range from a rebound in forest growth following invasions by pests and pathogens to a change in forests or soils caused by declining inputs of sulfuric acid in precipitation. Another possibility is that the increasing concentration of carbon dioxide in the atmosphere has stimulated the growth of these forests, thereby increasing plant demand for nitrogen and other nutrients. We do not know what causes the decline in streamwater nitrate, but increasing carbon dioxide is a plausible cause (table 1).

If increased carbon dioxide is in fact responsible, there is no modern baseline against which this change can be evaluated. All of Earth is affected by it, no matter how remote. Similarly, all of Earth will be affected (though not equally) by climate change. Assuming again that carbon dioxide does cause the recent change in New England stream chemistry, we should worry a little about what our southern hemisphere baseline can tell us about nitrogen losses from never-logged forests. We have to recognize the possibility that the Chilean forests, measured initially in the 1990s, might have had slightly different dynamics earlier, before increased carbon dioxide stimulated their demand for nitrogen. Certainly they must have been very different from northern hemisphere forests that receive substantial anthropogenic nitrogen, then as now, but we could overstate the magnitude of that difference by missing the (assumed) effect of elevated carbon dioxide.

## Conclusions

We conclude with three more or less contradictory thoughts about wilderness science in a changing world.

1. The world is changing substantially under human influences, and it will continue to be altered by human activity for the foreseeable future.

2. Nevertheless, the baseline represented by little-managed systems represents our best way of evaluating and understanding some of the major components of human-caused global change.

3. While we need to seek—and preserve and protect—systems that can provide a baseline for evaluating human-caused change, we should also be suspicious of what they can tell us. Indeed, we should be suspicious of the idea of a baseline in a changing world. Paleocological studies, rather than comparative studies, may provide a more direct baseline for evaluating change—at least in those characteristics of ecosystems that leave an interpretable record. We should not reject baseline studies or baseline ecosystems, but we should use them cautiously (table 1).

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# Future Trends in Society and Technology: Implications for Wilderness Research and Management

George H. Stankey

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**Abstract**—Judging the impact of social and technological trends on the future of wilderness is complex. Declining public trust, growing demands for scrutiny, a need to recognize the link between biophysical and socioeconomic systems, and the need for criteria to select among alternative futures challenge us. A burgeoning global population will increase resource impacts, but more critically, the growing gap between haves and have-nots will aggravate equity concerns. Future technological changes are problematic; they will enhance understanding of wilderness but also make it more accessible. We lack ethical frameworks for resolving such dilemmas; what we *can do* will almost always outpace our ability to decide what we *should do*.

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It is my assignment to discuss how future trends in society and technology might affect how wilderness is both used and perceived, as well as the implications of these changes for the conduct of science in wilderness. I am also to describe the nature of ethical frameworks available to respond to these changes and to the conduct of science in wilderness. This is an ambitious assignment, for not only does it require consideration of two large, complex sectors and their equally complex interactions, but it also implies that the analysis will account for what has not yet happened. Our capacity to anticipate the future accurately has yet to be demonstrated; there are a host of examples of this inability, such as Bill Gates' apocryphal quote "640K ought to be enough for anybody." Speaking specifically of wilderness, Nash (1982) observed "who in the 90s could have foreseen a world in which oil is piped from Alaska, the planet's mightiest rivers are thoroughly regulated, and recreational backpacking threatens to love designated wilderness areas to death? We may be in no better position today to predict the state of wilderness on this planet in 2980." I would agree fully with Nash's assessment, but I doubt our capacity to forecast, with any accuracy, what the situation will be in the next 50 years, let alone the next millennium!

But having said that, we must also recognize that our failure to think reflectively about the future only increases the chance that it will bring neither what we might wish for nor what we might desire. Those who specialize in forecasting (as opposed to prediction) remind us that the future is not some immutable trajectory, determined by our history, the stars, or our genes. As Polak (1961) notes, "history does not

unfold itself, but evolves through man's evolving." Instead, it is shaped by the numerous actions and decisions (or perhaps more often, by nonactions and nondecisions) taken today; to a very great extent, we choose our destinies, explicitly or implicitly, and "steer our collective enterprise toward any one of several worlds" (Hammond 1998).

Reflecting upon the nature of tomorrow also leads us see today in ways not previously possible. By looking ahead, we see particular trajectories and outcomes that we might like to avoid or alter; to do so will first require changes in present attitudes, behaviors and institutions. However, such future-oriented feedback is often ignored or denied because to acknowledge it is to presage a need to change current institutions (Michaels 1973). This, in turn, can produce such a state of psychological discomfort that denial becomes the order of the day.

Thus, we are faced with a dilemma: attempting to forecast what is yet to come and which is ultimately unknowable, yet cognizant that our failure to do so could very well produce what we wish to avoid (and even more frustratingly, might well be able to avoid). It is a case of "Catch-22," alive and well!

In this paper, I try to walk the fine line between these two outcomes. First, I present some basic presumptions and caveats. In this section, I outline some of the larger, in most cases global, forces at play with which both wilderness managers and scientists, as well as the whole of society, will need to contend.

Second, I turn to a discussion of selected social trends underway, globally as well as in the United States. Space does not permit a full appraisal of this topic, but hopefully I can provide some basic familiarity with these trends and, more importantly, comment on some of the scientific issues these trends present.

Third, I present a somewhat similar analysis of technological trends. The course of technology in the future is truly confounding—as is its impact on society, resource management, and wilderness. I've tried to avoid either the course of unbounded enthusiasm (technology will free us!), as well as unremitting gloom (technology will imprison us!).

Fourth, I have also been asked to comment on changing ethical systems and how these might affect wilderness and the conduct of science within such areas. I am neither ethicist nor philosopher and do not feel particularly well-suited to comment on this aspect in any depth. However, having said that, I am convinced that the challenges here far exceed those posed by more people and machines. To foreshadow my comments regarding changing ethical frameworks, I argue (1) that *what we can do* tends to outrun our capacity to judge *what we should do* and (2) that *will*, not *wit*, is the most critical deciding factor in the future of wilderness.

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## Wilderness in the Context of Tomorrow

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Let me begin by identifying some broad, contextual aspects of the future that will affect not just wilderness and its use, including science, but our lives in general. In most cases, these aspects already have begun to make themselves known, and we have evidence that they imply significant changes in how we, as a society, behave.

### Trust Is Declining While Demands for Public Scrutiny Are Increasing

There is growing evidence of disenchantment, anomie and distrust throughout society and between those who govern and the governed. For example, researchers tracking public confidence in six primary institutions between 1973 and 1989 (Cambridge Reports 1990) reported that only about 40% of the public consistently ascribed to itself a "high" degree of trust in the scientific community (the top ranking, shared with medicine; corporations and Congress are at the bottom of the list, each hovering around 20%). More directly related to our concerns here, Kasperson and others (1992) observed that "growing public concern over health, safety, and *environmental protection* has accompanied the erosion of social trust" (emphasis added). Finally, Shindler and O'Brian (1998) reported that while nearly half of the agency personnel surveyed agreed that "federal forest managers in your area are building trust and cooperation with citizens so that people feel the agency is acting in their best interest," 60% of citizens either disagreed or were neutral on the question.

Science is not immune to the question of declining trust. In 1980, then-president of the National Academy of Science Philip Handler, writing in *Science*, opined that "Important to the future of science and technology is the fact that the public has somewhat lost confidence in the ultimate value of the scientific endeavor. It is not that they hold...science or scientists in any less esteem. But they are less certain that scientific research will inevitably yield public benefit." Thus, an attendant feature of declining trust will manifest itself in growing demands for public scrutiny of decisions, including scientific endeavors. Such scrutiny will focus attention on fundamental purposes as well as the nature and distribution of costs, benefits and risks. These demands, and appropriate responses to them, typically will exceed the capacity of the routinized, mechanized and procedurally based public involvement institutions common today.

The specter of the public eye over one's shoulder can be unsettling in any situation, and this is especially true for those who often see their work as requiring extensive training and specialized knowledge and skills. However, the role of citizens in democratic societies long has embraced the notion of *civic participation* (Lee 1993), and growing demands for scrutiny of decision-making processes, including those in the scientific sector, are a logical extension of this role. Such demands, incidentally, are driven, in part, by a growing recognition that science and its results have profound effects on things of great value to us. It is also a recognition that science, left to its own devices, is capable of the same variety of faults and flaws as

any other sector of society, ranging from poor judgment to incompetence to evil. At the same time, we must be cognizant of the stresses our society faces as it attempts to deal with what Pierce and Lovrich (1983) described as *the technical information quandary*: "how can the democratic ideal of public control be made consistent with the realities of a society dominated by technically complex policy questions?" However, I would also point out that public scrutiny of "technically complex policy questions" tends to enhance, rather than diminish, the technical rigor, quality and usefulness of investigation. Paehlke and Torgerson (1990), for example, reported that public scrutiny of highly complex technical issues, such as the development of air quality standards in Ontario and the construction of the trans-Alaskan oil pipeline, resulted in more rigorous outcomes than initial plans would have created.

The bottom line is that the practice of science in the future, in all sectors, will be subject to increasing review by society. The effects this will have on what science does, as well as how results are used, are problematic. However, it seems this will be an issue particularly in situations in which there is a perception of significant risk. Risk assessment conventionally involves two distinct dimensions: the likelihood of occurrence (a statistically grounded calculation) and the importance of an occurrence (a value judgment). This has significant implications for the practice of science in wilderness because the very existence of such reserves often can be traced to the strong bonds between them and people. These ties, in turn, derive from a variety of sources: recreational experiences, philosophical convictions about their importance, their importance as a legacy to the future, their biological legacy, their spiritual value and so on. Because wilderness is important for many reasons, actions (including those of science) perceived to affect these areas will attract close scrutiny because people will be concerned that those actions could put these values at risk.

A corollary of this issue that I anticipate is growing demands and pressures for science and scientist involvement in management and policy-making. Again, this is a phenomenon across our whole society, but it has gained particular attention in the natural resource management field; for example, in regional efforts such as the Forest Ecosystem Management Assessment Team (FEMAT) (1993), the Interior Columbia River Basin (ICRB) and the Bitterroot Ecosystem Study in Montana. It is also a key element in recommendations contained in the recent report of the Committee of Scientists to the Secretary of Agriculture (1999). This movement has both supporters and detractors. On the positive side, it heralds an increased recognition of, and support for, the incorporation of our best scientific knowledge into management decisions and policies. However, it also raises serious, legitimate questions about the role of science and scientists in the decision-making process. Such concerns were at the root of Handler's previously cited editorial in *Science*: he wrote "The public image of science and scientists has been distorted by the participation of scientists in public policy formation." Nonetheless, I see the demands for such engagement by the scientific community as growing, not diminishing, notwithstanding serious and legitimate concerns regarding impacts on scientists and the practice of science *vis a vis* policymaking (Jasanoff 1990).

## Wilderness Is Part of a Larger Biophysical and Socioeconomic Web

Although not a new idea, it's worth recalling that wilderness exists within, and is given meaning by the larger biophysical and socioeconomic fabric within which it exists. My use of the term "wilderness" here is in the broadest sense; we need to remind ourselves that the concept of wilderness as a *land use* is strongly North American in origin. However, discussions need to embrace a much broader, inclusive view of these areas, irrespective of the name attached to them. For example, if we were to rely on the categories of protected areas recognized by the International Union for the Conservation of Nature (1994), we would include Categories I (*Strict Nature Reserves and Wilderness*), II (*National Parks*), III (*National Monuments*) and IV (*Habitat/Species Management Areas*); we would also probably include *Biosphere Reserves* designated by UNESCO, *World Heritage Sites* protected under the World Heritage Convention and *Wetlands of International Significance* protected under the Ramsar Convention. The origins of the wilderness concept derive from European and Middle Eastern experiences; as Nash (1982, p. xii) notes in the Preface to the third edition of *Wilderness and the American Mind*, modern conceptions of wilderness trace to, and beyond, the "Dark and Middle Ages" to the advent of cultivation.

Many kinds of areas, often with no designation at all, also need to be included in our discussions. This range of areas, with an attendant variety of values, uses and benefits, are part of a wider fabric with sociopolitical and environmental conditions that bear directly on the condition of the wilderness. The lines on maps that give form to the members of the National Wilderness Preservation System, for example, are notoriously permeable. As Peter Vitousek's paper in these proceedings suggests, global air and water pollution or the fragmentation of critical habitat operate to erode the very heart of the pledge that wilderness is to be "protected and managed so as to preserve its natural conditions..." (The Wilderness Act of 1964). Similarly, the character and quality of the sociopolitical fabric has direct implications and consequences for the future of wilderness.

There are many examples of this. The horrors of ethnic cleansing in Kosovo or central Africa might seem far removed from the issue with which this conference is concerned, but I would contend they are not. The issue of security—regional, national, global—will be a dark backdrop to many policy discussions in the next century, and to the extent that the factions and frictions that produce a Kosovo or a Rwanda remain unattended, our capacity to maintain areas in which environmental processes operate "untrammelled" or where people have the opportunity to seek restoration and re-creation will prove futile. Writing about the growing culturally-based conflicts of the mid-east and Africa, Kaplan (1994) notes "The savagery of the fighting points to a truth that we lack the stomach to contemplate: a large number of people on this planet, to whom the comfort and stability of a middle-class life is utterly unknown, find war and a barracks existence a step up." How will it be possible to maintain wilderness, in any sense of the word, in such a world?

My point is simply that the ultimate future of wilderness lies not within the boundaries of those places we define on

maps with a capital "W," but in the array of economic, institutional and human systems and processes within which such areas are imbedded.

For example, O'Riordan and Rayner (1991) note that about two-thirds of the tropical moist forests logged annually are removed by landless families, many of whom have been forced to leave their homes by the very soil drying process their earlier clearance created. This clearance, in turn, is driven by corruption in government, by favorable tax policies and stumpage fees paid to the rich and famous, etc. Contrary to the view of many, O'Riordan and Rayner argue that the solution to the problem of tropical deforestation does not lie in improved management of these forests. Such a contention derives from a perception of the problem as largely *operational* in origin—that is, as a result of ineffective management, inadequate information, poor operating procedures and so forth. However, because the causes of tropical deforestation are grounded in *systemic* deficiencies, the solution to their sustainable management must be found in systemic reform: changing the structure, incentives, and purposes of international finance, in corporate investment policies of organizations such as the World Bank in developing countries, etc. Systemic problems derive from inherent deficiencies in the underlying socioeconomic and technological systems; solutions must, therefore, embrace fundamental change in those systems (Caldwell 1990).

## There Are Many Possible Future Scenarios

Finally, "although we cannot know the future, we can envision it" (Hammond 1998). However, to think about the future isn't useful without some specific parameters. For example, are we talking in the near-term (next year), mid-term (the next decade or generation) or the long-term (next century)? Are we talking about the future of our community, our state or province, the nation, or the world? Most importantly, what are our assumptions about the future? Is our view guided by a belief in humans' fundamental ability to cope or by a view that "there is no hope, we can only cope?" Will humans demonstrate a continual capacity to rise to the challenges that unfold in the future, or will greed, lack of ingenuity and short-sightedness eventually doom us?

Obviously, we each think about the future in different ways. Indeed, the multiplicity of views might lead one to conclude that it is unfruitful at best, and self-delusional at worst, to even bother thinking about tomorrow. However, we must again return to the idea that the future begins now and that the actions and decisions we initiate today can and will shape tomorrow; we do have the capacity to influence what the future holds.

Notwithstanding Santayana's admonition that "those who cannot remember the past are condemned to repeat it," our ability to project events of the past into the future has limited utility. This is especially the case now, when the rates of transition in the socioeconomic and political milieu are so rapid. As Toffler (1980) reminds us, the ability of past events to inform us of the future is diminished during periods of rapid change; this seems very much the case today, with high levels of uncertainty and change characterizing virtually all sectors.

The concept of *scenarios* provides a useful way to think about tomorrow (Hammond 1998). Scenarios are not predictions, projections or forecasts; instead, based on specified assumptions, constraints and logic, they provide a framework within which we can think not only about the future, but perhaps more important, about our present situation in ways that help reveal possibilities and implications. In a way, scenarios are stories about the future, grounded in both science and imagination. Given sufficient rigor, detail and creativity, they can provide images of the future that are plausible, self-consistent and sustainable (Gallopín and others 1997).

However, even within the confines of rigor, plausibility and the other qualities of useful scenarios, a vast range of possible scenarios could be (and have been) constructed. Hammond (1998) provides three scenarios that he defines as “clearly within the realm of the plausible.” He notes that even eliminating the extreme, almost science-fiction-like, futures aside, the scenarios suggest that humankind still faces starkly different possibilities: (1) a *Market World* in which economic and human progress occur almost automatically, driven by free markets and human initiative; (2) a *Fortress World*, characterized by instability and violence, economic decline and unprecedented human misery; and (3) a *Transformed World*, in which fundamental changes in institutions, norms and beliefs lead to a better life for all humanity.

Gallopín and others (1997) present a similar range to Hammond; they envision (1) the *Conventional World*, characterized by essential continuity to current patterns; (2) *Barbarization*, marked by deterioration of the fundamental social, economic and moral underpinnings of society; and (3) a *Great Transitions* scenario, involving “visionary solutions to the sustainability challenge,” involving preservation of natural systems, high levels of welfare through material sufficiency and equitable distribution and a strong sense of social solidarity. They also identify two variants for each class. In the Conventional World scenario, they describe the *Reference* variant, grounded in assumptions of fundamental continuity in population and economic growth and technological change. A *Policy Reform* variant adds comprehensive, coordinated government action to achieve greater social equity and environmental protection. In the Barbarization scenario, they identify a *Breakdown* variant, involving unbridled conflict, institutional disintegration and economic collapse. The *Fortress World* variant features authoritarian and draconian measures, with an elite ensconced in protected enclaves, surrounded by repression, environmental destruction and misery.

Finally, the Great Transitions scenario is divided into (1) the *Eco-communalism* variant, incorporating bioregionalism, face-to-face democracy and appropriate technology, and (2) the *New Sustainability Paradigm* variant, sharing the characteristics of its sibling but emphasizing changes in the urban industrial civilization, rather than its elimination, and a greater focus on an equitable civilization, as opposed to a retreat into localism.

Future scenarios for wilderness have also been fashioned. For example, Nash (1982) describes two ways in

which we might think about the wilderness of tomorrow. First, there is a wasteland scenario, one which envisions a ravaged, paved and poisoned planet (similar to the Barbarization scenario described above). The second, and the more serious threat in Nash’s judgment, is the garden scenario. Here, wilderness as we think about it today is gone, not through violent, destructive industrialization and urbanization, but ironically, through beneficence; today’s wildlands are replaced by sculpted, cultivated and civilized landscapes. It is a scenario wholly consistent with the Jeffersonian ideal; “but wilderness is just as dead in the garden as it is in the concrete wasteland” (Nash 1982).

Such scenarios are examples of the kinds of futures that could plausibly unfold; such scenarios facilitate our ability to reflect on the kinds of actions and strategies we need to consider now in order to prevent undesirable outcomes. Although both of Nash’s scenarios are grim, they are not inevitable. If both the garden and the garbage dump represent unacceptable futures, what are we called upon to do *now* to fashion a more acceptable alternative? I’ll return to this issue in the conclusion.

Space and time do not permit a full exposition of plausible scenarios in this paper. However, I do want to acknowledge that my view of the future is founded on the idea of plausibility rather than possibility. I acknowledge the possibility that, despite the best efforts of Bruce Willis, a mammoth comet could smash into the earth, obliterating all forms of life and converting what’s left into a first-rate *de facto* wilderness. I acknowledge the possibility that unbridled nationalism, racial and religious bigotry and blind greed could turn the world into an armed camp, where “survival of the fittest” becomes our creed.

Despite the current headlines, I do envision a global society that is capable of finding a more benevolent, less acrimonious future. In short, I retain confidence that a worldwide cataclysm, either natural or human-induced, is not imminent. At the same time, I am no Pollyanna or even particularly optimistic. Changes in social and technological trends carry significant import for the future, not just for wilderness, but all of society. We have major choices before us and we still have a considerable capacity and range of options that we can exercise; within that capacity and those choices, we can make both good and bad decisions. My sense of the future is that the trends in social and technological change are certainly a factor that will affect the wilderness of tomorrow, but a much more important issue is the extent to which we can mobilize fundamental reform in the institutional arena—systemic change as opposed to operational (Caldwell 1990). As suggested earlier, our future is primarily a function of the collective will that society can bring to bear, not only on the wilderness and environmental challenges that will confront us, but an array of pressing social issues. However, the extent to which we do so remains problematic.

With this background, let me turn to a discussion of some of the key social and technological trends with which we must be concerned. As noted earlier, it is not possible to discuss all these trends in detail, but I have attempted to select key dimensions that seem particularly relevant to the topic of this conference.

## Social Trends and Their Implications for Wilderness Science

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We are all familiar, at least in general terms, with projections of global and national populations. The United Nations (1996) reports that the world is now home to about six billion people, with a projected growth to nearly ten billion by the year 2050. This growth will occur despite a dramatic decline in the world's average annual growth rate. Between 1950 and 1990, the world's population grew at an annual average of nearly 2%; between 1990 and the year 2050, estimates indicate this will decline about half and, between 2050-2100, is estimated to decline to .2% per year (United Nations 1992). However, it's important to treat such projections and estimates cautiously; global population projections made by the UN in 1992 and 1994, for example, differ fairly sharply, with the 1992 estimate of the year 2050 population being 10 billion and the 1994 estimate 9.4 billion, a difference of about 600 million people in only two years! Significant changes in assumptions about rates of population growth and fertility (both lower than expected) combine to explain the differences. But the fact remains that world population in the near future will be substantially larger. However, there are competing hypotheses as to what a larger population implies, both for society in general and for environmental protection in particular. On the one hand, there are estimates that general economic prosperity will increase; Hammond (1998) reports that the global average per capita income will more than double over the next 50 years. To the extent that we make progress on alleviating poverty, we might hypothesize some reduction in adverse environmental impacts. On the other hand, the "ecological footprint" associated with higher levels of living might only grow larger, resulting not only in more people, but in more people having higher incomes that facilitate increased rates of resource consumption and impact. As Rees (1996) argues, the world's "advanced" nations are, in large part, advanced because they have accumulated large and unaccounted ecological deficits at the expense of the rest of the planet. However, estimates of future economic conditions are notoriously unreliable, even more perplexing, they might be accurate on average, but wide variation means that while the rich get richer (and consume more), the poor get poorer (with attendant impacts on the environment as they struggle to survive). The result is disheartening: While socio-economic inequities grow larger, environmental impacts also worsen, with their effects disproportionately borne by those least able to contend with them.

The relationship between economic condition and resource utilization is complex. It is confounded by the fact that while global population growth rates might be in decline, significant differences remain (and are projected to remain) between these rates in the so-called "most developed regions" (MDR) and the "least developed regions" (LDR). For example, while the population growth rates of the MDR regions is estimated to drop to -0.1% in the period 2045-2050, it will remain at .6% in the LDRs (United Nations 1996). The implication here is that those without will continue to grow more rapidly than those with; the growing inequity between "haves" and "have-nots" will

further aggravate not only the demands for resources for survival, but the state of global security, which, as noted earlier, places the array of reserves, parks and wilderness around the world at even greater risk.

This is especially a concern because long-range population forecasts also suggest major changes in the distribution of the world's population. For example, the United Nations (1992) reports that in 1990, about 20% of the world's population resided in developed nations in Europe, North America and Oceania; by 2050, this percentage will decline to only about 12%. Perhaps the converse is more revealing: people living in the lesser developed countries (Africa, Latin America, China, India) will grow from slightly less than 80% to nearly 90% of the total world population. The burgeoning populations in these lesser developed countries also imply rising levels of impact on resources and, by implication, further pressures on reserves in which human use and occupation is limited if not outright prohibited.

The social and equity pressures created between haves and have nots are not just phenomena of the Third World. In the United States, Census Bureau figures indicate that since 1969, there has been an increase in income inequality; for example, in 1997, the share of aggregate household income controlled by the highest quintile increased from 43 to nearly 50 percent, while the bottom quintile declined from 4.1 to 3.7 percent. More noticeably, the share of income controlled by the top five percent of households increased from around 17 to nearly 22 per cent (Weinberg 1996).

The annual population growth rate in Canada and the U.S. has slowed dramatically in recent years. In 1995, the population of the two countries was about 293 million, and it is projected to reach 389 million by 2050; annual growth rates in both countries is now about 1%. However, there are important trends in the structure and distribution of the population that hold significant implications for those charged with the management of wilderness, parks and reserves. For example, of the 10 states projected to have the largest increases in population between 1995 and 2050, three are in the West (AZ, CA, WA), where many of these reserves are found. Perhaps more important than absolute growth rates, six of the ten fastest growing states are in the West (AZ, CA, ID, NM, NV, and UT). In these states, where we find millions of acres of classified wilderness, population is projected to increase between 4% and 5% per year, largely as a function of high levels of in-migration (Biyearly and Deardorff 1995).

Shifts in internal migration, rather than increased birth rates, could have significant effects on many wildernesses. For example, the recently completed Interior Columbia River Basin (ICRB) ecosystem assessment (Quigley and Arbelbide 1997) reports that alternative population projections for the region for the year 2040 differ by a factor of well over two! From a 1990 population of less than three million people, the region's population could range from virtually no growth by 2040 to nearly seven million people. Much of the difference derives from fundamental assumptions about rates of in-migration.

As we think about trends in population, we need to be mindful of the fact that absolute growth is only one factor in the implications of population change for wilderness. To illustrate this, let me discuss two examples of how structural changes in the U.S. population might affect wilderness.

Throughout the industrialized western nations, average ages are increasing. In 1980, about 12% of the U.S. population was over 65; by the year 2030, that figure is projected to reach 20%. Median age in the United States has gone from 30 in 1980 to about 35 today and is projected to reach 38 by 2035 (Day 1996).

Structural changes in age are of concern because studies of recreation participation rates have long noted the dampening effects of increased age; that is, participation declines as age increases. Cordell and others (1989), for example, note that the pattern varies with the specific type of activity (some rates increase with age, such as walking for pleasure), but that in general, more physically demanding recreation activities show the sharpest decline. For example, within the age cohort 20-29, about 15% of individuals report participating in backpacking and around 17% report camping in primitive campgrounds; however, the participation rates in these two activities for the age cohort 50-59 decline to 4% and 9%, respectively (Hartmann and Cordell 1989).

If the average age of the American population continues to increase, what effects might such changes have on the use of wilderness and on the importance of such areas? What are some of the research questions such changes raise? First of all, will use actually decline? Historically, recreation use has diminished as age increases, but what happened then might no longer be relevant. The increased interest in, and concern with, health and fitness likely means that the "shelf life" of wilderness users is longer than in the past. A history of socialization into a "wilderness-enhanced" lifestyle might also mean that the patterns of behavior, social connection and lifestyle choices will combine to create more persistent use patterns; that is, participation rates will be more resistant to increased aging than previously observed.

Such questions present wilderness researchers with an interesting opportunity and challenge. For example, longitudinal studies that permit us to track the behavior of wilderness users over extended periods would be especially helpful. Not only would they provide valuable time-series data on use, they would also provide an improved sense of the entire use dynamic. This would include such things as changes in the social group (family, friends) with whom one participates, the effect of factors such as lifestyle or family stage affecting patterns of entry and exit into the activity, patterns in the source of new users and adequate substitutes for former users and so forth.

Another facet of the shifting age structure has, in my judgment, significant relevance for the future of wilderness and its management. I would hypothesize that over the past 35 years (going back to approximately the passage of the Wilderness Act), we have created a generation of individuals deeply entrenched in the politics of wilderness protection. It is a population that includes direct users, such as recreational users, as well as indirect users. These are people who, either through direct use and its attendant effect on them or their continuing political and advocacy actions, remain deeply committed to the wilderness ideal and to its adequate protection. Thus, we have a population whose continued direct recreational use of such areas as they age might be problematic, but who will remain intensely involved in the creation and management of such areas. This means heightened levels of scrutiny of management plans and of proposals for adjacent developments that might

jeopardize key wilderness values, of organizational commitment to wilderness in terms of staff and budgets and of efforts to either add to or delete from the existing system. Moreover, this is a population that often will bring sophisticated capacities and skills to the political arena in which wilderness is managed and protected. It is also a population that possesses "voice," which can be defined as an understanding of political and legal processes as well as an articulate capacity to specify concerns, well-developed social and negotiation skills, etc. (Fortmann and Kusel 1990). They are people who will have major effects and impacts—for good or bad—on future wilderness management.

This phenomenon reinforces earlier comments about the context within which future wilderness management might operate—an environment of increased scrutiny. It represents an important opportunity to capitalize upon, and benefit from, a large body of experiential knowledge held by such individuals and to utilize their commitment and interest to secure the necessary understanding and support to implement effective management programs, not only within wilderness but in adjacent lands, communities and cities as well. This raises some important questions for science to consider: How might this rich experiential knowledge be better integrated with the formal knowledge of science? What are the most effective forums and mechanisms to elicit such knowledge?

However, if we extend our conception of the future beyond the next generation or so, we can envision a very different set of circumstances. To frame this as an hypothesis: Will the present generation, raised in a "virtual-reality" world, have minimal interest in, commitment to and use of wilderness? Will the ever-expanding world of computer games, simulations and interactive capacity replace direct, personal interaction with our environment? As Nash (1982) writes, "the movement for the appreciation and then the preservation of wilderness may have succeeded in accomplishing something posterity will find irrelevant." There is an obvious irony here, because the supporters for wilderness preservation have always noted the importance of maintaining options for the future; what we might find is that future generations exercise that option by either converting the wilderness to other uses or simply letting it decline through neglect.

Nearly 50 years ago, geographer Edward Ullman (1954) published a paper entitled "Amenities as a factor in regional growth," an early exploration of the role of factors other than jobs and economic considerations in people's decisions to move elsewhere. More recently, Gudzitis (1996) has explored this issue specifically with regard to the role of wilderness as a factor affecting migration. Comparing population change from 1960 to the 1990s in counties where classified wilderness was found with those where it was not, he found significant differences; during the 1960s, wilderness counties had population increases three times greater than other nonmetropolitan counties. During the 1970s, they grew at twice the rate, and this increased to a six-fold difference in the 1980s. These trends appear to be continuing as we close out the 1990s.

Gudzitis (1996) also reported that the individuals involved in these movements tended to be young, educated professionals; only about 10% were over 65 years old. Moreover, most were not dissatisfied with their former places of residence; their decisions to move appear motivated not by

flight from urban crime, pollution or congestion, but rather by an attraction to the amenities their new homes offered. Only about one-quarter reported that employment was the reason for their move; almost 50% reported a decline in income.

The role of wilderness as a factor in regional growth is, like many social trends, one characterized by both positive and negative outcomes. The idea that wilderness designation will have an inevitable and adverse impact on local and regional economies is without foundation; the nature and characteristics of such effects warrants increased attention by economists. However, the growth of communities and residential areas proximate to wilderness could also have significant effects on use and conditions within these areas. For example, extensive developments adjacent to wilderness could produce micro-climatic effects within the wilderness, disrupt historical wildlife corridors and critical winter habitat and produce changes in public access and use patterns by altering or closing entry points.

Demographers report that since the turn of the century, the U.S. has experienced two major trends in migration: (1) migration to the Western and Southern states and (2) migration from rural to urban areas. However, a "rural renaissance" emerged in the 1970s, marked by movement from urban to rural areas and the resulting "gentrification" of many rural communities. Then, during the '80s, traditional migration patterns returned; for example, in Interior Columbia River Basin, 41% of the counties reported population declines as people left rural regions for the cities, largely in response to changes in economic conditions (Quigley and Arbelbide 1997). The volatility continued into the 1990s, with yet another reversal, marked by urban to rural movement. Johnson and Beale (1994) reported that nationwide, about 43% of the population growth occurred in nonmetropolitan counties. In the Interior Columbia River Basin, nearly two-thirds of the net population increase between 1990 and 1994 was attributed to migration.

As suggested above, the reasons for such internal movement vary widely and are driven by both positive attributes (or at least what are perceived to be positive—the "grass is greener" syndrome) as well as negative. However, there is a common hypothesis that the economic well-being enjoyed by many people carries with it an increasing capacity to live where one wants to live. This is facilitated by the fact that we have an increasing number of people who have sufficient wealth (including a growing number of retirees whose pensions, transfer payments, etc. provide considerable latitude) or who can utilize the burgeoning technology of communication in ways that permit them to take their jobs with them. For whatever reasons, our population is increasingly characterized by substantial flows and eddies that result in "new" residents (with new interests, knowledge, values, uses and beliefs) and the loss of former residents (who take with them knowledge, concerns, etc.).

As the character and composition of residents living adjacent to wilderness changes, how does this affect the levels of knowledge and understanding, the types of uses or the political commitment such people have to wilderness and its management, and even to the practice of science in such areas? I acknowledge that wilderness management must accommodate a wider range of concerns and interests than those held by people who "live next door," at the same

time, these constituents are important. Moreover, as noted earlier, the change in people may bring important changes in abilities and capacities to act effectively in the legal and political arena.

A specific example will help. There is growing appreciation that human intervention in historical fire regimes has had a dramatic effect on the underlying ecological structure, processes and composition of many wildernesses. Consequently, efforts have been made to restore fire to such regimes have been undertaken. However, as McCool and I have noted (Stankey and McCool 1995), "wilderness and fire join two of the most evocative terms in natural resource management." Concerns of local people about increased air pollution and threats to life and property, as well as the potential threats to wilderness values they deeply treasure, can easily become the center of mobilization efforts designed to resist implementation of fire restoration, either set by nature or humans.

In response to such public resistance, the typical tendency has been to mount yet another "education" program, grounded on a presumption that public opposition derives from a lack of knowledge. The track record here is dismal, in part because we fail to acknowledge the underlying value of the issue. Using fire as an example, questions of credibility, trust and confidence are probably more critical to gaining public understanding and support than adding another decimal point to estimates of flame height or spread rate!

But this example, in many ways, understates the magnitude of the problems that will face wilderness managers and scientists in the future. As our population changes, and especially as it becomes increasingly urbanized, we can only hypothesize about how the values, uses and knowledge regarding wilderness will change. However, we can anticipate that, as a society, we will continue to be confronted with competing demands and social needs—poverty and homelessness, health and medical care for the elderly, education. What will be the effects on political interest and support (a close sibling of the budget allocation process) in wilderness *vis a vis* other social priorities as more and more of our country's population lives in the city?

Two dramatically contrasting hypotheses can be offered. The "out of sight, out of mind" theory hypothesizes that as the geographic and psychological distance grows between people and the land (wilderness), the sense of urgency and importance regarding its protection diminishes. Alternatively, the "absence makes the heart grow fonder" theory hypothesizes that the importance and significance of such places increases in direct proportion to the distance society finds between itself and wilderness. Confirmation of either hypothesis presents significant challenges to managers, scientists and interested citizens alike. To the extent that we find the former process unfolding, we would be challenged to better understand the implications and consequences of the disconnection between people and nature; we would need to identify what strategies, processes and experiences, under what conditions, most effectively operate to re-establish the human-nature connection or what substitutes (if any) might serve to provide the benefits that have been lost. Confirmation of the latter hypothesis would create challenges related to how to accommodate growing use pressures on wilderness and how to promote appropriate, low-impact use. We would need to address the role of the burgeoning information

technology (more about this later) and how it can be most effectively used. Even if public interest in, and commitment to, wilderness remains high, we will face the possibility that changing public conceptions of wilderness and its appropriate use and management might change.

Let me briefly mention another dimension of the changing population that presents both intriguing management/policy and science questions. We are becoming a more racially and ethnically diverse country. Although whites remain the dominant race, their proportion is changing, from 84% in 1995 to an estimated 75% in 2050. Perhaps one of the most dramatic ethnic changes underway involves people of Hispanic origin. In 1995, about 9% of the population was Hispanic origin; by 2050, this percentage is estimated to rise to 25% (Day 1996).

In some regions of the country, these changes will be (or already are) significantly greater. For example, in the American Southwest, people of Hispanic origin already constitute about 25% of the region's population, with Texas reaching one-third, and 37% and 45%, respectively in California and New Mexico.

My purpose in citing this ethnic change is to remind us of the need to be aware of new and different cultural conceptions of wilderness. This is not to suggest that people of other cultures and races are indifferent or uninterested in wilderness. However, at its core, wilderness is a cultural construct, given meaning and importance within a particular cultural context; we need to be cognizant that as culture changes, so too will the use, meaning, value and political priority accorded to it.

In many ways, the changing cultural fabric of the nation already confronts us. The growing urban nature of the nation is as much a cultural shift as it is a demographic change. Our norms, beliefs, values and conceptions about such things as the role of humans *vis a vis* nature, the role of science as a source of knowledge to inform decision-making, and the notion of our moral obligation to future generations are all embedded in a cultural web; when differing cultural conceptions confront one another, the opportunity for misunderstanding and conflict is great. Thus, as we track society's changing racial and ethnic makeup, we can anticipate the emergence of new conceptions and values associated with wilderness, its management and its relative significance compared with other social priorities and programs.

## Technological Trends and Wilderness: Salvation or Iconoclast?

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By this subheading, I wish to convey the idea that trends and changes in technological development will (and do) present an enormous enigma, in terms of their potential effects on wilderness and its management (and, for that matter, on most of our society). As Hughes (1985) notes, "rate of technological change is both largely unmeasurable and very uncertain." If any issue deserves characterization as "Janus-like," technology is it.

The conceptual relation between wilderness and technology is fascinating and complex, and it has attracted attention from scientists as well as philosophers, historians and ethicists. Although there is a conventional sense that wilderness is where technology is not, in reality, there is a close, dependent relationship between the concepts. Indeed, it was the growth of technology that helped create a sense of the need for wilderness, for places where one might escape that technological presence. Prior to the advent of technology, probably dating to the onset of cultivated agriculture and the domestication of animals, there was no "meaningful distinction between man and culture, no dualism" (Nash 1982). However ironic it might appear, technology was, and continues to be, what gives meaning to the concept of wilderness.

Picture, if you will, a vintage wilderness campsite scene: Two or three people are gathered around a small crackling fire, sipping a hot drink, listening to the sounds of the night, the stars shining brightly above. Upon closer inspection, we see the state-of-art North Face tent, Eddie Bauer ultra-light sleeping bags, Sierra Club cup and REI self-contained propane stove. Kelty titanium-frame backpacks lean against a tree. The evening meal of *boeuf Bourguignon*, complete with blanched onions and mushrooms, came from a sealed packet, requiring only water from the stream (but only after being filtered for Giardia through a micro-porous filter). The group is examining printouts downloaded from a Web site about routes and attractions for tomorrow's journey. One of the group checks her GPS unit to confirm their exact location, then dials home on her cell phone to confirm the pick-up time at the trailhead (probably in a Subaru Forester!).

It's a scene that's not hard to imagine, and reaction to it will probably vary, but I suspect many would find it repugnant. But how does this differ from a scene many years ago, when a match was used to start the fire, when a horse and Decker pack saddle helped move gear, when canvas and cast iron were the materials of choice, and when the decisions about where to go tomorrow are based on a USGS map? In both cases, current technology facilitates the use.

Of course, the ambivalence of the society-technology relationship is not peculiar to wilderness. The role—positive or negative—of technology in our future is one wrought with uncertainty. Much of the debate has been characterized by the extremes; on the one hand: the *deus ex machina* view that all current problems are largely insignificant because technology will ultimately provide answers and, on the other side, the view that technology ultimately will doom us. Indeed, it is difficult to find any type of dispassionate, reasoned discussion about technology, a disconcerting situation when it is clear that abandoning or disregarding the role of technology simply is not possible.

Hughes (1985) attributes much of this to the inordinate complexity and uncertainty surrounding the trajectory of future technological change. He notes, "...as difficult as forecasting population growth or energy demand over the next twenty years might be, such forecasts are trivial compared to the difficult task of anticipating technological developments...a major difficulty is our inability to measure or quantify technology in a meaningful way..."

Technology is such a central feature of life today that we have become oblivious to its profound effects on our lives, for good or bad. A fascinating glimpse into this was revealed by

Platt (1969), who compiled a list of changes over the past 100 years. But his list is even more revealing because it is already 30 years old! Even at that time, we had witnessed an increase in data handling speed by a factor of 10,000 and an increase in speed of communications by a factor of 10 million. These changes, as extraordinary as they are, were well before the era of Pentium III chips and microprocessors, high speed modems, satellite communication systems, etc.

At the same time, we have ample evidence of our extraordinary capacity to overstate technological achievement. Three decades ago, Ayres (1969) forecast that vehicles would reach the speed of light by 1982, immortality would be achieved by 2000, and a single individual would control the energy equivalent of the sun by 1981. An apocryphal quote attributed to Charles H. Duell, former commissioner of the U.S. Office of Patents, sums up the limits of our capacity to accurately foresee the future of technology: Arguing for closure of the Patent Office in 1899, he supposedly noted, "Everything that can be invented has been invented!"

The breadth and complexity of technological trends makes them difficult to address in a paper such as this. However, I have chosen to focus on two particular areas of technological development because I believe they hold special import for questions of future management and science in wilderness.

Perhaps the most extraordinary example of technological change that confronts us daily is the burgeoning array of developments related to information technology. This is not called the "Information Age" for nothing; nearly 20 years ago, Naisbitt opened his best selling book *Megatrends* by noting, "This book is about ten major transformations taking place right now in our society. None is more subtle, yet more explosive...than the *megashift* from an industrial to an information society" (Naisbitt 1982, emphasis added). What he was referring to was the phenomenal expansion in the creation and dissemination of knowledge; moreover, it involved far more than simply a lot more numbers and facts. It has fundamentally restructured our economy and our lives. For example, it had been a central role in the "uncoupling" of the historic link between a primary products economy to an industrial economy as well as between industrial production and industrial employment (Drucker 1986). The implications of such "uncoupling" are still unfolding, but as noted earlier, they are at least partially revealed in the growing capacity of people to elect where they live and work, as well as in the decline of historic primary production industries, which have often been in conflict with wilderness preservation efforts.

## The Information Explosion: A Two-Edged Sword?

Let me address a small piece of this phenomenon. The wilderness management and research literature has devoted extensive discussion and attention to the role of information as a potentially powerful management tool. It has been seen as a more desirable alternative than reliance upon rules, regulation and law enforcement. This view derived from a sense that many of the problems confronting wilderness managers, social as well as ecological, stemmed not from purposeful or malicious behavior, but from uninformed or inappropriate use. Moreover, there was a conviction that if people only understood the "right" way to behave,

many problems would disappear. It also derived from a sense that the reason many people came to the wilderness was to escape the normal regimen of the world; the idea of "policing" wilderness visitors simply seemed wrong.

The provision of information, then, has long had appeal as a wilderness management strategy of great potential, one that was both respectful of the experience and effective in preventing or reducing problems. However, the record of experience shows that the use of information has not achieved its hoped-for potential. The relationship of information to visitor behavior is extraordinarily complex; what types of information should be provided, at what point, to whom, in what forms—all are questions that plague this issue. Even more fundamentally, one might question whether improved and/or more accessible information will have *any* effect. Bardwell (1991), for example, argues that it is "people's attention, not information, that is the scarce resource." Continued scientific examination of these issues seems appropriate and potentially valuable.

Newly emerging information technologies provide a challenging opportunity to revisit some of these questions. The capacity, for example, to deliver increasingly complex and site-specific information is very high. Opportunities for learning, either through formal distance-learning models or interactive web sites, could be tested. The relative efficacy of information transmitted through such means, as compared to "traditional" methods (brochures, signs and the like) or direct, on-site efforts could be examined.

These new technologies also mean there is more opportunity to supply real-time information to visitors—for example, about use levels along trails and at campsites, about trail conditions, temporary closures, special management problems, such as nesting time for an endangered species.

However, there is a dark side to the information explosion, about which concern is already developing. Because of the open-access to the Web, there are few, if any, controls on either what kinds of information are provided or its quality or accuracy. A number of years ago, managers of the Bridger Wilderness in Wyoming recounted an article published by *Sunset Magazine* regarding fishing for Golden Trout in the high lakes of the Wilderness. When summer arrived, so did the crowds. What the story had failed to convey, however, was that the trailhead was at 9,000 feet, and the lake was 10 miles from the trailhead. Would-be fishers arrived in cut-offs, t-shirts and flip flops, with no food or water, expecting a full creel by noon. What they often ended up with were headaches, heat exhaustion and blisters, with Forest Service personnel coping with a host of emergency calls, litter and complaints.

It's not hard to visualize a similar scenario, made even more dramatic by the increased capacity to disseminate information through the new technologies. In only a matter of minutes, using the Web to search on "wilderness," I found close to one million hits; joining the term "future" to wilderness doubled that figure! A major challenge confronting managers will concern how to cope with both the scale and speed of information dispersal, with few, if any, opportunities to influence or even comment on its accuracy or appropriateness. The important challenges for research will involve developing improved understanding of the effects of such information dispersal and for strategies and programs that might be utilized to mitigate problems associated with inaccurate and/or inappropriate information.



## Monitoring Ecological and Social Change in Wilderness

When the Wilderness Act passed in 1964, a key feature of that legislation was that its creation of a system of areas in which historic ecological processes would be allowed to operate, to the maximum extent possible, outside human influence; this is the meaning of the idea of “untrammelled.” Implicit was the idea that by understanding the ways in which ecological systems changed over time, we would gain important understanding of the systems dominated by human occupancy and use; wildernesses would provide a baseline against which human-induced changes could be tested and evaluated.

However, our record in capitalizing upon this role for wilderness is not particularly notable. Indeed, if we think about the value of monitoring environmental conditions in general, we find more rhetoric than performance in virtually all sectors. We have had the National Wilderness Preservation System for 30+ years, and I would challenge our ability to say much about how that system has changed, why, where things are headed, and what it all means for either management or further scientific inquiry.

But the burgeoning technological revolution has an important role in helping us improve this in the future. The array of remote sensing technologies, for instance, now provides a capacity to develop site-specific, real-time and ongoing measures of changes, whether induced by direct on-site recreation use, air pollution from distant metropolitan areas or subtle evolutionary shifts. These techniques also provide an opportunity to enhance our understanding of ecological processes, functions and structure in ways that minimize so-called “destructive” sampling.

But again, we need to be mindful of the “Janus-like” character of these developments. Technology will also create new dilemmas as it improves knowledge. For example, the same technology that enables us to better understand ecological changes and environmental impacts on wilderness environments will also enhance abilities to locate new resources and values, which might contradict what is commonly considered appropriate in wilderness. Years ago, at a wilderness conference in New Zealand, a representative of the mining industry told delegates that the reason the industry wanted to repeatedly survey the mineral potential of remote areas was that each time they did a survey, the likelihood of finding something increased! This was because the technologies of discovery and recovery, as well as the markets for those products, constantly were improving. Combined with technological improvements and discoveries of new uses, we have a potent likelihood that wildernesses will be found to hold a range of values and uses, many of which might not be consistent with the areas’ classification.

A response to this might be that “the Wilderness Act will not allow it.” That’s true...now. Let me again remind you that wilderness is as much a political construction as it is an ecological condition. For example, resisting the demands of the mining industry is one thing; what if the discovery entails a cure for cancer, AIDS or Alzheimer’s disease? This would present us with a perplexing moral quandary, because the argument for the preservation of wilderness has often been grounded in the idea that such areas help protect as yet unknown values that might

eventually be required for society. However, if realizing these values requires actions and impacts upon the wilderness inconsistent with our conventional and accepted standards of appropriate wilderness behavior, what then?

Technological developments also have the potential to confuse ends and means. Our capacity to accumulate data has been greatly enhanced by technology; this is both good news and bad news. On the one hand, it has the potential to provide accurate, real-time understanding about changes and trends underway in the wilderness. On the other hand, these data are only numbers on a sheet or screen; they do not constitute information, knowledge or understanding until they are processed and evaluated. The conversion of data to information and knowledge begins with good questions; without questions, we can literally be inundated with massive accumulations of data, collected simply because it is possible to do so. This can reach a state of paralysis, in which people charged with interpretation don’t know where to begin or when to stop.

There is another, perhaps more subtle, yet nonetheless critical dimension to the explosion of information that challenges wilderness management. Throughout the history of the wilderness movement, commentators from Bob Marshall to Roderick Nash, from Joseph Sax to Joseph Wood Krutch, have observed that the first increment in the loss of wilderness comes when the pen touches the map—when the blank space on a map that so motivated Marshall becomes filled in with place names and boundaries. When the notion of wilderness as *terra incognitae* is replaced by full and comprehensive understanding, does wilderness remain? Nash (1982) argues that because “all the blank spaces are being filled in...(T)oday, not 1890, is the real end of the American frontier”. In the Information Era, will wilderness be lost, not because of increasing recreation use and impacted trails and campsites, but by the flood of information about it? When web sites, constantly updated with real time reports, exist for every wilderness and when every user is equipped with a GPS module and cell phone on their belt, will wilderness remain? During my Web search on wilderness, for example, I located one site which asked “What kinds of news do you want information on? ...secret places/hikes...?” (my emphasis; the paradoxical nature of the statement is truly breathtaking!). There are a host of “dot.com” addresses featuring all you ever wanted to know about wilderness: World Wide Wilderness Directory, Wilderness Press, Wilderness Maps, even The School of Wilderness Arts and Technology!

The issue of technology *vis a vis* wilderness will likely represent one of the major future dilemmas with which we must contend. The vast array of specific issues far exceeds the time and space available here for discussion in any detail, but let me note a couple of examples. The potential impacts of genetic engineering, cloning and gene splicing hold profound implications, obviously not only for wilderness but for all of society. How meritorious are the arguments for wilderness preservation to protect future options when we have the capability to preserve those options in the test tube? How will we resolve issues of endangered species protection when we can capture the full genetic makeup of the wolf and grizzly bear in the lab? Or, even more perplexing, what would be the compelling reasons not to maintain populations of a species such as the grizzly bear when we have the genetic capacity to alter the species in such a way

that it does not represent a threat to domestic livestock or backpackers?

It's easy to label such issues as fantasy, much as we did with issues such as space travel, cloning and television not so many years ago. Whether these things eventuate is arguable; what is not, it seems to me, is the formidable ethical challenges with which we shall be confronted.

## Can We? Should We? The Ultimate Challenge

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"Surely one of the messages of the twentieth century to posterity will be that our science and technology persistently outran our ability to govern our expanding capacity to change the world and ourselves" (Lee 1993).

Kai Lee's perceptive, yet troubling observation encapsulates the most formidable challenge before us. As noted earlier, I am neither ethicist nor philosopher, so I am especially pleased that such individuals are a part of this conference. However, as I reflect on the problems, issues and challenges that face the future place and role of wilderness in our society, I am concerned that the matter of *what we can do* will dominate the question of *what we should do*. This should come as no surprise; in a society that prides itself on technological achievement, economic growth and dominance, this is the norm. Our natural resource management organizations take great pride in being depicted as "can do" agencies. Our capacity to resolve the question of whether what we can do should be done is much less well-developed, as well as much less valued.

Caldwell (1990) argues that when we consider both the causes of and solutions to problems related to what he calls "environmental impairment," we have a strong tendency to see these problems (and their solutions) as either incidental in nature (the result of carelessness) and thus solvable through exhortation ("give a hoot, don't pollute") or moral persuasion ("just say no!") or as operational, the result of inefficiencies in process (not enough public meetings), insufficient data or inadequate laws. But there is another whole class of problems, which Caldwell labels systemic; these derive from fundamental flaws in the underlying socio-economic-technologic system. For example, debates about whether it is possible to have a sustainable society under a capitalistic economic system fall into this category.

As noted earlier, solving systemic problems requires systemic solutions, not just fine-tuning our array of operational policies, writing new laws or exhortations to "do better." A central feature of systemic change is that it requires new ways of thinking about the world around us and our relationship and obligation to that world. It requires acknowledgment that many of the profound questions that will confront us (and of which wilderness and its future are only one) are, at their core, moral issues. When my colleagues Roger Clark, Margaret Shannon and I prepared the social assessment to FEMAT, we posited two rhetorical questions: Why should we be concerned with the preservation of endangered species, such as the northern spotted owl? And why should we worry about the fate of the region's rural communities? We responded that these questions are fundamentally moral in character. Yet the actual response to such questions was largely done in operational terms—that is, they were treated

as scientific questions—with millions of dollars spent, thousands of hours invested, and something on the order of 1,500 pages written.

I would argue that, in part, the FEMAT response, grounded in a scientific paradigm, was a failure of problem-framing. But it also reflects, in my judgment, either the paucity of our ethical frameworks for coping with such issues and/or the impermeability of our institutions, organizations, disciplines and our general mindset to new ways of thinking and acting.

This is not to say that powerful new ways of thinking about human-nature relationships are not available. Whatever criticisms one might level at our conceptions of the ethical relationship between society and nature need to be tempered by a realization of how much those conceptions have changed over the past century (for example, Nash 1989). Society's ethical stance toward nature is an evolving position; the more challenging issues concern its pace and the extent to which it becomes part of the cultural norm, rather than the exception.

Examples of emerging alternative ethical frameworks include the idea of extending legal rights and standing to objects of nature (Stone 1972), the work of Naess (1973) and Devall and Sessions (1984) on the concept of deep ecology, the growing impact of work on ecofeminism (for example, Warren 1994), the new insights offered by scholars examining ecological economics (such as Costanza and Daly 1992) and critiques of the dominant Western worldview of the relationship between humans and the wilderness, especially the notion of a dualism in which civilization is distinct from the wilderness (Gomez-Pompa and Kaus 1992). More generally, the work of Riley Dunlap and Kent Van Liere (1978) in fostering the New Environmental Paradigm (NEP) is also applicable to this topic.

There have also been indications of growing concern about the relationship between humans and nature among organized religions. Contrary to the view that our Judeo-Christian origins are largely responsible for our domination and subjugation of nature (White 1967), some scholars argue that there has long been a tradition of concern for stewardship (Bratton 1986). For example, *The Oregonian*, the Portland, Oregon newspaper, recently reported that the Roman Catholic bishops of the Pacific Northwest and British Columbia have drafted a "reflection" as an attempt to inject a greater role for religion and morality into discussions over the future of the Columbia River drainage basin. In the draft, they argue that the well-being of salmon is not only a sign of ecological health of the river, but also of the "spiritual vitality" of the watershed (O'Keefe 1999). The story notes the growing debate within formal religious circles over the need for enhanced stewardship of the environment. For example, in 1997, the leader of the Orthodox Christians declared degradation of the natural world a "sin." There are also the recent efforts of environmentally conscious congregations to link together, including creation of The National Religious Partnership for the Environment and the Evangelical Environmental Network.

However, the extent to which these evolving ethical frameworks will influence the dominant social paradigm (DSP) remains problematic. I believe that the issue of the ethical/moral framework within which we think about, and from which our actions derive, regarding nature in general and wilderness in particular will be the most critical factor

influencing the future of wilderness. However, I see little evidence that of any major breakthrough on the immediate horizon. In the short-term, I see the debate over wilderness—its management and use—played out largely in the political arena (an area, incidentally, in which wilderness advocates have proven exceedingly skilled). It might very well be that innovative ethical frameworks will follow the successes achieved in the political arena, rather than the other way around. In my conclusions, I turn to some summary comments on the nature of actions that I see as critical to sustaining society's commitment to wilderness preservation.

## Conclusions

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The breadth of the assignment which I've been assigned is truly breathtaking. I can only hope that my brief remarks have in some way provided a sense both of the nature of the social and technological trends underway around the world and in the United States, and their potential implications for wilderness and science. However, I believe it is important to draw together some concluding remarks on what I see as necessary courses of action.

First, although I have noted that there are clear signs that world population growth is beginning to slow, population growth will remain a crucial concern, both in general terms and specifically affecting wilderness. Under the most conservative growth projections, we face a doubling of the world population over the next 200 years. And whether we see a continuing disparity between rich and poor or a general rise in well-being for everyone, the likely sum effect will be an increasing level of demand on, and consumption of, environmental goods and services. Rees' (1996) concern with the "ecological footprint" of society reminds us that the "good life," which almost all of us enjoy, carries a substantial price tag that is largely subsidized, as well as ignored. As population burgeons, demands on the world's land base will similarly grow, and the competition for resources will intensify. The capacity to maintain, let alone expand, wilderness under such conditions will be increasingly problematic.

A conventional response to concerns with population growth is to argue that technological change will not only keep pace, but will make it possible to continue to grow and prosper—to have our cake and eat it too. As my earlier discussion about the role of technology acknowledged, the future of technological change and its impact on society is extraordinarily difficult to estimate. There is little question that technology has achieved marvelous breakthroughs and that the capacity of human ingenuity, imagination and creativity has taken us beyond our wildest dreams. The question is, will those dreams turn to nightmares?

There are disquieting signs of trouble. In the United States, per capita energy consumption has increased nearly 20-fold in the last 200 years. Global consumption of net production of terrestrial photosynthesis now exceeds 40%; global fisheries yields have fallen since 1989 (Rees 1996). All of these indicators reflect population growth and, even more importantly, rising levels of living. Thus, an expanding world population, coupled with rising aspirations, has a clear potential for substantially increasing environmental impact. Despite our technological prowess, there are growing concerns that these achievements cannot be sustained

indefinitely. "Technology," Ayres (1979,) wrote, "everyone's favorite *deus ex machina*, cannot continue to multiply the proverbial loaves and fishes without limit."

What to do? Clearly, there are no simple answers. The right to bear children is deeply ingrained in religious dogma, in governmental policies and in fundamental beliefs in the rights of free people. Ironically, technology represents one "solution," the improved technology of birth control has had important beneficial effects in reducing birth rates. But just as ironically, technological achievements in increasing life spans often have offset the gains in reduced birth rates. Governmental intervention through draconian means seems unacceptable to many, yet our failure to reform other sectors—economic, religious—might eventually make such steps difficult to avoid.

Second, I see an important need for the creation of innovative institutional structures and processes for the future management of wilderness. Let me quickly point out that this does not include the idea of some kind of "National Wilderness Service." In my judgment, this would only exacerbate the current functional, nonintegrative nature of resource management, and it would do little for either the interests of wilderness or its supporters.

The topic of institutions seems dry and arcane. However, if one defines institutions to include the array of formal and informal norms, rules, processes and structures that govern our thinking and behavior, it is clear that institutions are key (Cortner and others 1996). It's been interesting to note that in the literature dealing with the issue of ecosystem management, a central conclusion is that, whatever the idea of ecosystem management means, it will be *institutional constraints* that most seriously challenge its implementation. I see interesting parallels to wilderness.

For example, I envision a growing role for more locally grounded structures, akin to the "Friends of..." movement common in many national parks. Such organizations not have only the capacity to serve a fund-raising function, but perhaps more importantly, they represent a venue in which local knowledge, expertise, skills and energy could be mobilized to deal with problems confronting wilderness managers. This goes well beyond trail maintenance and litter cleanup; it could involve participating in decisionmaking processes, collecting and analyzing data, monitoring, etc. Wondolleck (1988), for example, has argued about the importance of the concept of "joint fact-finding" as a mechanism to build trust and confidence between forest managers and citizens; similar processes could be initiated in wilderness.

I can anticipate criticisms of such a move. For example, the Federal Advisory Committee Act (FACA) has had a dampening effect on efforts to involve citizens in a more direct fashion in resource decision-making. Although the basis for the act was legitimate concern about the undue influence of interest groups, it is also clear that it tends to run counter to growing interest in implementing a social learning model of decision-making. But laws are changed all the time, and what seems important now is to begin building the compelling arguments for reforming this legislation.

Another concern is that a heightened role for citizens in the land management process will somehow challenge the authority and credibility of land managers. Frankly, given the current state of acrimony and contentiousness, it's hard to imagine how things could be any worse. As noted earlier,

the diminishing levels of trust and credibility have reached epidemic proportions, and it seems time to consider significant reform in our management processes. Some of these concerns, and the need to respond to them, are foreshadowed in the recommendations of the Committee of Scientists report (1999).

The “upside” of increased participation, it seems to me, is that it provides a venue through which a highly committed group of citizens can lend their various talents to the challenges confronting wilderness management. Yankelovich (1991) argues that the key ingredient currently lacking in much of the American political structure is a forum for *working through*—venues where contentious and complex public policy issues can be debated, alternatives considered and consequences and implications weighed. Too often, the venues purported to serve such functions actually facilitate antithetical qualities: They promote adversarial stances and self-interest and do little to inform or to promote learning.

Another key role such forums will play is to help in the process of problem-framing. Earlier, in the discussion of technological change, I noted the importance of asking good questions. Sound processes for problem-framing are the first step to effective problem-solving; “problem definition is critical to the subsequent organization of one’s understanding of and approach to that problem” (Bardwell 1991). Questions guide analysis. If the set of questions is incomplete or misdirected, there is little chance the resulting analysis will provide useful insight and understanding. Who gets to participate in framing questions is probably as important as the kinds of expertise they hold; if the problem-formulation stage is restricted to the expert, it is likely to fail. New approaches (forums)—grounded on the principles of inclusion, full disclosure, honesty, respect and openness—are critical to facilitate informed problem-framing, as well as effective problem-solving.

Third, it is essential that we not forget the interconnected nature of wilderness—the larger biophysical and socioeconomic fabric of which it is an inextricable part. Although it might be easy to acknowledge this, I see it as key to the future (or lack thereof) of wilderness. I am convinced that the future of wilderness depends largely on what happens outside its boundaries. The extent and quality of wilderness in the United States, for example, will eventually prove to be directly related to the quality of our decisions about our youth, about our cities, about our educational systems, about our farms. The competition for scarce financial resources and for *informed* political attention (even scarcer) means that the values of wilderness to society—recreational, spiritual, economic, scientific—will need to be communicated and linked to the wider sociopolitical system. I frankly acknowledge that this is an anthropocentrically grounded perspective, but in the foreseeable future, I foresee little success associated with the various “intrinsic” rights arguments.

More specifically, with regard to wilderness as a place, I think we need positive, serious attention and commitment to the creation, protection and management of a spectrum of wildland settings. No less of an authority than Henry David Thoreau said it best: “in Wildness is Preservation of the world” (cited in Nash, 1982). Not “wilderness,” but “wildness.” Yet, everyday, purposefully or incidentally, wildness is lost. As I write this, I am sitting and looking over the

freshwater marsh that separates our house from the Pacific Ocean along the Oregon coast. Although I’ve lived here for over a year, I can still spend hours staring out the window at the marsh, watching the seasonal and diurnal changes that move across it. Yet, like the magnificent agricultural and rural landscape in the Willamette Valley 50 miles east, each year more of these lands disappear. Everyone has their own version of this scenario. And with each lost acre, I fear, the connections are further eroded between society and wild nature. How long, I wonder, can this go on before our ability and our willingness to sustain the wildest portions of this spectrum—wilderness—languishes and dies?

As Moir and Mowrer (1993) argue, we need landscapes that are diversified in “shades of gray along spatial and temporal gradients rather than as a mosaic of black and white ecosystems.” By that, they mean the active and positive provision of an array of places between wilderness and those landscapes devoted to development and utilization. In a recent article in *The Seattle Times* (1998), William Meadows, president of the Wilderness Society, argued that many of the values associated with wilderness—solitude, clean water, abundant fish and wildlife, beauty—can also be found in our own backyards, and he called for creation of a nationwide network of wildlands, such as Seattle’s Mountains-to-Sound Greenway. If our maps become divided into only two colors or categories—wilderness on the one hand, urbanization and development on the other—the loss of values, in whatever terms one might choose, will be incalculable. Moreover, it will be an inexorable step on the way to the eventual loss of our wilderness.

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# Contemporary Criticisms of the Received Wilderness Idea

J. Baird Callicott

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**Abstract**—Names are important. The *name* “wilderness” is fraught with historical baggage obfuscating the most important role of wilderness *areas* for contemporary conservation. The received wilderness idea has been and remains a tool of androcentrism, racism, colonialism, and genocide. It privileges virile and primitive recreation, because the main reason wild lands were originally preserved is for such utilitarian purposes. The wilderness idea is associated with outmoded equilibrium ecology and ignores the ecological impact of at least eleven thousand years of human inhabitation of the Americas and Australia. Finally, the wilderness idea perpetuates a pre-Darwinian separation of “man” from nature. The alternative concept of “biodiversity reserve” more clearly expresses the most important role of so-called wilderness areas for contemporary conservation: habitat for nonhuman species that do not coexist well with *Homo sapiens*.

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In one of the most ancient and venerable sources of Chinese philosophy, the *Analec*s, his disciple asks Confucius what he would do first were he to become the prime minister of the State of Wei. Without question, Confucius replies, first I would rectify names (Hall and Ames 1987). His disciple was puzzled by this saying; and for a long time so was I. No more, for here my project is precisely to rectify one domain of names—the wild domain.

The answer to Juliet’s question, “What’s in a name?” in Shakespeare’s play, is “Really, quite a lot.” Consider, by way of analogy, a different domain of names: various names for women—chicks, babes, broads, ladies. The feminist movement has made us keenly aware that what we call someone or something—what we name him, her or it—is important. A name frames, colors and makes someone or something available for certain kinds of uses...or abuses. The feminist project in the domain of names for women also makes us keenly aware that someone who criticizes a name is not necessarily critical of what the name refers to. Indeed, often quite the contrary. Women themselves have, of course, taken the lead in purging polite and respectful discourse of such names as “chicks,” “babes” and “broads.” Even the name “lady” is freighted with so much baggage that it is not worn comfortably by many women.

Just as the women who criticize some of the names they are called do not intend to criticize themselves or other women, I want to note here at the outset, in the most direct and emphatic way I can, that I am not here criticizing the

places we call “wilderness.” Quite the contrary. Rather, I criticize a *name*, a concept, the *received* wilderness idea. I am as passionately solicitous of the places called wilderness as any of the defenders of the classic wilderness idea. However, in my opinion, the name “wilderness” improperly colors them, frames them and makes them available for inappropriate uses and abuses.

As Michael Nelson and I brashly write in the introduction to our recently published anthology, *The Great New Wilderness Debate*, the wilderness idea is “alleged to be ethnocentric, androcentric, phallogocentric, unscientific, unphilosophic, impolitic, outmoded, even genocidal” (Callicott and Nelson 1998). I hasten to say that *we* are not necessarily the ones who allege that the received wilderness idea is *all* these bad things, just that such things have been alleged—some of them by him or me, some by other writers included in the book. Here, I take up each of these indictments, try to explain why they have been filed and expose the evidence on which they are based.

But first, what is meant by the “received” or “classic” or “traditional” wilderness idea? The idea of wilderness we have inherited—received—from its framers, going back now at least several centuries, but shaped most fully during the first half of the 20th century. The *received* wilderness idea is eloquently conveyed in the definition of “wilderness” in the oft-quoted Wilderness Act of 1964: “A wilderness, in contrast to those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain” (Public Law 88-577).

First, the received wilderness idea is ethnocentric. My friend and fellow environmental philosopher, Holmes Rolston, III—a staunch defender of the classic wilderness idea—told me awhile back that when he was lecturing in Japan, his translators could come up with no Japanese word for the English word “wilderness.” Recently, I asked another friend, Roger T. Ames, who translates and interprets Chinese philosophy, if there is a word for wilderness in Chinese. There is for wild man, he said, and wild woods, but no word for wilderness. Even for most Europeans, wilderness is a foreign concept. The notable exceptions are the Norwegians and other Scandinavians, who, significantly, have an arctic frontier inhabited by indigenous peoples, formerly called Laps and now Sami.

The wilderness idea is most familiar in American and Australian discourse. The United States and Australia have colonial histories, both beginning as English colonies. As opposed to the French, Spanish and Portuguese, who seem to have been more interested in extracting and appropriating resources and leaving behind their genes, the English colonial enterprise was focused on land to live on and to make over into a landscape like the one they left behind. The

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English colonists called the new lands of North America and Australia “wilderness,” an idea originally taken from the English translation of the Bible—about which more below. This designation enabled them to see the American and Australian continents as essentially empty of human beings, and thus available for immediate occupancy. The Australian bureaucratic term for wilderness, *terra nullius*, a Latin phrase meaning “empty land,” says it all quite explicitly (Bayet 1998). So does the U.S. Wilderness Act of 1964, “an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation” (Public Law 88-577, emphasis added).

The Australian and American continents were not, however, empty lands when “discovered” by Europeans and settled by English colonists. Until recently, the voices of American Indians and Australian Aborigines were either ignored or silenced (Plumwood 1998). In the third edition of *Wilderness and the American Mind*, Roderick Nash (1982) belatedly noted that American Indians disputed the idea that European colonists found North America in a “wilderness condition,” and quoted Luther Standing Bear to that effect. Nelson and I could find no earlier American Indian protest against the wilderness idea, so we republished the chapter of Standing Bear’s 1933 book, *Land of the Spotted Eagle*, in which it occurs. As many readers of Nash’s preface to the third edition will recall, Standing Bear (1998: 201) said,

We did not think of the great open plains, the beautiful rolling hills, and winding streams with tangled growth, as “wild.” Only to the white man was nature a “wilderness” and only to him was the land “infested” with “wild” animals and “savage” people. To us it was tame. Earth was bountiful and we were surrounded with the blessings of the Great Mystery. Not until the hairy man from the east came and with brutal frenzy heaped injustices upon us and the families we loved was it “wild” for us. When the very animals of the forest began fleeing from his approach, then it was that for us the “Wild West” began.

This is as clear a piece of evidence as one could want to show that the wilderness idea is ethnocentric; it was an idea not entertained by a representative member of and spokesperson for a non-European ethnic group. Shakespeare’s Juliet goes on to say “a rose by any other name is still a rose.” Yes. And in almost every language, there are different but mutually translatable names for common plants, such as roses, and animals, such as rabbits, and all the other general features—rivers, mountains, valleys—of the landscape. But not every language has a name for wilderness—not Lakota, not Japanese, not Chinese, not Dutch, probably not most. Unlike the names “mountain” or “river,” which are just the English labels for actual topological features of the landscape, the name wilderness *socially constructs*, as we now say, the landscape, in a way not shared by all social groups. It is therefore an ethnocentric idea.

Note that I am here making a more limited claim than that recently ridiculed by Gary Snyder (1996)—“the idea of Nature as being a ‘social construction.’” Because “liberal critical theorists,” according to Snyder “. . . are still under the illusion that it isn’t seriously *there*, they indulge themselves in this moral and political shallowness.” While other philosophers, East and West, past and present, have doubted the

robust reality of the whole of *nature*—mountains and rivers, plants and animals, sun and moon, stars and planets—I do not. In my opinion, nature and all its components and processes are incontestably real, “there” as Snyder would have it. But to call certain areas of the natural world “wilderness”—just as to call certain aspects of nature “natural resources”—is to put a spin on them; it is to socially construct them, not as objective, autonomous nature, but nature in relationship to us human beings. The name “natural resources” socially constructs nature as a self-renewing larder existing for our consumption; “wilderness” socially constructs it in a variety of ways, many of which are the subject of this discussion. Most feminists believe that women too are seriously *there*, but to call them “babes” or “ladies” is to put a spin on them, it is to socially construct them in relationship to men, not neutrally as autonomous female persons. The name “babes” socially constructs women as sexual objects; “ladies” socially constructs women as paragons of virtue standing on a pedestal.

The quote from Standing Bear provides a transition to the ugliest allegation against the wilderness idea—that it is genocidal. More precisely, it was and is a *tool* of genocide. Suppose you come to a place already inhabited by people and declare it to be a wilderness, that is, “an area...where man...is a visitor who does not remain,” an area that is devoid of “human habitation,” to quote once more the essential characteristic of wilderness in the Wilderness Act of 1964. Then you have “erased,” as Australian environmental philosopher Val Plumwood (1998) puts it, the indigenous inhabitants from the landscape as you and your group socially construct it. If you don’t acknowledge their existence in the first place, it makes it easier to dispossess and delete them.

There is another way of defining wilderness, which is not in contrast to man and his works, but in contrast to a certain kind of man and certain kinds of his works—to civilized man and to the works of civilization (Duerr 1985). By that definition, a wilderness may be inhabited by wild people without invalidating its wilderness condition. Which means, in effect, that the noncivilized *Homo sapiens* living in the wilderness are just another form of wildlife. So it is of as little moral consequence to hunt them as it is to hunt other kinds of wildlife. We know that in North America, indigenous peoples were often regarded as “vermin” to be shot on sight, man, woman or child—as indicated in the infamous frontier phrase, “the only good Indian is a dead Indian”—while in Australia, Aborigines were actually hunted for sport (Berkhofer 1978; Whitelock 1985).

But that was then, and this is now. In Central America—Guatemala most notoriously—genocidal campaigns against indigenous peoples have been conducted right into the 1990s, although not under cover of the wilderness idea (Broder 1999). In Africa and India, however, wilderness areas have been created, quite recently, by clearing out inconvenient human inhabitants. A quarter century ago, Colin Turnbull (1972) shocked the world with an account of an African tribe called the Ik who seemed to have lost their humanity, living sullenly in their huts, with only minimum human contact and turning their children out at three years of age to fend for themselves. What had happened to these people to turn them into a travesty of humanity? They were victims of the wilderness idea. They had the misfortune to live in the

Kidepo Valley, where, a decade earlier, the dictator of Uganda, Milton “Apollo” Abote, decided to establish an American-style national park in which “man himself is a visitor who does not remain” (Harmon 1998) Thus, he couldn’t have the Ik remaining there, where they had happily, successfully, sustainably and humanly lived as gatherer-hunters from time immemorial. The Ik seem literally to have abandoned their humanity, in their abject despair over having been evicted from their homeland and forced to live in sedentary villages. A similar fate, though with less dramatic human consequences, befell the Juwasi San, among the famous Kalahri bushmen, when Etosha National Park was created in Namibia (Thomas 1990). These are not isolated cases. They only loom large because they were publicized in popular media, such as trade books, magazines, and film. All over Africa, according to Raymond Bonner (1993), similar cases abound.

The most bitter critique of the wilderness idea in our anthology was written by Ramachandra Guha, who documents several Indian examples of ethnic cleansing in recently declared “wilderness areas.” Here is his characterization of one case.

The Nagarhole National Park in Southern Karnataka has an estimated forty tigers . . . [and] is also home to about 6,000 tribals, who have been in the area longer than anyone can remember, perhaps as long as the tigers themselves. The state forest department wants the tribals out, claiming they destroy the forest and kill wild game. The tribals answer that their demands are modest, consisting in the main of fuel wood, fruit, honey, and the odd quail or partridge. They do not own guns, although coffee planters on the edge of the forest do. . . . [T]hey ask the officials, if the forest is only for tigers, why have you invited India’s biggest hotel chain to build a hotel inside it while you plan to throw us out? . . . [T]he Nagarhole case is not atypical. All over India, the management of parks has sharply pitted the interests of poor tribals who have traditionally lived in them [so far, apparently, without destroying them] against wilderness lovers and urban pleasure seekers who wish to keep parks “free of human interference”—that is, free of *other* humans. These conflicts are being played out in the Rajaji sanctuary in Uttar Pradesh, in Simlipal, in Orissa, in Kanha in Madhya Pradesh, and in Melghat in Maharashtra (Guha 1998).

I now take up the allegation that the wilderness idea is politically suspect. As mention of these African and Indian cases demonstrates—along with a thousand other things, from Coca Cola, Kentucky Fried Chicken, and Marlboro, to Bay Watch, blue jeans, and Michael Jordan—the influence of American culture is global. The politics of wilderness preservation in the rest of the world, however, is not what it is in the United States. In the U.S., a beleaguered minority of mostly liberal and progressive people heroically battle the industry-funded Wise Use Movement, congressional delegations of Alaska, Idaho, and Utah, and a variety of ideologically driven right-wing, private-property zealots on behalf of some roadless fragments of backcountry with a precious modicum of remaining ecological integrity. In many other parts of the world, the politics of wilderness preservation are not so unambiguously respectable. There, preservationists often find themselves bed-fellowed with wealthy urban elites, state-sponsored paramilitary terrorists and undemocratic regimes against remnant populations of Fourth World peoples—tribals as Guha calls them—living by traditional

modes of subsistence in scattered pockets of Third World nation states.

Take the androcentric and phallogocentric charges against the received wilderness idea next. “Androcentric” means male-centered. I’m not sure what “phallogocentric” means. Evidently, it is a feminist neologism combining *phallus* with *logos* and adding the suffix “centric.” The bottom line here is that the wilderness idea is macho.

I am not sure if it still is, but it certainly once was. One hundred years ago, Theodore Roosevelt was advocating wilderness preservation for reasons based on historian Frederick Jackson Turner’s then new and convincing “frontier thesis.” After generations of contact with the wild frontier, the transplanted Northwestern European had become a new kind of human being on the face of the earth, an American. Or so it was thought. However, by the end of the 19th century—with the construction of the transcontinental railroad, the slaughter of the bison, and the final solution of the wild Indian problem—the frontier closed. To conserve the American character, Roosevelt advocated conserving simulacra of the frontier, to which future Americans could repair for rugged, character-shaping adventure. One might call this the “American-character” rationale for wilderness preservation.

By the way, we forgot to mention in the introduction to the anthology that, ancillary to the American-character rationale, the wilderness idea is liable to the allegation of racism, not to be confused with ethnocentrism. Aldo Leopold (1998, emphasis added), early in his career a warm supporter of the American-character rationale for wilderness preservation, expresses the racist undercurrent in this argument with his characteristic flair for elegant succinctness: “For three centuries [wilderness] has determined the character of our development; it may in fact be said that coupled with the character of our *racial* stocks, it is the very stuff America is made of. Shall we now exterminate this thing that made us Americans?” Leopold (1998) defined the distinctive American character as follows: “a certain vigorous individualism combined with the ability to organize, a certain intellectual curiosity bent to practical ends, a lack of subservience to stiff social forms, and an intolerance of drones.” Leopold (1991), incidentally, was fully aware that designated wilderness areas provide only illusions—simulacra—of the bygone frontier:

[T]he loss of adventure into the unknown . . . causes the hundreds of thousands to sally forth each year upon little expeditions, afoot, by pack train, or by canoe, into the odd bits of wilderness which commerce and “development” have regretfully and temporarily left us here and there. Modest adventurers to be sure, compared with Hanno, or Lewis and Clark. But so is the sportsman with his setter dog in pursuit of partridges, a modest adventurer compared with his neolithic ancestor in single combat with the Auroch bull. The point is that along with the necessity for expression of racial instincts there happily goes that capacity for illusion which enables little boys to fish happily in washtubs. That capacity is a precious thing, if not overworked.

But, getting back to androcentrism, according to Roosevelt, the distinctive American character was decidedly machismo: “wilderness promoted ‘that vigorous manliness for the lack of which in a nation as in an individual, the possession of no other qualities can atone,’” while its absence risked a future



breed of American “who has lost the great fighting masterful virtues” (Nash 1982).

The androcentrist aspect of the wilderness idea is also prominent in the work of two wilderness-movement giants in the first half of the 20th century, Robert Marshall and Sigurd Olson. First, according to Marshall (1998),

Some men become so choked by the monotony of their lives that they are readily amenable to the suggestion of lurid diversion. Especially in battle, they imagine, will be found the glorious romance of futile dreams. William James has said that “militarism is the great preserver of ideals of hardihood, and human life with no use for hardihood would be contemptible.” The problem, as he points out, is to find a “moral equivalent of war.”...This equivalent may be realized if we make available to every one the harmless excitement of the wilderness.

The androcentric brassiness of Olson’s prose, like Marshall’s written in the 1930s, is a little shocking in the 1990s. His essay, “Why Wilderness?” opens with the following sentence: “In some men, the need of unbroken country, primitive conditions and intimate contact with the earth is a deeply rooted cancer gnawing forever at the illusion of contentment with things as they are” (Olson 1998). And it continues through to the end in the same vein:

I have seen them come to the “jumping off places” of the North, these men whereof I speak. I have seen the hunger in their eyes, the torturing hunger for action, distance and solitude, and a chance to live as they will. I know these men and the craving that is theirs; I know also that in the world today there are only two types of experience which can put their minds at peace, the way of wilderness and the way of war...The idea of wilderness enjoyment is not new. Through our literature we find abundant reference to it, but seldom of the virile, masculine type of experience men need today (Olson 1998).

In the first third of the 20th century, the dominant argument for wilderness preservation was recreation of a primitive and unconfined sort. Now, ironically, wilderness recreation has become one of the most gadget-laden and rule-bound forms of sport available—what with the freeze-dried food, Swiss Army knives, nylon tents, permits, designated camp sites, open-flame restrictions, packing-out-your-garbage-and-feces requirements and all. But back then, wilderness recreation was imagined to be the crudest and freest form available, suitable for the men about whom Olson waxes poetic. They take off their clothes, “laugh as they haven’t laughed in years and bellow old songs in the teeth of a gale. . . . I can honestly say, that I have heard more laughter in a week out there than in any month in town. Men laugh and sing as naturally as breathing once the strain is gone” (Olson 1998).

After Roosevelt, so entangled with the notion of an unconstrained, virile, masculine type of recreation was the wilderness idea that in the 1920s Leopold routinely characterized the minimum size of an area to qualify for wilderness designation in terms of such recreation—“big enough to absorb a two weeks pack trip.” And by “pack trip,” he didn’t mean back pack; he referred to a donkey train.

Next, the wilderness idea is unscientific. One scientific problem with the wilderness idea has already been indicated in connection with the ethnocentric allegation. The fact is, there were people here in the Americas before Columbus’s

landfall in the late 15th century and in Australia before the European discovery of that continent by James Cook in the mid-18th century. That not only renders the received wilderness idea ethically and politically problematic, it also creates an ecological conundrum for “wilderness science” based on that idea. When the existence of such peoples was acknowledged at all by the framers of the wilderness idea, their ecological impact was minimized. Read Marshall (1998) on the matter:

When Columbus effected his immortal debarkation, he touched upon a wilderness which embraced virtually a hemisphere. The philosophy that progress is proportional to the amount of alteration imposed upon nature never seemed to have occurred to the Indians. Even such tribes as the Incas, the Aztecs, and Pueblos made few changes in the environment in which they were born. “The land and all that it bore they treated with consideration; not attempting to improve it, they never desecrated it.” Consequently, over billions of acres the aboriginal wanderers still spun out their peripatetic careers, the wild animals still browsed unmolested in the meadows and the forests still grew and moldered and grew again precisely as they had done for undeterminable centuries. It was not until the settlement of Jamestown in 1607 that there appeared the germ for that unabated disruption of natural conditions which has characterized all subsequent American history.

But the ecological impact of American Indians, over the 13,000 years or more since America was originally discovered, and of Australian Aborigines, over the 40,000 years or more since Australia was originally discovered has probably far exceeded the ecological impact of the rediscovery and resettlement of those continents by European peoples (Denevan 1998; Pyne 1997). For starters, there is a disturbing coincidence, and very probably a causal connection, between the extinction of some 30 genera of megafauna in the Americas and the arrival of Siberian big game hunters, the infamous clovis spearmen (Martin 1973). Paul S. Martin (1984) traces the same coincidence of a spreading wave of *Homo sapiens* out of Africa and a wave of megafaunal extinctions all over the planet.

After the ecological spasm that followed initial invasion of the Western Hemisphere, *Homo sapiens* became naturalized in the Nearctic and Neotropics. The species became an ecological keystone, structuring biotic communities by horticulture, irrigation, cultural fire and unremitting predation on grazers and browsers (Doolittle 1992; Kay 1994; Kretch 1999; Pyne 1987). Therefore, the classic wilderness idea as defined by the Wilderness Act of 1964, serves only to befuddle the science of wilderness management. The goal of wilderness management in the United States—to preserve “the condition that prevailed when the area was first visited by the white man”—was set by the enormously influential Leopold Report in 1963 (Leopold and others 1998). But that condition was heavily influenced by the Native Americans; it was not a condition “affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable” as specified in the Wilderness Act of 1964. Knowing what we now know about the ecological impact of indigenous peoples in the Americas, preserving these “vignettes of primitive America” requires a continuous trammeling of the kind historically imposed by their original human inhabitants on areas designated as wilderness, “where the earth and its community of life are untrammelled by man, where

man himself is a visitor who does not remain.” You see how confusing this is.

Adding to the confusion and paradox is the post-contact demographic history of the Western Hemisphere. Today’s demographers estimate the 15th-century New World human population to be ten times greater than demographers estimated it to be in Marshall’s day, the 1930s (Denevan 1998). Earlier estimates did not take account of Old World diseases that reduced the pre-Columbian population of the Western Hemisphere by up to ninety percent. In 1750—the halfway point between Columbus’s “immortal debarkation” and the present—subtracting all the Indians that died, and adding all the Europeans and Africans that immigrated and multiplied, the human population of the Western Hemisphere was thirty percent *less* than in it was 1492, according to William Denevan (1998). Old World diseases stalked the New World, transmitted from Indian to Indian, well in advance of the leading edge of European conquest and settlement. Thus, the condition that prevailed in areas of the North American west—where most designated wilderness is located—when first visited by the white man was one of rapid ecological transition. Denevan (1998) refers to it tentatively as in a process of “recovery.” In any case, between 1492 and 1750, the keystone species that had for centuries, if not millennia, structured the biotic communities of the New World was reduced by epidemic disease and warfare with the white (and black) invaders from the Old World. Thus, whatever we call it, the biotic communities in the Western Hemisphere were headed toward new ecological domains of attraction. So here’s a nice scientific mind bender. The upshot of Denevan’s thesis is this: When the white man first visited the interior of North America, he did, after all, find a wilderness condition as defined by the Wilderness Act of 1964—“an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain”—but it was an *artificial* wilderness condition, an anthropogenic ecological effect, created by the depopulation of the country following the devastating demographic consequences of contact.

As the quotation from Marshall shows, the received wilderness idea is entangled with another unscientific assumption, the now discredited balance-of-nature paradigm in ecology. Stripped of its fancy language, this is the picture Marshall paints: The Western Hemisphere was virgin territory when discovered and then raped by the white man. Well, maybe there were some Indians here, but there were not very many of them, and they were so technologically backward and environmentally ethical that they either couldn’t or wouldn’t change the Nature of which they were a part. Thus—and here’s the new point—for centuries, if not millennia, Nature remained in a dynamic equilibrium. In his own words, again, Marshall believed that “the wild animals still browsed unmolested in the meadows and the forests still grew and moldered and grew again precisely as they had done for undeterminable centuries.” In the absence of a robust human presence in the Western Hemisphere, Nature remained in a steady state.

By now, however, we have all read and absorbed the work of Margaret Davis (1969) and other palynologists who paint a very different picture of the constantly shifting ecological mosaic of North America over time. By now, we have all

read and absorbed the work of Pickett and White (1985) and other landscape ecologists who emphasize the normalcy, not the abnormalcy, of ecological disturbance, whether anthropogenic or nonanthropogenic. Daniel Botkin (1991) has popularized the new “shifting paradigm” in ecology in his well-read book, *Discordant Harmonies*.

Now, next to last, I discuss the allegation that the received wilderness idea is unphilosophic. As Nash (1982) points out in his classic *Wilderness and the American Mind*, the word “wilderness” hails from Old English and was used in English translations of the Bible. In its biblical context, it stood opposed not only to civilization, but to the Garden of Eden, and often referred, more especially, to arid, desert regions such as the Sinai. And as Nash (1982) also points out, it was applied to North America by the Puritans especially, for whom at first it had a wholly negative connotation. North America in the perfervid Puritan imagination was the stronghold of Satan, and the indigenous population—what was left of it anyway—was composed of the devil’s minions. In the words of historian Perry Miller (1964), the Puritans believed themselves sent by God on an “errand into the wilderness,” to convert the continent to Calvinism and replace the wilderness with fair English-style, small-hold farms and shining European-style cities on hills.

After several generations had succeeded well in this enterprise, later Puritan fervor found sin in those very cities. The country having been ethnically cleansed and pacified, Nature began to appear to be God’s pristine, undefiled creation. A central doctrine of Puritan theology was original sin and human depravity. Our anthology opens with selections from Jonathan Edwards, who finds “images or shadows of divine things” not in his fellow men or in human works, but in Nature. To make a long story short, the received wilderness idea is ultimately a legacy of Puritan theology. At the heart of that theology is a dualism of man and nature. To the first generations of Puritans in America, man was created in the image of God and, if not good, at least the Elect among men were put in the service of a good God to enlighten a benighted, dismal and howling wilderness continent. To later generations of Puritans, the positive and negative poles of the dualism were reversed. The Fall and man’s consequent evil were stressed. In the minds of some influential Puritan thinkers like Edwards, Nature became a foil for man’s sin and depravity. It was transformed into the embodiment of goodness. After all, Nature was created by God and declared to be good, as you may read for yourself in the first pages of Genesis. And as Muir (1916) astutely observed in the mid-19th century, Nature and its nonhuman denizens remain, in sharp contrast to man, “unfallen” and “undepraved.”

In many of the most passionate framers of the received wilderness idea, strains of what might be called neo-Puritan Nature theology run strong. Man and his works are sinful, Nature is pure and divine. It is there in Thoreau, there most vividly in Muir, there in Marshall, there in Rolston (1998)—an ordained Presbyterian minister, I might add—and there in Dave Foreman (1998a), who likes to boast about his pugnacious Scotch-Irish temperament. I don’t see it in Leopold, and, curiously, the Scandinavian Olson complains that this meme in the memetic makeup of the received wilderness idea gets in the way of the expression of the macho meme: According to Olson (1998),

Typical of this tone of interpretation is Thoreau with his “tonic of wildness,” but to the men I have come to know his was an understanding that does not begin to cover what they feel. To him the wild meant the pastoral meadows of Concord and Walden Pond, and the joy he had, though unmistakably genuine, did not approach the fierce unquenchable desire of my men of today. For them the out-of-doors is not enough; nor are the delights of meditation.

Olson’s men had to be out there yukking it up in the real wilderness, not silently sniffing the ladyslippers and communing with the Oversoul in a rural wetland. Muir, on the other hand, being the most orthodox neo-Puritan framer of the received wilderness idea, opposed the macho meme in it for which Roosevelt is most responsible. According to Nash (1982), Muir took Roosevelt on a hike and sleep-over in Yosemite and there said to him, “Mr. President, when are you going to get beyond the boyishness of killing things...are you not getting far enough along to leave that off?”

Finally, I come to the outmoded allegation. Recreation may be an important purpose served by designated wilderness areas, but the most adamant apologists for the wilderness idea and I agree that wilderness areas have a higher calling in these desperate days. According to Snyder (1996), “we are not into saving relatively uninhabited wild landscapes for the purpose of recreation or spirituality even, but to preserve home space for nonhuman beings.” Historically, according to Foreman (1998b), “The most common argument for designating wilderness areas . . . touted their recreational values.” But now, “core wilderness areas [should] be managed to protect and, where necessary, to restore native biological diversity and natural processes. Traditional wilderness recreation is entirely compatible, so long as ecological considerations come first.” The most important *raison d’être* of designated wilderness areas is habitat for species that do not coexist well in close proximity with *Homo sapiens*—for whatever reasons; brown bears, wolves, and mountain lions are the most frequently cited examples (Grumbine 1992, 1998). They do not coexist well with people because of direct or indirect conflict of interest. Usually people, out of fear or ignorance, attack them; or, more rarely, they attack people or pets or livestock. But many species of birds, with which people have no direct conflict, need interior forest habitat that is increasingly fragmented, and thus ruined for them, by suburban and exurban real estate development (Robinson and others 1995).

What to do now? We’re talking about a name, an idea, a concept. We could redefine it. We could purge it of its macho baggage, its neo-Puritan theological freight, its connotation of a resource for either virile or meditative recreation, its penumbra of Arcadian ecology, its undercurrents of ethnocentrism and racism, and sanitize or disavow its colonial origins and functions. Or we could start with a fresh concept for the purposes of wilderness science. I recommend the latter alternative; except in that case, of course, we wouldn’t call it “wilderness science.”

If we call the habitat of wolves, bears, lions, lynx and warblers “wilderness areas,” inevitably our minds are flooded with all the hogwash the wilderness idea is steeped in. Visions well up in our imaginations of virile, unconfined recreation, or of reverential pilgrimages in holy sanctuaries unsullied by the presence of profane people and preserved forever just as they always existed, in splendid harmony and

balance from time immemorial. We get confused by the wilderness name and think that these places should remain “natural” and not be actively managed by, say, prescribed burns or therapeutic hunts to make them fit habitat for threatened species, or that they mainly exist for us to recreate in, just as the Wilderness Act of 1964 says. But that should not be their primary purpose. They should exist, primarily, for the animals, whose homes they are, and for us to manage with their needs exclusively in view or, in some cases, to stay out of altogether. Imagine insisting on calling a Battered Women’s Shelter, the House of Babes or the Home for Uppity Ladies. It might attract the wrong kind of attention.

Well, how do I propose we rename the places misnamed wilderness areas? The scientific community seems to be settling on “biological reserve” or “biodiversity reserve” as the most straightforward name (Scott 1999). That idea, however, is not new (Grumbine 1998, Scott 1999). A similar concept was proposed in the first quarter of the 20th century, just as the wilderness movement was gathering steam, most notably by Victor Shelford (1921, 1933), Francis Sumner (1920, 1921), G. A. Pearsons (1922), and George Wright and others (1933). It was reasserted again at mid-century by S. C. Kendeigh and others (1950) and Ray Dasmann (1972). But the proposal for a representative biological reserve system for the United States, as opposed to a system of “wilderness playgrounds” (Leopold 1991), was eclipsed by the human-experience-oriented wilderness idea and, until now revived, was consigned to the dust bin of American conservation history (Grumbine 1998; Scott 1999). The names of Shelford, Sumner, Pearsons and Wright became but footnote fodder in the scholarly tracts of conservation historians, while the names of Thoreau, Muir, Roosevelt, Leopold, Marshall and Olson live on in wilderness legend.

We are in the midst of a global conservation crisis. The present generation is witness to and the cause of only the sixth abrupt mass extinction event in the 3.5 billion-year biography of the Earth. To address this gargantuan problem a new transdisciplinary science called conservation biology has taken shape. Its summum bonum—or “greatest good”—is biodiversity. As one of its architects, Michael Soulé (1985), put it in a field-defining paper, “Diversity of organisms is good.” Period. The only way to save species populations from extinction is to provide them with habitat. *Ex situ* conservation without the hope of reintroduction into fit habitat is a kind of living extinction for species, just as confinement in a hospital with no hope of going home is a kind of living death for sick people. Human activities, such as agriculture and suburban and exurban development, provide some organisms—such as raccoons and white-tailed deer—with excellent habitat. But the habitats of many other organisms are severely degraded by the cultural modifications of landscapes that characterize contemporary industrial civilization. These organisms need places that are otherwise suitable for them where modifications of that kind are prohibited. Such places are biodiversity reserves, and a major focus of the science of conservation biology is reserve selection, design and management (Meffe and Carroll 1997).

Designated wilderness areas now serve as biodiversity reserves, but only as an afterthought. As Dave Foreman (1998b) points out, they were selected for purposes other than providing threatened and endangered species with

habitat. They were selected, rather, because of their potential for a virile and unconfined type of recreation, or because they contained spiritually uplifting “monumental” scenery, or often because they simply had no other foreseeable utility (Foreman 1998b). They may not be the best places for biodiversity reserves, but they are a start.

However, to continue to call these places and future reserves “wilderness areas” not only confuses the public about what their most important function is, it also confuses their scientific management. What are the goals of wilderness science? To preserve vignettes of primitive America? To preserve pristine Nature in perfect balance? To provide opportunities for meditative solitude, or for travel by canoe and pack animal? To monitor what happens to a biotic community when its keystone species has been prohibited from remaining and can only visit as a tourist or scientist? To provide habitat for threatened and endangered species? Some of these? All of these? Or only one of these? If we had already decided to take my suggestion and rename wilderness areas “biodiversity reserves,” then “wilderness science” would be more narrowly focused, as I believe it ought to be, on the science of reserve selection, design and management.

With a clearer focus on goals, we can achieve not only a clearer focus on the scientific task, but also a better criterion for determining what is and what is not an acceptable human presence in biodiversity reserves. In some places in the Amazon, for example, traditional extractive activities, such as rubber tapping and nut gathering, may be consistent with many if not all the biodiversity conservation goals in those areas (Peters and others 1989). In which case conservation may not be at odds with the economic activities of indigenous peoples. Such peoples and conservationists may then form political alliances against capital-intensive development schemes hatched in distant capitals that would destroy the economies of both tribal peoples living by traditional means and the habitat of the species with which they have traditionally coexisted. On the other hand, in the First World, bourgeois recreational use of wilderness areas may come in conflict with species recovery plans. If renamed biodiversity reserves, the priority question—the species recovery plan or the bourgeois recreational use—is not even up for debate. We allow recreational and other human uses of biodiversity reserves, certainly, but only up the point that the maintenance of threatened species populations is not compromised.

As Grumbine (1998) notes, “the concept of ‘biodiversity’ has become a central rallying cry for a growing portion of the US environmental movement.” It may not be, however, so central on the radar screens of most laypersons. While the term “biodiversity reserve” may serve to better focus the energies of the scientific subset of the environmental movement, it may be a nonstarter politically. But “wilderness” too, as already noted, is a politically loaded term. For purposes of public relations, other more or less equivalent names might be employed. We might resurrect, for example, the term employed by Kendeigh and others (1950) at mid-century, “nature sanctuaries.” Or if “nature” is too vague and inclusive a term, we might call them “wildlife sanctuaries.” A task for future social science research might be to discover the most appealing name for what future erstwhile wilderness scientists will refer to as “biodiversity reserves,” if my advice is heeded.

In conclusion, I have criticized a name, “wilderness,” not the places—wilderness areas—that bear the name. I might add that I am not criticizing the framers of the received wilderness idea either: Edwards, Emerson, Thoreau, Muir, Roosevelt, Aldo Leopold, Marshall, Olson—well maybe Olson—Starker Leopold and Howard Zahnizer, the ghost-writer of the Wilderness Act of 1964. Their times were different from ours today. Now we are in the midst of a global biodiversity crisis that, with one exception, they knew nothing about. That exception was Aldo Leopold (1998b) who, although he continued until the end to call them wilderness areas, recast his arguments for their preservation in the same terms as I am here, namely habitat for “threatened species,” as had Shelford and a few other of his now all-but-forgotten contemporaries. The baggage that freights the received wilderness idea, in my opinion, makes it an unsuitable conceptual tool to meet the challenge of the biodiversity crisis. We need a new name that will better focus our contemporary conservation goals and, therefore, our conservation policy and science. I suggest that new name, at least within the scientific sector of the conservation community, should be “biodiversity reserves.”

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# The Real Wilderness Idea

Dave Foreman

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**Abstract**—In recent years, some philosophers, historians and literary critics have condemned the “Received Wilderness Idea.” Close examination reveals that this Received Wilderness Idea is a literary/philosophical construct little related to the Real Wilderness Idea that conservationists have used to establish the National Wilderness Preservation System. Analysis of the origin of the word “wilderness,” the meaning of the Wilderness Act and the history of the conservation movement show the Real Wilderness Idea and the National Wilderness Preservation System to be robust.

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I come not to praise The Received Wilderness Idea, but to bury it. The very name, “The Received Wilderness Idea,” conjures up a mystical origin. If the Wilderness Idea that Baird Callicott, Bill Cronon and other postmodern deconstructionist scholars so eagerly banish with Milton’s Lucifer has been received, I think it has been received as they hold hands in a darkened room around a seance table, trying to hear voices from the misty shades of Jonathan Edwards and Henry David Thoreau.

But, first, why should you lend me your ears on the idea of wilderness? Well, it’s because I’m an expert on the Real Wilderness Idea—the one that created the National Wilderness Preservation System. I’ve been a wilderness backpacker for 40 years, a wilderness river runner for more than 30. During the several thousand days and nights I’ve spent in wilderness for fun and for conservation, I’ve had a few hundred companions (not all at once!). I’ve heard their thoughts about wilderness while plodding up dusty switchbacks, floating past canyon walls aglow in sunset flame and passing Scotch around the campfire. On many of these trips, my friends and I were checking out the wilderness qualities of unprotected areas and putting together boundary proposals to send to Congress for designation. In the 1970s, I wrote a widely-used guide, “How To Do A Wilderness Study.” From all this, I got a very clear idea of wilderness, one that is widely shared with other conservationists doing the same thing.

In 1971, as I dove into wilderness issues in New Mexico, I found a complete set of The Wilderness Society’s magazine, *The Living Wilderness*, in the basement of the University of New Mexico library. I read every issue all the way back to the first ones in the 1930s. During the early 1960s, *The Living Wilderness* covered the campaign for the Wilderness Act in great detail, including the arguments for and against wilderness protection. Since then I have read uncounted magazines, newsletters and action alerts from many wilderness

protection groups. I have read dozens upon dozens of brochures and maps about wilderness areas from government agencies.

My mentors in the conservation movement were people who had led the campaign for the Wilderness Act and later efforts to protect mandate areas (Forest Service Primitive Areas and National Park and Wildlife Refuge roadless areas) and Forest Service roadless areas. I was trained as a grass-roots organizer by Clif Merritt, who organized Westerners to support the Wilderness Act, Ernie Dickerman, who wrote the Eastern Wilderness Areas Act, and Harry Crandell, who wrote the wilderness provision for the BLM organic act. Dave Brower, Ed and Peggy Wayburn, Stewart Brandborg and Celia Hunter taught me about wilderness battles stretching back to the 1930s. I talked at length with old-timers in Silver City, New Mexico, who had led the successful citizen fight against the Forest Service’s proposed dismembering of the Gila Wilderness in 1952 (to allow logging). I have been privileged to know Bob Marshall’s brothers, Aldo Leopold’s daughter, Mardie Murie (Olaus Murie’s widow) and Sig Olson. I applied their experience and wisdom when I became a national leader in the wilderness campaigns on RARE II, the BLM wilderness review and the Alaska Lands Act.

I have sat through dozens of public hearings—agency and congressional, field and DC—about wilderness area designation. I believe I have known people involved in every wilderness designation bill passed by Congress. For 30 years, I have been involved in strategy meetings and public presentations about wilderness areas in nearly every state. During the past 15 years, I have given more than 200 lectures about wilderness at colleges in 35 states and Canadian provinces and afterwards discussed wilderness with small groups of students at local bars. I have stood with Earth First!ers, risking arrest and physical injury in nonviolent civil disobedience, to protect wilderness from bulldozers and chain saws. I have attended a dozen professional meetings on wilderness organized by federal and state agency wilderness managers, and I know key wilderness people in the agencies.

In my personal archives are three shelf-feet of congressional hearing records and committee reports on wilderness area designation; every Forest Service primitive area, Park Service and national wildlife refuge wilderness area recommendation document; every RARE II state document; every BLM wilderness study document for each of the Western states; the responses by conservation groups to all of these; and 23 file drawers of wilderness area issues dating back to the 1960s (this does not count a similar number of file drawers on other conservation issues). Believe it or not, I have read all of this stuff.

During 20 years as an editor, executive editor, or publisher of the *Earth First! Journal* (1980 to 1988) and *Wild Earth* (1990 to the present), I have read, rejected, accepted and edited more wilderness articles than I want to remember from all over North America and the world. I spent eight

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years researching my book (with Howie Wolke) on lower 48 roadless areas, *The Big Outside*.

During the past 15 years, I have been closely involved with the key conservation biologists working on protected area design and protection strategy. My wilderness work and close colleagues now reach into Mexico, Costa Rica, Canada, Chile, Argentina and southern Africa.

I have been personally involved in defending unprotected wilderness from dam building, water diversion, logging, road building, hard rock mining, oil and gas exploration and development, uranium mining, off-road vehicle abuse, poaching of reintroduced wolves, overgrazing, juniper chaining, observatory construction and introduction of exotic species. I have helped defend designated wilderness areas from dam building, overgrazing, grazing developments, administrative vehicle use, non-commercial logging, government predator killing, sabotage of endangered species recovery (Gila trout), mountain bike invasion and snowmobile invasion. We conservationists have not always been successful in this defense, and I know wild rivers now drowned behind dams, grand forests clearcut, stunning badlands stripmined....

In short, I know something about the only wilderness idea that matters on the ground—the one that has led thousands of people to devote their time, money and sometimes their freedom and even lives to protect wilderness from exploitation. This is the Wilderness Idea that has created the National Wilderness Preservation System of the United States of America.

This Real Wilderness Idea is very different from The Received Wilderness Idea invented and then lambasted by Baird Callicott, Bill Cronon and other deconstructionist social scientists. The literary and philosophical writings they draw from have had little influence in the wilderness protection movement; in fact, intellectual and academic discussions about wilderness have pretty much been ignored by wilderness defenders. Since 1920, wilderness conservationists have been motivated primarily by two things: One, they like a particular wilderness; two, they see a need to protect it from development and exploitation.

As Samuel Hays (1996), the great historian of resource conservation, Nature conservation and environmentalism, writes, “Cronon’s wilderness is a world of abstracted ideas...but divorced from the values and ideas inherent in wilderness action.”

This Received Wilderness Idea is a straw dog; it does not exist on the ground. It is not the idea of wilderness that led to the Wilderness Act and the National Wilderness Preservation System and spurred thousands of citizen conservationists from Alabama to Alaska. When one fights a phantom, it is easy to claim you have mortally wounded the monster.

Twenty-five hundred years ago, Socrates told Phaedrus, “I’m a man of learning and trees and open space teach me nothing, while men in towns do.” More recently, Nobel Laureate Linus Pauling (1995) wrote,

I remember reading a book on philosophy in which the author went on, page after page, on the question: If there is a leaf on a tree and you see that it is green in the springtime and red in fall, is that the same leaf or is it a different leaf? Is the essence of leafness still in it? Words, words, words, but ‘chlorophyll’ and ‘xanthophyll’—which are sensible in this connection of what has happened to that leaf—just don’t appear at all.

This so-called Received Wilderness Idea comes from Socrates and his buddies in town, not from the wilderness of trees and open country. And among all the words about the Received Wilderness Idea, words about living landscapes and the political reality that threatens them don’t appear.

I have spent my life fighting the lies, blather and myths of extractive industry about wilderness. I have concluded that their pitiful arguments against wilderness are actually more legitimate, rational and grounded in reality than those of the postmodern deconstructionists.

I am not going to respond point by point to the academic left’s complaints about wilderness. I’ve done it before, most recently in the Callicott/Nelson anthology, *The Great New Wilderness Debate*, and I have not noticed anyone rebutting my specific points (Foreman 1998). (I will, however, respond in detail in my book-in-progress, *The War on Nature*.) What I would like to do is present not the Received Wilderness Idea, but the Real Wilderness Idea of the citizen conservation movement and how it is still robust after all these years, blending both experiential and ecological values and purposes.

## Self-Willed Land

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In our slacker era, when rigor in thought and ethics is too much to ask for, we often get into a snarl because of poorly defined words. Bud Man on his motorized tricycle, academic grandees and just about everybody in between use the word *wilderness* in sloppy ways, muddying the wrangle about conservation.

In a 1983 talk at the Third World Wilderness Conference in Scotland, philosopher Jay Hansford Vest sought the meaning of wilderness in Old English and further back in Old Gothic languages. He showed that wilderness means “‘self-willed land’...with an emphasis on its own intrinsic volition.” He interpreted *der* as *of the*. “Hence, in wilderness, there is a ‘will-of-the-land’; and in wilder, there is ‘will of the animal.’ A wild animal is a ‘self-willed animal’—an undomesticated animal; similarly, wildland is ‘self-willed land.’” Vest shows that this willfulness is opposed to the “controlled and ordered environment which is characteristic of the notion of civilization.” The early northern Europeans were not driven to lord over Nature; thus, wilderness “demonstrates a recognition of land in and for itself.” (Vest 1985.) Thanks to Vest, we are able to understand that this word, wilderness, is not a coinage of modern civilization; it is a word brewed by pagan barbarians of the Bronze and Iron Ages.

This self-willed land meaning of wilderness overshadows all others. Wilderness means land beyond human control. Land beyond human control is a slap in the face to the arrogance of humanism—elitist or common man, capitalist or socialist, first worlder or third; for them, it is also something to be feared.

I’ve called wilderness areas the arena of evolution. However, Aldo Leopold, as usual, was way ahead of me. Fifty years ago, he saw wilderness as the “theater” for the “pageant of evolution.” (Leopold 1989.) Evolution is self-willed. The land where evolution can occur is self-willed land, especially for large species.

## The Wilderness Act

The civilized world's greatest embrace of self-willed land came in the form of the 1964 Wilderness Act in the United States. This legislation was the product of eight years of discussion and revision in Congress and in public hearings across the nation. It was pushed by hikers, horse packers, canoeists, hunters and fishers. It contains at least four definitions of wilderness. I believe that all four of these definitions are thoroughly in keeping with self-willed land. The first definition of wilderness is found in the statement of purpose for the Wilderness Act in Section 2(a):

In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.

Was Congress, prodded by American citizens, setting up a National Wilderness Preservation System to preserve a mythical past wrapped up in literary romanticism, Manifest Destiny bravado and Calvinist dualism? Well...no. It was much simpler. Wilderness areas needed to be protected because all of the remaining backcountry of the United States was threatened with development and industrial exploitation driven by population growth, mechanization and expanding settlement. Here and throughout the wilderness conservation movement, the motive force has been to protect land from development. Hays (1996) writes, "[W]ilderness proposals are usually thought of not in terms of perpetuating some 'original' or 'pristine' condition but as efforts to 'save' wilderness areas from development." Wilderness areas, then, are lands protected from industrial civilization's conquest. Isn't that easy to understand?

The second definition is the ideal:

A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. Section 2(c).

Written by Howard Zahniser of The Wilderness Society, who, as a professional editor and writer, understood the importance of word selection, this definition agrees with self-willed land. First, wilderness is not where the works of man dominate the landscape. It is not under human will. Second, Zahniser chose the obscure word "untrammelled" carefully, and not just because it rolls off the tongue pleasantly. A *trammel* is a fish net and also a hobble for a horse, thus a thing that hinders free action. As a verb, *trammel* means to hinder the action of something. *Untrammelled*, then, means that the will of something is not hobbled; it is self-willed. Untrammelled land is the arena of evolution. Third, humans are only visitors in wilderness; there are no permanent human settlements. Many kinds of wilderness foes especially bristle at this barring of human habitation. However, I believe this lack of long-lasting settlement is key to wilderness. Where humans dwell long, we trammel or hinder the willfulness of the land around our living sites and outward. How far? This hinges on the population size and technological sophistication of the group.

The third definition of wilderness immediately follows the second. It is the specific, practical definition of wilderness areas protected by the Wilderness Act and sets out the entry criteria for candidate areas:

An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value. Section 2(c).

Although in keeping with self-willed land ("undeveloped," "primeval character and influence," "without permanent improvements or human habitation," "natural conditions"), this is a practical definition that acknowledges that even mostly self-willed land may not be pristine ("generally appears," "affected primarily," "substantially unnoticeable"). Indeed, the word *pristine* does not appear in the Wilderness Act.

This down-to-earth view of wilderness answers the often silly question, "What is natural?" It understands that *natural* is not a single point opposed to the single point of *unnatural*. Rather, I think it sees that land falls on a continuum from wholly yoked by human will to altogether self-willed. At some point, land quits being mostly dominated by humans; at some other point, land begins to be controlled primarily by the forces of Nature. There is a wide gray area in between, where human and natural forces both have some sway. After natural forces become dominant, the land is self-willed. Because we humans have limited and differing understandings of ecology and depths of wisdom, we may find the changeover to self-willed land in different places on this unnatural-natural line. But this does not mean we cannot say, "This place is primarily natural." And let us not fall into the woolly-headed trap of thinking that naturalness is merely a human idea. Naturalness exists out there. A falling tree in a forest does not need a human ear to be.

Ecological wounds suffered by the land come from humans trying to impose their will. The severity of these wounds and their full impact settle whether the land is mostly self-willed (affected primarily by the forces of Nature) or not. Some kinds of wilderness foes falsely believe that conservationists see wilderness as pristine (an absolute word). Other anticonservationists, in order to limit protection, argue that places must be pristine in order to qualify as wilderness areas. Neither gospel is true.

If we read Section 2(c) of the law closely, we see that there are really two definitions of wilderness twined about each other. One is a definition of the human experience in wilderness areas ("appears," "unnoticeable," "solitude," "a primitive and unconfined type of recreation," "educational," "historic," "scenic"). The other is an ecological definition ("undeveloped," "primeval character and influences," "forces of nature," "ecological," "scientific"). Understanding that these descriptions of ecological conditions and values are



prominent in the Wilderness Act belies the persistent rap that the act and the National Wilderness Preservation System created by it are only about scenery and recreation. Even some conservationists and scientists have criticized the Wilderness Act for an overwhelming recreational bias. It's important to understand that this is not the aim of the act, although federal agencies have often managed wilderness areas as if it were.

The two lessons we need to draw from Section 2(c) are that wilderness areas are not expected to be pristine and that the ecological values of wilderness areas are strongly recognized along with experiential values.

The fourth definition of wilderness comes with rules for managing land after it comes under the protection of the Wilderness Act:

Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and except as necessary to meet minimum requirements for the administration of the area for the purposes of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area. Section 4(c).

(Elsewhere, the Wilderness Act provides for certain exceptions to the above prohibitions, such as firefighting, rescue, livestock grazing and prospecting for minerals until 1984, all of which were political compromises that supporters of the Wilderness Act had to make before Western members of Congress would allow passage. Thus, the Wilderness Act is somewhat flawed and sometimes at odds with itself.)

The use prohibitions try to keep the land untrammelled (self-willed). They are more strict than the entry criteria in Section 2(c). For example, there is no requirement that candidate wilderness areas have to be roadless or unlogged, but Section 4(c) holds that they must be managed as roadless after they are placed in the National Wilderness Preservation System. In other words, existing roads must be closed and no further commercial logging allowed after designation of an area as wilderness. There are many cases of once-logged or earlier-logged areas in the National Wilderness Preservation System—including some of the classic big wilderness areas in the West.

If what wilderness means and what the Wilderness Act says are clearly worded, many misunderstandings about wilderness should melt away. However, as we too often find, muddying the meaning of wilderness is not always due to simple ignorance, but is a witting tactic by anticonservationists.

The brawl over conservation is at heart about whether we can abide self-willed land.

## The River Wild

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In "Rewilding and Biodiversity: Complementary Goals for Continental Conservation," Michael Soulé and Reed Noss (1998) clearly show that science-based Nature-reserve design does not come to bury traditional wilderness area designation, but to marry it. To see how this is so, we need both a lookout that takes in the whole conservation movement and a metaphor that can limn it.

The metaphor I use for the conservation movement is that of a river's watershed, with streams dropping from high saddles and cirques and flowing down to mix as currents in the river. A good perspective is that of an eagle, which allows us to see the watershed spread out before us.

The headwater streams that flow together to make the River Wild are wildlife protection, stewardship, beauty protection and forest protection. Downriver, the streams of wilderness protection, ecosystem representation, carnivore protection, connectivity, and rewilding flow in. Nearby, but apart, are watersheds for the rivers of resourcism and environmentalism. I see environmentalism (pollution fighting), conservation (wildlife and wildlands protection) and resourcism (efficient exploitation of resources) as separate movements, with different views about humans and Nature. Some of the headwaters of the Resourcism River come off the same ridges and peaks as those that feed the River Wild, but they flow in a different direction. The Environmentalism River does not spring from the same divides as the River Wild, but its course later runs parallel to the River Wild, with only a low ridge between the two.

All the streams feeding into the conservation movement spring from protecting land and wildlife from threats of development and exploitation.

From the farthest mountain pass flows the sturdy stream of Wildlife Protection. Contrary to the common wisdom, American conservation began with wildlife protection, not with forest protection. English aristocrat William Henry Herbert came to America in 1831 and brought with him the "code of the sportsman." In his woody role as "Frank Forester," Herbert fought the era's rapacious market hunting and spurred sportsmen to band together to fight game hogs. National hunting magazines began in the 1870s, and they joined the battle against commercial exploitation of game and fish and for habitat protection. Sport hunters and their magazines raised a din against the senseless slaughter of the buffalo. The first national conservation group was not the Sierra Club (founded in 1892), but the Boone and Crockett Club, founded in 1887 by Theodore Roosevelt and his fellow hunters. The role of Boone and Crockett in creating the first national parks, wildlife refuges and forest reserves has generally been overlooked by historians as well as by today's conservationists (Reiger 1990).

The second headwater stream is that of Stewardship. One of the most remarkable Americans of the 19th century was Vermont's George Perkins Marsh. As Lincoln's ambassador to Turkey and later Italy, Marsh took in the sights of the Mediterranean, where among the ruins of classical civilizations he found ruins of the land. The rocky, treeless hills of Greece were as much a testament to a fallen civilization as the crumbling Acropolis. His 1864 book, *Man and Nature; or, Physical Geography as Modified by Human Action*, is one of the benchmarks of both history and science. He wrote, "But man is everywhere a disturbing agent. Wherever he plants his foot, the harmonies of nature are turned to discord." Former *New York Times* foreign correspondent and later environmental reporter Phillip Shabecoff (1993) writes, "Marsh was the first to demonstrate that the cumulative impact of human activity was not negligible and, far from benign, could wreak widespread, permanent destruction on the face of the earth." However, I also see a spring called Malthus contributing to the flow in the Stewardship Creek.

Stewardship is needed to combat soil erosion and other careless land management; more recently, it has tried to deal with the threats of human population growth and depletion of resources.

The third headwater stream is Beauty—protection of national parks and other places to safeguard their spectacular, inspiring scenery. Yosemite Valley in the Sierra Nevada of California was not discovered by white settlers until 1851, and the mighty sequoias near it were not described until 1852. Within a few years, both were attracting visitors who wanted to see their splendor. In 1859, Horace Greeley, editor of the *New York Tribune*, visited the Yosemite Valley and wrote to his readers that it was “the most unique and majestic of nature’s marvels.” (Runte 1987.) Five years later, on June 30, 1864, taking time from the burden of the Civil War, President Abraham Lincoln signed a bill transferring beautiful Yosemite Valley and the Mariposa Grove of sequoias to the state of California as a public park.

American citizens supported setting aside Yellowstone, Yosemite and the other early national parks primarily because of beauty, although other factors, including the support of railroads, helped lead to the political decisions. Conservationists feared that all of America’s natural wonders were threatened by tawdry tourist development and industrial exploitation because of what had happened to Niagara Falls from 1830 on. Alfred Runte (1987) writes, “In the fate of Niagara Falls, Americans found a compelling reason to give preservation more than a passing thought...A continuous parade of European visitors and commentators embarrassed the nation by condemning the commercialization of Niagara.” This all holds true for the closely related national parks movement in Canada.

The fourth and final headwater stream is Forest Protection. It falls out of a cirque-held tarn, but cascades only briefly before a great sharp ridge splits the stream. One side pours off into the Resourcism River with Gifford Pinchot and the other falls into the River Wild with John Muir. In the 1880s, business interests in New York City called for protecting the Adirondacks to ensure a good water supply from the headwaters of the Hudson River. In the West, irrigators and towns worried about watershed destruction by overgrazing and logging in the high country and asked for protection. Forest lovers, led by John Muir, feared that all natural forests would soon be scalped by logging companies. New York protected state lands in the Adirondacks, and Congress authorized the President to withdraw forested lands in the West.

The 1891 Forest Reserve Act “merely established reserves; it did not provide for their management,” explains Samuel Hays (1979). Conservationists ranging from Muir to the sportsmen of the Boone and Crockett Club hoped to keep the forest reserves off-limits to commercial logging, grazing and other uses. They wanted the reserves protected for their watershed, recreational and scenic values, as well as for wildlife habitat. Gifford Pinchot, however, demanded “management” that would include logging, grazing and dam building. The 1897 Organic Act, which Pinchot pushed, opened the reserves for commercial exploitation. However, for both Muir and Pinchot, forest protection was a response to the threat of uncontrolled and wasteful logging.

Down the River Wild another stream—Wilderness—comes in. The specific movement to preserve wilderness areas

came first from Forest Service rangers, such as Art Carhart and Aldo Leopold. Leopold, who railed against “Ford dust” in the backcountry, feared that growing automobile access to the national forests would destroy and replace the pioneer skills of early foresters. He wanted to protect the experience he enjoyed when he came to Arizona’s Apache National Forest in 1909. “Wilderness areas are first of all a series of sanctuaries for the primitive arts of wilderness travel, especially canoeing and packing,” said Leopold (1987). In 1921, he defined wilderness as “a continuous stretch of country preserved in its natural state, open to lawful hunting and fishing, big enough to absorb a two weeks’ pack trip, and kept devoid of roads, artificial trails, cottages, or other works of man.” (Leopold 1921.) The backcountry was threatened by automobiles and roads. It needed protection. In the 1930s, conservationists like Bob Marshall called for wilderness protection in the national parks because the parks were threatened by proposals for scenic highways from the National Park Service and the tourist industry.

On the other side of the River Wild, just below the confluence with the Wilderness stream, the Ecological Representation stream joins in. As early as 1926, the *Naturalist’s Guide to the Americas*, edited by prominent biologist Victor Shelford, called for protecting ecologically representative natural areas. Both the National Audubon Society and The Nature Conservancy have tried to buy and protect ecosystems not represented in federal and state protected areas. The National Park Service and conservationists have tried to establish national parks for all major ecosystems, admittedly without total success. The 1975 Eastern Wilderness Areas Act, which established wilderness areas on national forests east of the Rockies, was explicitly about ecosystem representation. During RARE II, the Forest Service, with conservationist support, sought to establish new wilderness areas that would protect hitherto unprotected ecosystems. The push here came because of development threats. Ecosystem representation, however, has not gotten the heed it needs. In a special report for the Department of the Interior, Reed Noss and his co-authors (1995) have detailed our poor record in protecting representative ecosystems.

Soon after, the Predator Protection stream splashes down as a stunning waterfall. In “A Nature Sanctuary Plan” unanimously adopted by the Ecological Society of America on December 28, 1932, Victor Shelford wrote, “Biologists are beginning to realize that it is dangerous to tamper with nature by introducing plants or animals, or by destroying predatory animals or by pampering herbivores...” The Ecological Society said we needed to protect whole assemblages of native species, including large carnivores, and the natural fluctuations in numbers of species (Shelford 1933). At that time, protecting wolves and mountain lions was—well, bold, hence my seeing it as a waterfall. Large carnivores were clearly threatened with extirpation from the United States, including from the national parks.

Another conservation stream began in the 1960s with work by E. O. Wilson and Robert MacArthur on island biogeography. Closely tied to island biogeography is the *species-area relationship*. Michael Soulé (1995) writes, “One of the principles of modern ecology is that the number of species that an area can support is directly proportional to its size. A corollary is that if area is reduced, the number of species shrinks.” The species-area relationship has been shown

with birds, mammals, reptiles and other kinds of animals on the Greater Sunda Islands (the Indonesian archipelago), Caribbean islands and elsewhere. An ecological rule of thumb is that if a habitat is reduced 90 percent, it will lose 50 percent of its species.

In 1985, University of Michigan ecologist William Newmark looked at a map of the western United States and Canada and realized that our national parks were islands. As the sea of settlement and logging swept over North America, national parks became islands of ecological integrity surrounded by human-dominated lands. Did island biogeography apply?

Newmark found that the smaller the national park and the more isolated it was from other wildlands, the more species it had lost. The first species to go had been the large, wide-ranging critters—such as lynx and wolverine. Loss of species (*relaxation* in ecological lingo) had occurred *and was still occurring*. Newmark (1987) predicted that all national parks would continue to lose species (as Soulé had previously predicted for East African reserves). “Without active intervention by park managers, it is quite likely that a loss of mammalian species will continue as western North American parks become increasingly insularized.” Even Yellowstone National Park isn’t big enough to maintain viable populations of all the large wide-ranging mammals. Only the total area of the connected complex of national parks in the Canadian Rockies is substantial enough to ensure their survival.

Bruce Wilcox and Dennis Murphy (1985) wrote that “habitat fragmentation is the most serious threat to biological diversity and is the primary cause of the present extinction crisis.” Reed Noss, then at the University of Florida, acted on their warning by designing a conceptual Nature reserve system for Florida consisting of core reserves surrounded by buffer zones and linked by habitat corridors. In a paper presented to the 1986 Natural Areas Conference, Noss (1987) said, “The problems of habitat isolation that arise from fragmentation can be mitigated by connecting natural areas by corridors or zones of suitable habitat.”

This connectivity stream came into being because of fragmentation threats by dams, highways, clearcutting and other development.

Those of us who float rivers know that it can take a long time before the water from an incoming stream mixes fully with the main current. We see this when a creek full of glacial milk dumps into the gin-clear waters of a river in the Yukon. A similar scene occurs in the Southwest when a clear mountain stream plunges into a red river full of silt. For miles, there may be two currents shown by their distinct tints.

So it has been with our river. The wildlife protection, stewardship, beauty, forest protection and wilderness streams mixed fairly well, but the currents of ecosystem representation, predator protection and connectivity did not mix as well.

Now a new stream—Rewilding—has entered. Unlike the other currents, this rewilding stream mixes all the other currents together into a deep, wide, powerful river.

Soulé and Noss (1998) “recognize three independent features that characterize contemporary rewilding:

- Large, strictly protected core reserves (the wild)

- Connectivity
- Keystone species.”

In shorthand, these are “the three C’s: Cores, Corridors, and Carnivores.”

This rewilding approach is built on recent scholarship showing that ecosystem integrity often depends on the functional presence of large carnivores. Michael Soulé and his graduate students (1988) have shown that native songbirds survive in large suburban San Diego canyons where there are coyotes; they disappear faster when coyotes disappear. Coyotes eat foxes and prowling house cats. Foxes and cats eat quail, cactus wrens, thrashers and their nestlings.

In the East, David Wilcove, staff ecologist for the Environmental Defense Fund, has found that songbirds are victims of the extirpation of wolves and cougars. As we have seen, the population decline of songbirds as a result of forest fragmentation is well documented, but Wilcove (1986) has shown that songbird declines are partly due to the absence of large carnivores in the East. Cougars and gray wolves don’t eat warblers or their eggs, but raccoons, foxes, skunks and possums do, and the cougars and wolves eat these midsize predators. When the big guys were hunted out, the populations of the middling guys exploded—with dire results for the birds. Soulé calls this phenomenon—mid-sized predators multiplying in the absence of large predators—*mesopredator release*.

John Terborgh of Duke University (in my mind the dean of tropical ecology) is currently studying the ecological effects of eliminating jaguars, pumas and harpy eagles from tropical forests. He tells us that large carnivores are major regulators of prey species numbers—the opposite of once-upon-a-time ecological orthodoxy. He has also found that the removal or population decline of large carnivores can alter plant species composition, particularly the balance between large- and small-seeded plants, due to increased seed and seedling predation by superabundant herbivores that are normally regulated by large carnivores. This is called *top-down regulation* (Soulé and Noss 1998). There is compelling evidence for such top-down regulation in forests outside the tropics as well.

Rewilding is “the scientific argument for restoring big wilderness based on the regulatory roles of large predators,” according to Soulé and Noss.

Three major scientific arguments constitute the rewilding argument and justify the emphasis on large predators. First, the structure, resilience, and diversity of ecosystems is often maintained by ‘top-down’ ecological (trophic) interactions that are initiated by top predators (Terborgh 1988, Terborgh et al. 1999). Second, wide-ranging predators usually require large cores of protected landscape for foraging, seasonal movements, and other needs; they justify bigness. Third, connectivity is also required because core reserves are typically not large enough in most regions; they must be linked to insure long-term viability of wide-ranging species....In short, the rewilding argument posits that large predators are often instrumental in maintaining the integrity of ecosystems. In turn, the large predators require extensive space and connectivity (Soulé and Noss 1998).

If large native carnivores have been extirpated from a region, their reintroduction and recovery is central to a conservation strategy. Wolves, grizzlies, cougars, lynx, wolverines, black bears, jaguars and other top carnivores need

to be restored throughout North America in their natural ranges.

Although Soulé and Noss (1998) state, "Our principal premise is that rewilding is a critical step in restoring self-regulating land communities," they claim two nonscientific justifications: (1) "the ethical issue of human responsibility," and (2) "the subjective, emotional essence of 'the wild' or wilderness. Wilderness is hardly 'wild' where top carnivores, such as cougars, jaguars, wolves, wolverines, grizzlies, or black bears have been extirpated. Without these components, nature seems somehow incomplete, truncated, overly tame. Human opportunities to attain humility are reduced."

What Soulé and Noss have done here is of landmark importance for the wilderness conservation movement as well as for those primarily concerned with protecting biological diversity. They have developed the *scientific basis* for the need for big wilderness area complexes. Here, science buttresses the wants and values of wilderness recreationists. Big wilderness areas are not only necessary for inspiration and a true wilderness experience, but they are absolutely necessary for the protection and restoration of ecological integrity, native species diversity and evolution. Elsewhere, Soulé calls wilderness areas self-regulated, another way of saying self-willed or untrammled.

Metaphors are never perfect, but this view of conservation as the watershed of the River Wild, with different side streams adding power, diversity and nutrients, is pretty darn good. It allows us to see that new streams did not replace old streams. It recognizes that the headwater streams that initially formed the River Wild did not disappear when new streams flowed in. It shows the compatibility of the "scientific" streams with the aesthetic and recreational streams. And it proves that the threat of destruction drove all of these conservation currents.

Wilderness and biodiversity conservation are not airy-fairy flights of romantic fantasy to recapture a mythical past of purity and goodness, but real-world efforts to protect self-willed land from damage by increasing population, expanding settlement and growing mechanization.

(Portions of this essay are excerpted from *The War on Nature*, a book-in-progress by Dave Foreman.)

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# Changing Human Relationships With Nature: Making and Remaking Wilderness Science

Jill M. Belsky

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**Abstract**—The paper identifies and discusses two major themes in wilderness social science. First, that wilderness studies (and its advocates) have been limited by an ontological tension between those who mainly approach the relationship between humans and nature on the basis of material factors and constraints and those who approach it through an examination of shifting concepts and ideas. Rather than pitting these against each other, I argue that a dialogue between how nature and humans relation to it has been culturally constructed and physically altered is critically needed. Second, while I commend wilderness and protected-area management strategies for responding to shifting ideas and diverse material conditions by incorporating participatory or community-based approaches, I argue that how and when a community-based approach is workable needs to be answered in the context of particular places, peoples, issues and ecosystems. In general, wilderness social science needs to move beyond simplistic dualistic thinking and binary categories, and continually be willing to address the politics behind how “nature” and what is considered “natural” are defined and deployed on behalf of particular human interests. The paper concludes with a brief discussion of efforts across the globe that seek to utilize multiple conceptual and practical management approaches tailored to particular social contexts and histories.

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In this paper I discuss two themes that I, as an environmental sociologist, view as pivotal with regard to changing ideas of nature and wilderness (social) science, and their implications for the practice of conserving and managing large ecosystems.

The first theme centers around to what extent wilderness studies has been limited by an ontological tension between those who approach the relationship between humans and nature on the basis of material factors and constraints, or through concepts and ideas. There is a dialectical tension that manifested itself in tension and polarization in the talks of Baird Callicott, Dave Forman and most strongly with Gary Snyder. Callicott emphasized how our ideas of nature and wilderness have changed over time (i.e., a social constructionist or “idealist” approach) whereas Forman spoke about the physical threats to wild nature and wilderness conservation (i.e., the materialist or “realist” approach to nature). Rather than pitting these ontological approaches and their related social science orientations against each other, I argue that each taps into an important dimension of

wilderness studies. A dialogue between how nature has been culturally constructed and physically disturbed and/or preserved is critically needed.

A subtheme of this first point is that the study of nature and wilderness is deeply political. Wilderness scientists, like scientists everywhere, have downplayed the politics behind how “nature” and what is considered “natural” are defined and deployed on behalf of particular human interests.

My second major theme is that while important concepts and strategies for protecting ideals of “wilderness” have changed there has been a tendency to substitute old sets of “received wisdoms” or “discourses” with new ones. I discuss how wilderness science has shifted between two ideal concepts and management strategies. That is, as a “pristine,” delicately balanced ecosystem, devoid of people and managed for solitude, recreation and re-creation, to wilderness as “humanized” landscapes, manipulated ecosystems, especially by native and rural peoples marginalized by development and coerced by violent protected-area management policies and practices. In the latter view, wilderness protection brings people in, especially via community-based approaches to conservation. I argue that neither position is inherently true or preferable. Whether a protectionist or community-based approach is desirable and workable is an empirical question that must be examined in the context of particular places, peoples, issues and ecosystems.

In this paper, I hope to illuminate the above themes and suggest instances where I see glimmers of hope that efforts are underway across the globe that utilize multiple approaches and adaptive management strategies tailored to particular social contexts and histories. In the conclusion I provide a brief mention of such efforts.

## Positioning Myself in the Debate

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Like everyone else, I have specific filters through which I make meaning of these topics. These include my formal education as an environmental sociologist to honor both materialist and idealist orientations. I have also become sensitive to cross-cultural and transnational perspectives having spent most of my professional career studying social and environmental interactions in remote tropical places. My research has also been highly applied and geared toward seeking practical solutions and policies for bridging conflicts between development and conservation, park protection and resident peoples’ cultural and economic survival. No easy task.

I am also learning how hard it is to achieve the often mentioned goal of becoming interdisciplinary. Whether teaching, researching or collaborating on a project, I am usually working side by side with physical scientists and officials,

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often from different nations and cultures. I am constantly explaining and defending why attention to social forces and social organization are relevant to ecological change and park management. I am still learning how to effectively communicate and get along with people who are vastly different than myself, in terms of language, disciplinary methods, technical terms, perceptions and objectives—among others. And like everyone in this room, a personal connection to nature underlies why and how I do my job. I am an avid backpacker, biker, sea kayaker and “nature” lover.

All of us are comprised of multiple, overlapping identities and interests that affect how we understand human-nature interactions. I hope the ones I’ve shared with you confuse and complicate your ability to pin a theoretical or ideological label on me, or my thinking.

## Materialist and Idealist Approaches to Nature and Wilderness Studies

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Throughout the conference, the ideal of wilderness, and why we should discredit or support this idea, has been reemerging and making a lot of people squirm in their seats. It keeps popping up because social scientists in the 1980s and 1990s have been rekindling attention to ideas, culture, moral values and social experience in their studies of society, and not surprisingly, they are applying this approach to their examinations of environmental change. Established and accepted terms of discourse are being critically examined and their ideological origins and purposes exposed. While we’ve heard the term “social construction of nature” and “discourse” banded around at this conference, I don’t think anyone has defined them for us nor provided a more balanced sense of their applications, advantages and disadvantages.

“Social construction” refers to the idea that how people “see” or understand nature or landscapes is very important and depends in large part on our own social context and perspective on social life (Greider and Garkovich 1994). This often occurs unconsciously and unwittingly when we think we are being completely objective. As our perspective changes across time and place, history and culture, the meanings we confer on nature change along with it. Social constructionists would say this is a universal, human condition. Both laypeople and scientists “see” the world through socially influenced filters. As with where and how we grew up, and the values taught to us and the stories told to us, our academic disciplines provide a filter to how we see and understand the world. Indeed, the very mission of science is to explicitly teach us how to see and represent the world, appropriate to the assumptions and methods of our respective disciplines. Thus, our view of nature and what we see as natural is partially a product of our culture and its influence on the “construction” of what nature is perceived to be.

The social constructionist approach, according to Michael Bell, author of *An Invitation to Environmental Sociology* (1998), alerts us to the highly political and partial way we conceive of nature. This is because our understanding of nature depends on *social selection* and *social reflection*. We all tend to select particular features of nature to focus on, ignoring those that do not suit our interests and world views. Over 30 years ago in *The Structure of Scientific*

*Revolutions* (1966), Thomas Kuhn described how scientific theories, methods and research topics are closely linked to the paradigms (as well as funding biases) of the existing scientific establishment, which changes reluctantly at a turtle pace, and only when contradictions and new questions expose the limitations of existing paradigms. Because of social selection and social reflection, “nature” (as well as science) are inescapably social—and political—phenomena.

This view suggests that all of our ideas about nature and environmental change are partial. That is, any one of us only sees part of the phenomenon, and that meaning is only complete when understood within the context and agenda of a community of like-minded thinkers. Despite assertions of objectivity, scientists obscure some portion of reality when they narrate the history and results of their studies. The narrative succeeds to the extent that it can hide the discontinuities and contradictory experiences that would undermine the intended meaning of the “story.” Science is political because inevitably some aspects of what scientists see, hear and record are sanctioned while others are denigrated or silenced.

For example, we are all aware of how attention has been redirected in the forestry sector over the past decade to how different publics make meaning of forests: as a source of living, connection to spiritual heritage, place for recreation, hunting or for aesthetic appreciation. Though not without extreme controversy, even Congress has made these variable meanings a legitimate consideration of forest policy on public lands. While we may argue over the sense of holding each view equal or as relative “truths,” the point is we all have forest images in our minds, and these images affect how we each think forests should be managed. We see conflict, therefore, not only over the prioritization of what values the forest should be managed for, but also over what the forest is and how it should be understood.

Let me suggest a more subtle example, and one with far-reaching implications for how we understand nature and ecological processes (Bell 1998). It has often been told that Karl Marx wanted to dedicate his famous work on capitalism to Darwin. He wanted to do this to recognize Darwin’s observation of competition in nature and how it influenced Marx’s view of class conflict and struggle. For decades, this anecdote symbolized the debt social scientists feel to ecologists. We often use biological metaphors. For example, an early and highly influential approach in sociology is “human ecology;” and there is cultural ecology, social ecology and, most recently, political ecology. For many years, an intellectual dependence on the biological sciences also denoted an acceptance of the superiority of the physical over social or interpretive sciences.

But times change and so does our narration of them. The influence of Darwin on Marx is being reframed to emphasize instead how social forces and contexts influenced Darwin himself. A review of Darwin’s biography and personal letters describe how he hit upon the theory of natural selection. In 1838, he “happened to read for amusement Malthus on Population, shortly after returning from his voyage around South America on board the HMS Beagle (Darwin 1858: 42-43 cited in Hubbard 1982:24).” In his letters, Darwin acknowledged an intellectual debt to, as well as the phrase “survival of the fittest” from, the writings of Herbert Spencer, a mid-19th century social theorist (Hubbard 1982).

When Karl Marx and his longtime friend and collaborator Friedrich Engels read Darwin's book on natural selection [*On the Origin of Species* in 1859], their correspondence about it noted its close resemblance to the economic theories of free-market capitalism that were so fundamentally altering the character of English society and, increasingly, world society at the time. Marx noted to Engels in a private letter in 1862, "It is remarkable how Darwin recognizes among beasts and plants his English society with its division of labor, competition, opening of new markets, inventions, and the Malthusian struggle for existence" (Meek 1971).

The latter refers to Thomas Malthus' theory that population growth grows faster than our ability to produce food. I might also add that Darwin's Malthusian image persists today with the tendency—especially among ecologists—to view population dynamics deterministically and monolithically as *the* cause of ecological change. Population growth is highlighted even when evidence suggests that other processes such as consumer demand, treadmill of capitalist production, and maldistribution of resources also set the wheels of environmental change and degradation in motion (e.g., Ehrlich 1968).

The point here is that the two scientists who first hit upon the theory of natural selection—Darwin and his lesser known contemporary Alfred Russel Wallace—were living in the midst of the world's first truly capitalist industrial society: 1840s and 1850s England. How might they have "seen" nature and ecological processes if they were living in a more communitarian, cooperative and socially homogeneous society? It is clear that their most influential work, their view of what nature is and how natural systems operate, reflect not only scientific observation but also the social and political milieu in which those observations and subsequent theoretical explanations were made.

Moreover, Marx and Engels were bothered by the way Darwin's work enables science to be used as source of political legitimization. Their concern is with a process that some refer to as "naturalization"—the claim that if something is natural, it can be no other way, it is inevitable. If capitalism resembled so closely the laws of nature, the argument could and was being made that it also is inevitable. Bell (1998) points out that we routinely talk about the economic "forces" of capitalism, such as innovation and competition, as if they were pseudonatural processes, implying that any other arrangement would be somehow unnatural. We also talk about the marketplace as a "jungle" in which you have to "struggle to survive."

Others have gone on to prove their concern that "naturalization" arguments could and would be used and misused. Many so-called laws of "human nature" by self-labeled "Social Darwinians" and others (including the Nazis) have been justified on the basis of "human nature." Arguments attempting to prove inherent differences in the capabilities of different human "races" have been used to justify social programs, brutal racism and the annihilation of people (i.e., defended as "ethnic cleansing"). At different times, "survival of the fittest" has been used as a rationale to defend the transfer of wealth from one group of people to another, often under conditions where the social structure of opportunity is highly unequal. Naturalization arguments disguise underlying political and economic interests, conflicts and competitions.

Furthermore, an emphasis on seeing certain human actions and nature as "natural," and hence innate, essential, eternal, nonnegotiable and off-limits to critical questioning and scrutiny, also flows from the appeal to nature as a stable external source of nonhuman values against which human actions can be judged without ambiguity. This is very compelling. However, this becomes far more problematic when you consider that scholarship across many fields has demonstrated that our views of nature—human and in the natural world—are far more dynamic, malleable and enmeshed with human history than popular beliefs about some "balance of nature" have assumed (Botkin 1990). Many studies call into question the validity of appealing to nonhuman nature as an objective measure of ourselves and our relationships with nature.

The stance of viewing human nature and various other aspects of our world as "natural" is, in fact, a centuries long dispute entailing "realists" versus "constructionists." The tension was in full evidence in the papers written by Callicott and Foreman (in this volume) and in the reading by Gary Snyder. Realists, characterized by Forman, focus their attention on material processes and factors such as consumption, economy, technology, development, population and especially how biophysical processes shape our environmental situation. They stress that environmental problems cannot be understood apart from "real" material processes and believe that scientists can ill afford to ignore the material "truth" of environmental problems and the material processes that underlay them. Realists tend to view nature and what is natural as a self-evident truth that we should open ourselves to see and appreciate. Constructionists do not necessarily disagree, but they emphasize the influence of social forces and ideas in how we conceptualize those "threats" or the lack of those "threats." Constructionist approaches, illustrated in the talk by Callicott emphasize the ideological origins of environmental problems, including what becomes defined and accepted as problems (or as nonproblems). Though strongly criticizing constructionists, Gary Snyder, nonetheless, illustrated how social construction in the form of the human imagination and poetry serve major roles in our relationships with nature. He reminded us that a map is not a territory, or a menu the meal but rather symbolic representations of the real, material phenomena.

## Beyond Dualism

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Each of the above approaches defines and seeks to understand a dimension of nature, wilderness and the threats to wild places and processes. Therefore each position taps a partial reality; each has certain strengths and certain weaknesses. A major benefit I see of the materialist position is its grounding in particular people and places, and on particular ecological processes and consequences. In contrast, a benefit of the social constructionist approach is its recognition that what we understand as nature, natural or as problems are also based on a long and complicated human cultural and political economic history. I think it is an important insight to recognize that while nature, indeed, has a physical reality, how we apprehend that reality never occurs outside a social context. The meanings and measures people assign to nature cannot help but reflect that context.

But what are the limitations of each approach? When social constructionists do not seriously and dynamically draw material processes and ecological consequences into their analysis, I think they are flawed. The result is an untenable relativist position. For example, while a clearcut may appear innocuous and even beautiful to a resident of Forks, WA (whose interest is served by seeing it as a temporal, if not “natural” part of his or her landscape), it does have physical effects on the ground: on soils, vegetation, wildlife, etc. These material consequences need to be incorporated into management decisions. But when materialists do not consider how social selection, reflection and self-interest affect their visions, and that their vision is one of many others, their position is also flawed and limited. I think there is much to be learned by examining the charge that wilderness advocates created a movement based on a partial view of nature and set of meanings, which have become what Callicott referred to as the “received wisdom” of wilderness. Attention to this critique can and already has opened up space for broadening areas of concerns and the types of places and people involved in wilderness studies. For example, in Foreman’s talk he explicitly included values besides recreation as a goal of wilderness management, particularly ecological function, and he specified that wilderness lands can and should include non-pristine places across the matrix (i.e., outside core areas). Lastly, he deliberately included photos of females in wilderness (though they were just female versions of “macho” rafters/recreationists).

Again, it behooves us to define our terms. What exactly does the wilderness “received wisdom” or “discourse” entail? I prefer to talk about “discourse” because it has become part of the lexicon and methodology (“discourse analysis”) in critical analysis of the making and unmaking of “the” idea of wilderness. In everyday speech, discourse is used as a “mode of talking.” Yet as Maarten Hajer (1995) notes in *The Politics of Environmental Discourse*, in the social sciences, discourse analysis aims to understand why a particular understanding at some point gains dominance and is seen as authoritative, while other understandings are discredited. Discourse analysis is concerned with analyzing the ways in which certain problems are understood and represented to others, how conflicting views are dealt with, and how coalitions on specific meanings somehow emerge. Most importantly, a discourse expresses ideas, images and words that are handed down to us as self-evident truths, as natural - it just couldn’t be otherwise. But of course it can. Baird Callicott provides a rich discussion of the major substance of the wilderness discourse, and the charges against it; so has Daniel Botkin (see contributions in this volume). I do not need to repeat them here. According to them the dominant wilderness discourse has been based on wilderness as balanced ecosystems, beautiful, inspirational places and devoid of people. Though others would say that wilderness is based on naturalness, remoteness and solitude.

The dimension of wilderness that I have worked most closely with is the role of people within wilderness, especially people whose livelihoods are tied to natural resources. In the wilderness discourse, human action is often pitted against the well-being of the natural environment. Wilderness, by law and practice, is a place where people can visit, recreate but not remain, and surely cannot work. “Work” versus “play” is another one of those binary juxtapositions that has historically been associated with wilderness debates, and has served

to widen rather than bridge understanding and advocacy of livelihoods that are compatible with ecological processes. Richard White (1996) in “Are you an Environmentalist or Do You Work for a Living?: Work and Nature” takes on the fallacies of this duality directly. By failing to examine and claim work within nature, environmentalists have been seen as insensitive to the needs of labor, he says especially to those working-class people whose livelihoods have been tied in the past to extractive enterprises. The failure to bring work—or labor and class issues in general—into the environmental conversation has ceded valuable cultural capital to the so-called “wise-use” movement. But as White points out, the wise use movement is not importantly concerned about work and the concerns of the working class. Instead, they turn issues of real work into those of invented property rights; they pervert the legitimate concerns of rural people—maintaining ways of life and getting decent returns on their labor—into the special “right” of large property holders and corporations to hold the natural world and the public good hostage to their economic gain. Acknowledging a place for people and work in nature is about identifying and supporting practices that tie livelihoods to maintenance of ecological function. Work that does not support and sustain the integrity of large ecosystems is not fostered. Gary Snyder’s charge that environmental historian Bill Cronon represents the intellectual “high end” of the wise use movement falls into this simplistic, dualistic and ultimately unproductive gulf. If Cronon can conceive of work in nature, surely he is one with the wise use movement and its earth-devouring, corporatist, invented property right arguments. But Cronon’s works never make this point. Quite the contrary, his essays on nature and wilderness speak to the social and political factors that lead different peoples and corporations to conceive of and use natural resources as they do, often in highly environmentally degrading ways.

I would like to note that not only environmental philosophers and environmental historians acknowledge and critically examine the dominant wilderness discourse. Botanists Gomez-Pompa and coauthor Kaus identify and discuss a “wilderness myth” and furthermore, the need to “tame it” (Gomez-Pompa and Kaus 1992). Never once using the phrase “wilderness discourse,” they nevertheless squarely capture its meaning when they suggest, “Through time and generations, certain patterns of thought and behavior have been accepted and developed into what can be termed a Western tradition of environmental thought and conservation (Gomez-Pompa and Kaus 1992).” These biologists ask whose “ideal” or “idea” is this, and who benefits or loses from it? Baird Callicott’s analysis of the wilderness myth amply demonstrates that women, native peoples, and an array of different values and traditions of living with nature have been denigrated, usurped, or ignored because of the logic of the dominant wilderness discourse and its incorporation into international park planning models. These injustices have been particularly true in tropical developing countries where park planning has been based on Western protected-area models which, until recently, did not incorporate meaningful participation and vested interest of resident peoples (West and Brechin 1991).

But in the critique and refashioning of our ideas of wilderness and protected-area management, have we replaced one set of partial images and self-selected dogma with another? I turn now to my second theme.



## Remaking Wilderness and Nature Protection: New Possibilities, New Risks

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As academics and planners rethink ideas of wilderness and the practice of wilderness management, attention is being redirected to how peoples and communities with interests in these areas (or living within or next to “buffer zones”) can be involved in their comanagement (West and Brechin 1991; Western and Wright 1994). Attention is also being directed to how to include people, communities and natural processes on “matrix” lands—places that connect “core” protected areas and move beyond islands of biodiversity to protecting, restoring and managing landscape-level ecosystems. While one can discuss the degrees to which some of these places are “self-willed” or bear the hand of human. It is increasingly recognized that there is no place on the planet not subject to some impact or decision of human action. As discussed above, active ecosystem manipulation may be hidden behind a screen of naturalization arguments. Many of my social scientist colleagues (including myself) are happy to accept the view that all places are manipulated by human action because it fits with places we have studied and, more fundamentally, because it provides a revisionist view of nature that squares with our political and social justice goals. These include contesting coercive forms of conservation and helping to reclaim resident and working people’s history, land rights and livelihoods.

However, biologists such as Vale (1998) warn that whether a landscape’s fundamental ecological processes have been altered by human actions, significantly or not, needs to be empirically examined and not determined because of one’s commitment or lack thereof to a social ideology. He sees debates regarding the prevalence of “humanized” landscapes as crystallizing into two polar opposite positions: One either sees nature as “self-willed,” largely untouched by human action, and reserved for recreation, *or* one sees nature as guided by human hands, personal, subjective and a landscape of everyday living and work. But isn’t it unrealistic to expect that only two categories of human-ecological interaction—nature as pristine or humanized, nature as stranger or home—are sufficient to capture the complexity and messiness of the real world? We need to be self-critical and honest about how our science is affected by our political goals and ever cautious of the seduction of binary categories.

But as a sociologist, this new debate raises questions of how resident and working peoples and rural communities have been constructed in the “old” received wisdom, and how they are being reconstructed in what may be understood as a “new” humanized wilderness discourse. By rural, I refer to the people who reside within or near to wilderness areas and/or their buffer zones. In the introduction to their 1996 book, *Creating the Countryside: The Politics of Rural and Environmental Discourse*, DuPuis and Vandergeest warn that rural peoples and communities—just like landscapes—are often portrayed in simplistic and binary terms. Specific words are chosen and deployed to communicate these dualistic meanings and to give privilege to one set of meanings over others. Rural peoples are represented as *either* destroyers of nature, “slash and burn” farmers, “addicts” to extractive industries,

uneducated, irrational, backward, traditional and in need of outside “progressive” assistance, or they are represented as living closer to nature, holders of “indigenous knowledge,” sacred, located in the past and the periphery, and able to sustainably manage their local environment through local customs and social institutions (the classic “ecological noble savage” image).

In both cases, the tendency is to view rural people and places generically and as having some essential characteristic, rather than to understand them within their particular historical and social contexts. In addition, I think there is a pattern for rural peoples and communities to be viewed as destroyers of nature in the United States, given their reliance on extractive industries such as mining, logging, grazing and commercial, petrochemical based-farming; and they provided political action in support of these industries. Given this history, it is not surprising that there has been a reluctance on the part of conservationists to envision how rural peoples and rural livelihoods could have played any significant role in the formation of wildlands or in any potential role they could play in the restoration and protection of large wildlands in the future. In the United States policy emphasizes *ecosystems* and *ecosystem management*. But while I understand this logic, I think it underestimates the importance of rural places, peoples and livelihoods in the management of large wildlands. I’ll return to this point in the conclusion.

In contrast, in the tropics, the tendency is to highlight the role of rural peoples, livelihoods and communities in altering landscapes, and to place a lionshare of hope for tropical conservation in them. This has led to an emphasis on *agroecosystems* and *agroecosystem management*. In the 1980s, attention to the critiques of coercive conservation based on the wilderness discourse led to a reframing of environmental protection as compatible with economic development. Operating under the rubric of “sustainable development,” projects have been funded around the world to “integrate” local livelihoods with environmental management (Wells and Brandon 1992). The idea of sustainable development legitimates “green” production, capitalist expansion and accumulation that tread lightly on the earth. We can have our cake and eat it too. The positioning of development and environmental protection in the 1980s as compatible rather than as in conflict (as was the case during the 1960s and early 1970s) is one of the most important and shrewd shifts in human-nature thinking during my time. Many suggest it remains a contradiction in terms (Redclift 1987).

A modification of integrating economic development with environmental protection, especially to meet goals of “local participation,” is focusing attention on “community” as the social management unit for implementing sustainable development. “Community-based conservation” or “community-based natural resource management” has become a shining light of conservation efforts in the tropics (Getz and others 1999; Western and Wright 1994). Community and citizen-led conservation efforts are also sprouting up across this country. The Sonoran Institute, for example, emphasizes “community stewardship” as its approach to integrating environmental protection and community economic development.

Support for emphasizing community in conservation stems from a variety of factors, including recognition of the role of rural communities—largely in the tropics—in developing sophisticated common-managed property and resource management customs which, until the intrusion of the modern state, market, and demographic pressures, were able to sustain both livelihoods and fundamental ecological processes. Advocates of community-based conservation argue that resident or rural peoples have a greater vested interest in the long-term condition of local environments than absentee corporate managers, have intimate local knowledge that can be applied and are less bureaucratic and hence more efficient at implementing conservation and development efforts. In any event, they point out that it is worth paying attention to the man or woman with the shovel. They, not the erudite social theorist or biologist sitting in our offices, will ultimately decide the fate of the forest—as the saying goes. I find it very interesting that many of the people utilizing a variation of this approach in the United States (e.g. Greater Yellowstone Coalition, Y2Y and Sonoran Institute) have considerable prior experience working in the tropics, many in Latin America.

Sociologist Arun Agrawal (1997) also suggests our enchantment with community in conservation—across the globe—builds on our current dissatisfaction with theories of progress and centrally-planned development and conservation. As Callicott and others have described, the designation of parks and implementation of protected-area management policies have often displaced resident peoples, “coerced” conservation and sanctioned violence, especially in ex-colonies and places where indigenous peoples do not have economic or political voice (West and Brechin 1992; Peluso 1993). Community conservation has rekindled hope around the world that concerns for place, devolution of power, and revival if not initiation of new democratic institutions based on civic activism, can and will take a place in environmental management.

While strongly supporting the rationale for community based conservation and the value of local, place-based conservation efforts, I offer the suggestion that we need to be careful not to replace one monolithic understanding of rural peoples, communities and dynamics of ecological change and development with another. More specifically, I think we cannot presume the existence of “ecological noble communities” nor universally position them as the cornerstone of every conservation effort—whether in the tropics or elsewhere. Let me give you three reasons why I think so.

First, not all marine or forest-dwelling communities have the local governing bodies, educational skills, technologies, social customs or conflict resolution skills (or the social capacity or social capital) to sustainably manage their environments and natural resources. Some have. Some haven't. Some had at one time. Some never had. In some instances there may be other local institutions or governing bodies (that is besides “the community”) that should be considered in the local or comanagement of natural resources.

Second, the celebration of community in conservation has taken the limelight off of more powerful actors and global trends, such as the actions of transnational corporations, international monetary lending institutions, multilateral trading treaties (such as NAFTA, GATT) and organizations (WTO) which exert tremendous influence on the

way “nature” is converted, commodified and compromised. IMF debt-restructuring policies are creating environmental and socioeconomic structures that compel if not determine choices and actions in the rural hinterlands.

A fatal implication of the social constructionists' ascendancy is lack of attention to how political and economic institutions and relations operating at the global or “nonplace based level” affect social and ecological interactions at multiple scales. Even where community-based efforts may be able to mitigate local impacts of global threats to sustainable living, they merely treat symptoms and do not necessarily resolve underlying causal mechanisms (or contradictions) operating at broader levels. The products of such contradictions are merely transported or felt elsewhere.

Third, those in control of conservation policy and practice do not often have an accurate understanding of communities and ecological processes, or of the supra-community political and financial constraints under which they operate. I do not think all images are equal. Thus, even in the good name of community (or the discourse of sustainable development, I should add), many social and ecological disasters have been produced. For example, in the Amazon, the insistence on “seeing” the tropical rain forest as exuberantly fertile negates the reality of infertile tropical soils and the disasters of large-scale grazing and colonization schemes. Slater (1996) suggests that we are fascinated with rain forests and rain forest peoples because they represent an “Edenic Narrative” or new Garden of Eden stories, complete with tales of natives living in complete harmony with nature and divine creatures, dramatic falls from grace and subsequent nostalgia for paradise. But based on her research, she contests these images as skewed and static. Furthermore, modern construction of these images is increasingly controlled and manipulated by corporate interests, such as travel agencies, fertilizer companies, media networks, etc.

Having lived the past 15 years off and on in rural communities in Southeast Asian tropical environments, and more recently this last spring in a remote rainforest community in Central Sulawesi, I am acutely aware of how careful we need be about imposing static categories and strategies on people in the name of conservation and development, or thinking nature is merely an abstract idea. In this village, residents are responding in diverse ways to the political and economic changes occurring in Indonesia. While some cling tenaciously to strategies to maximize food production and security, others are rapidly transforming traditional agroforestry systems to sun-grown cacao monocrops, a commodity trading high on the global market and a cultivation method like sun-grown coffee aimed at maximizing quick returns. Some are embracing political opportunities to be citizens in “New” Indonesia, others resist “reformasi” as just more of the same.

This is also a community with few traditional forest management customs and social institutions. How to build on community values and practices while working to maintain rain forest ecological processes is a dilemma facing myself and my physical scientist/colleague/husband in our collaboration with The Nature Conservancy and Indonesian Park and Forestry officials to develop strategies that integrate conservation and development. There was no presumption or image to uphold, however, for my 10 year old son who directly lived the “edenic” experience. Not expecting the

people to act one way or another toward nature, he was very disturbed during our stay when village kids shot colorful songbirds with their slingshots, or tied their legs to sticks as toys. He disliked immensely using the river for human waste disposal, bathing and drinking. But he was most alarmed at his dad's near-fatal illness, caused by a virulent strain of new biodiversity—chloroquine resistant-cerebral malaria. We were indeed living closer to nature, but not the kind he could romanticize.

So what is my point? The tendency to see rain forest peoples as either in the state of original innocence and harmony with nature *or* after the fall misses the messy reality of the diversity of peoples, desires, experiences and (changing) relationships with (changing) nature. Our view needs to remain wide enough to contemplate broader political and corporate forces affecting local peoples and local environments. Generic understandings do not capture the dynamic, often chaotic and complex nature of social forces and their interactions with nature (or how people interact with changed or “second” nature). And generalizations do not alert us to the disasters created when policies are based on imaginary communities and imaginary people-nature relationships.

A paper I recently completed details the problems I observed in an acclaimed community-based wildlife conservation effort in Belize (Belsky 1999). Conceived by a group of very well-intentioned wildlife biologists, the project was based on generalizations of some essentialized, traditional, Creole community and how “links” could be formed between ecotourism and community support for hunting regulations and conservation. The planners paid no attention to local history, politics, social change or the ties between this local community and the broader political economy. Lacking the social institutions and material resources to support the mental picture the planners carried in their head (and successfully communicated to funders), the project exacerbated intra-community rivalries and incited a backlash to the very conservation values it had hoped to foster. Dominant groups in Belize and elsewhere have been able to exercise control not only over land, labor and other productive resources, but also over the production of meaning. Sometimes these dominant groups are classes and states; in other contexts, they include environmental organizations, scientists or well-meaning social and ecological activists, perhaps like ourselves. We are often able to impose modern (or postmodern) categories on the landscape and the people who live there; and draw strict, if not inaccurate boundaries between multiple, fluid categories of people and space. And they have been able to justify such partial and self-interested actions by claiming that they are “natural.” When backed by power and capital, dominant groups are able to control the meanings which bolster policy and practice, even when a larger less powerful majority thinks otherwise.

What then are the policy implications for the ways we think and rethink humans' relationships with nature? I consider this question as we turn to my last theme of wilderness policy.

## Conclusion: Implications for Wilderness Management and Policy

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In this paper I have emphasized the interplay between material factors and ideas in the development of wilderness studies, science and policy, and why neither a focus solely on ideas, ideologies and cultural constructions, nor a focus solely on material processes and physical threats to environmental protection, is sufficient. Attention to their interaction is critical, as is how such interaction occurs at multiple scales (that is across space and over time). Serious discussion and dialogue, not just casting aspersions on opposing positions and their advocates, is necessary. However, doing so as Foreman and others point out, is a political act in itself and undermines the authority of some standpoints.

My second point applied critical attention to the opportunities and dangers in replacing the “received wisdom” on wilderness and strategies to protect wilderness and ecological processes, with a new set of assumptions and policy prescriptions. I suggested there are both potentials and pitfalls with uncritical acceptance of thinking of all landscapes as either “self-willed” or altered by human action. Similarly, we cannot know without examination of a particular social context if local participation can be accomplished through community institutions or some other local institutions, or how viable is a particular approach to integrating conservation and local development (for example, developing rural ecotourism, nontimber forest products, or value added enterprises). The emergent discourse on the benefits of collaboration over confrontational politics and litigation is another “received wisdom” that may also depend on context and the particular dispute. In all of these cases, I suggest analyses need to embrace the interplay between materialist and idealist approaches.

From the social constructionists,<sup>7</sup> I applied the insight that we all operate out of partial understandings based on our own processes of social selection, social reflection and self interest, as well as the suggestion that the labels we use and the stories we tell about nature and social relationships to it are more than just mental constructs or images. They form the institutional basis for conservation missions, policies and interventions. We need to pay attention to them. For these reasons, while not sufficient to make a movement, it does matter what you call the movement. The idea and term “wilderness,” regardless of its biases and problems in practice, has mobilized a global movement. And I think it will continue to motivate people to seriously consider the movement, moreso I suspect, than if we replace the term “wilderness” with “biodiversity reserves,” as suggested by Callicott. Despite the fact that reserves were created as a response to privatized hunting reserves, there is still something disturbing to me about “reserving nature.” The term begs the difficult question: reserved for what and for whom? The term is also limiting because it suggests ecological and other values should guide action in only designated “reserves” rather than across the landscape. I like Foreman's imagery of rivers and blended

currents. It conjures the ecological dialogue and integration of approaches I also support. However, a colleague reminded me that rivers are also full of turbulence and the possibility of getting swamped.

Our discussion of ideas and words is not just an academic enterprise. When particular viewpoints are backed by political power and funding, they move out of our heads and into the realm of action. They have important consequences for people and habitats (Zerner 1996). I'd like to be very specific with what I see as policy consequences resulting from the different discourses I've raised in this paper. I should also emphasize that the discourses I'm talking about are also imagined models. They are not static. They have been influenced by these debates. Below, I summarize some of the ways our thinking about humans relations to nature have shifted, and their policy implications. To the extent I am aware of particular efforts that incorporate these insights, I briefly acknowledge them.

1. *The concept of "wilderness" has multiple meanings. We need to make visible or less "mystified" how human actions and social processes affect both the concept as well as the actual places we label as "wilderness."*

I think this point creates much confusion, anger and backlash. It is also the most subtle, but perhaps most powerful. For the many reasons discussed above, we need to be cautious in seeing certain human actions and places as "natural," inevitable, inherent and hence off-limits to critical questioning and scrutiny. A failure to examine and reveal the history of particular peoples and places, including the history of our ideas of them, enables naturalization arguments to exist and persist. We also need to acknowledge that different understandings serve different interests, and hence that wilderness science involves political choices.

2. *Because of past conceptions of wilderness, places without people have received considerably less attention in wilderness science. However, as conceptions of wilderness expand, including their role in protecting and restoring ecological processes across broad landscapes and ecosystems, places within and beyond "core" areas are being incorporated into wilderness science.*

We see this above shift in the Wildlands project and efforts such as Yellowstone to Yukon ("Y2Y"). These projects are trying to pay attention to regions outside of "core" protected areas and reserves. This includes lowlands that provide critical habitats and biological corridors between core areas. They are also trying to find ways to incorporate attention to the people and economic processes that have direct bearing on these ecosystems. For example, the Sonoran Institute highlights building community stewardship and sustainable livelihoods as integral to its environmental protection efforts. I have been personally involved in a project aimed at transnational and trans-community approach to protected-area management in the Maya Forests across Belize, Guatemala and Mexico. But so far this latter project has been quite limited in space and scope. Another example, The Northern Rockies Ecosystem Protection Act ("NREPA"), seeking to develop legislation and venues to implement conservation across broad landscapes, has yet to significantly link ecological and economical policies across its targeted area. Notably, its plans include measures that include private working ranches in biological corridors. However, NREPA was planned without direct involvement

of private landowners who reside in the various proposed corridors, nor has it developed its policies around the proprietary and other concerns of these private landowners (Wilson and Belsky 1999).

3. *The new wisdom is critical of the view that casts working rural people and development as enemies of environmental conservation.*

We need to maintain a healthy skepticism about what livelihoods and which economic practices are compatible with (particular) ecological processes. Long term social and ecological monitoring is critical. How to build collaboration between rural peoples and scientists, as well as with corporate private landowners, remains a fertile area for experimentation and adaptive management. Mandating collaboration between historical adversaries is not the answer.

4. *Much sensitivity has been developed over proposing universal wilderness protection following a "hands off" policy. Such a policy will be unsustainable under particular demographic, economic and customary property rights.*

Until recently, the largest conservation organization in the world, the International Union for the Conservation of Nature, (IUCN) provided the conceptualization and blueprint for protected-area management. IUCN's schema divides space in terms of a set of categories and prescribed behaviors: core areas, buffer, production and use zones. Some now may include biological corridors. These models are still universally applied without specific understanding of particular rural peoples' colonial, ethnic, customary property rights, local knowledge, and involvement in the global political economy, or without sufficient rigorous ecological assessment.

5. *As the concerns of wilderness science expands, the tool box of techniques for studying, managing and protecting large wildlands and ecological processes must also be broadened.*

Merely mapping, zoning and restricting human use are not sufficient for managing wilderness and large ecosystems. Even where designations are made, any one place may not be able to honor every wilderness value. Nor can any management tool or strategy be assumed to be inherently appropriate. In some instances management may best entail individual (landowner) strategies such as placing conservation easements on particular properties, or they may entail community-based solutions built on viable community institutions, such as employing planning boards to develop zoning schemes. In other cases, the lawyers may have to be brought back in. We need to be careful not to pick a favorite strategy and become the kid with the new hammer—everything we see needs to be hammered!

In conclusion, we need to recognize and move beyond simplistic and narrowly paradigmatic (or singularly disciplinary) ways of conceptualizing problems and imagining solutions. In particular we need to transcend thinking in binary, opposing categories and be wary of the seduction of universalist solutions and models. These are not easy tasks. Discussions on the relationship between humans and nature favor extreme positions, sound bites, and avoidance of self-criticism. It is hard for most of us to know how to analyze complex linkages and multi-scaled phenomena such as environmental change whose causal mechanisms are not place- or disciplinary-bound. Most of us can gain only a partial understanding of these phenomena. Rather than become

humble in the face of such an awesome undertaking, we take sides. We make enemies of other viewpoints or positions. We encounter opposing perspectives not to understand them, but to discredit them. To avoid controversy, we learn instead to be cautious and to mute critical inquiry that stirs up challenging or difficult ways of framing discussions; or reveals our own limitations. We don't permit self-criticism for fear that we will threaten our cause. And we create the impression that you're either for the environment or against it. But there are many dangers when we refuse to critically assess our own assumptions, methods and recognize our own dogmas. As Cronon (1996) warns,

At a time when threats to the environment may never been greater, it may be tempting to believe that people need to be mounting the barricades rather than asking abstract questions about the human place in nature. Yet without confronting such questions, it will be hard to know which barricades to mount, and harder still to persuade large numbers of people to mount them with us.

I hope this paper has raised some of those difficult and abstract questions, and more importantly, suggested some ways of beginning to shape responses to them.

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# Wilderness Science: An Oxymoron?

Daniel B. Botkin

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**Abstract**—Can researchers use the traditional scientific method in studying wilderness without violating the concept and wilderness law concerning “untrammelled” land? This philosophical essay seeks to answer that question through historical review and literature overview, suggesting how science and the study of wilderness can be compatible.

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Can one study wilderness scientifically? The modern idea of wilderness, including the statement in the 1964 U.S. Wilderness Act, provides strong limits on human impact. The U.S. 1964 Federal Wilderness Act defines wilderness as a place “untrammelled” by human beings and where people are only visitors. Trammel is itself an interesting word, referring literally to a certain kind of net for catching birds or fish, so that a “trammelled” area would be one in which people had trapped living things, removed them, in this sense had a direct impact. The general idea of an untrammelled area is explained in additional phrases of the Wilderness Act, which goes on to state that a wilderness area “(1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition.”

But the scientific method requires direct detailed observations, experimentation with controls and treatments, the development of theory, the search for generality, and the requirement that hypotheses are statements that can be disproved. The conundrum is: Can scientists use this method without violating the idea or the reality of wilderness?

## Research Approaches

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There are several possible resolutions to this conundrum. One is that studies might be done elsewhere, outside of wilderness, whose results could then be applied to wilderness. But this assumes either that (1) the ecosystem states that exist outside of a wilderness system include all the set of states found within the wilderness; or (2) that there are general rules or laws about ecological systems that will apply directly to *unstudied* wilderness based on studies elsewhere. The first assumption is difficult to meet,

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although not necessarily impossible. For example, under sponsorship from NASA, I and my colleagues conducted a study of the potentials of remote sensing to observe successional states of the boreal forest. As the study area, we chose the Superior National Forest in Minnesota, which includes the famous Boundary Waters Canoe Area, one of the first legally designated wilderness areas under the Wilderness Act. Because this region of the boreal forest is subject to wildfires, the forest, both inside and outside the wilderness within the national forest, have a similar range of states. Heinselman (1973), in a famous paper about the Boundary Waters Canoe Area, made use of historic records, measurements of forests stands, and fossils to determine that, on average, the entire BWCA burned approximately once a century. Thus the kinds of states of the forest and the range of states found inside the wilderness also occurred outside. Additionally, we were able to use remote sensing to determine the change in successional states of hundreds of thousands of stands both inside and outside the wilderness. In this case, experimental manipulation of stands outside the wilderness but within the national forest would include the range of states found within the wilderness (Hall and others 1991).

The boreal forests offer the potential for such a comparison because this forest type cover a very large geographic range, some of which meets the legal requirements of wilderness. But other ecosystem types no longer have such representation. For example, it would be difficult to find large areas of North American prairie with representation of all successional stages both inside and outside of legally designated wilderness.

## Wilderness as Nonsteady-State Systems

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The second assumption, that there are general rules or laws about ecological systems that will apply directly to *unstudied* wilderness based on studies elsewhere, is an untested hypothesis, itself requiring research that is likely to require direct intervention in wilderness areas. Ecological systems are so complex, and scientific research about them so new, in relative terms, that we do not know whether that generalization is correct. And since natural ecological systems vary greatly in space as well as in time, many such tests might be required.

Throughout much of the twentieth century, scientists believed that wilderness achieved a steady-state, and that one had only to study this steady-state condition to understand, forecast, and manage wilderness. For example, in the early 1950s, Rutgers University purchased Hutcheson Memorial Forest, a 65 acre stand known never to have been cut—it had been owned by a single family since European settlement in 1701 and family records showed that the stand had remained an unused woodlot. An article in

Audubon in 1954 described this wood as “a climax forest...a cross-section of nature in equilibrium in which the forest trees have developed over a long period of time. The present oaks and other hardwood trees have succeeded other types of trees that went before them. Now these trees, after reaching old age, die and return their substance to the soil and help their replacements to sturdy growth and ripe old age in turn” (Botkin 1990). *Management* of such an area, if it really were in steady-state, merely required the removal of any human actions. Nature would then take care of itself. Wilderness management policy could merely be “hands off.”

But research on ecosystems and populations during the last 30 years of the twentieth century made clear that natural ecological systems are not in steady-state. They change in response to environmental change, and in response to internal dynamics. Many species are adapted to, and require, these changes. What then is the solution? How can there be a wilderness science in nonsteady-state systems?

## Wilderness and Naturalness

One solution lies with the difference between the idea of what is *wilderness* and what is *natural*. According to the old, steady-state idea, these would be identical: a wilderness area would be natural, and a natural area would be a wilderness. But if ecological systems are always in flux, then perhaps what is natural might not fit the classic idea of wilderness. And perhaps a studied and manipulated area might be natural. Part of the resolution of this question lies with an understanding of physical phenomena, but part of it lies with people’s attitudes, beliefs, and desires. We must ask: when is it that people are seeking to conserve and understand about *wilderness*, and when is it that they are seeking to conserve and understand a *natural* area?

The difference between wilderness and a natural area is illustrated by a classic example of a problem in the conservation of an endangered species, the Kirtland’s warbler. In 1951, a survey was made of this warbler, making it the first songbird in the United States to be subject to a complete census. About 400 nesting males were found. But concern about the species increased in the 1960s when the population declined. Only 201 nesting males were found in 1971 (Byelich and others 1985). Conservationists and scientists began to try to understand what was threatening the species with extinction.

They rapidly recognized the problem. Kirtland’s warblers breed only in young jack pine woodlands in southern Michigan—between 6 and 21 years old. The warblers build their nests on dead branches near the ground. Young trees, between 5 and 20 feet high, retain these dead low branches. Because of fire suppression and the replacement of jack pine stands with forests of commercially more valuable species, Kirtland’s warbler nesting habitat was disappearing (Botkin 1990). Jack-pine, a fire-dependent species, has serotinous cones that open only after they are heated by fire, and the trees are intolerant of shade, able to grow only when their leaves can reach into full sunlight. Even if seeds were to germinate under mature trees, the seedlings could not grow in the shade and would die. Jack pine produces an abundance

of dead branches that promote fires, which is interpreted by some as an evolutionary adaptation to promote those conditions most conducive to the survival of the species.

The Kirtland’s warbler thus requires change at short intervals—forest fires approximately every 20 to 30 years—which was about the frequency of fires in jack-pine woods in presettlement times (Heinselman 1973). At the time of the first European settlement of North America, jack pine may have covered a large area in what is now Michigan. Even as recently as the 1950s, jack pine was estimated to cover nearly 500,000 acres in the state. Jack pine, a small poorly formed tree, was considered a trash species in the nineteenth century by the commercial loggers and was left alone. But many large fires followed the logging operations when large amounts of slash—branches and twigs and other economically undesirable parts of the trees—were left in the woods. Elsewhere, fires were set in jack-pine areas to clear them and promote the growth of blueberries.

Some experts think that the population of Kirtland’s warblers peaked in the late nineteenth century as a result of these fires. After 1927, fire suppression became the practice, and control of forest fires reduced the area burned and the size of individual fires. Where possible, it was the practice to encourage the replacement of jack pine with economically more useful species. These actions reduced the areas conducive to the nesting behavior of the warbler (Mayfield 1969).

Although it may seem obvious today that the warbler requires forest fire, this was not always understood. In 1926, one expert wrote “fire might be the worst enemy of the bird” (Norman A. Wood in Mayfield 1969). Only with the introduction of controlled burning after vigorous advocacy by conservationists and ornithologists was habitat for the warbler maintained. The Kirtland’s Warbler Recovery Plan, published by the Department of the Interior and the Fish and Wildlife Service in 1976 and updated in 1985, allocated 38,000 acres of new habitat for the warbler. There, prescribed fire would be “the primary tool used to regenerate nonmerchantable jack-pine stands on poor sites” (Byelich and others 1985).

Those who wanted to save this species acted from observation and made use of the scientific method. They were not working in legally designated wilderness areas, but worked in areas where active experimentation could be done. They were creating a natural area in the sense that it was natural for the warbler. The jack pine stands manipulated to conserve the Kirtland’s warbler could be considered “natural” in the sense that they were recreations of the habitat conditions that species had evolved within, adapted to, and required.

This episode indicated a turning point in the modern perception of the character of nature and the requirements to manage and maintain nature. If wilderness areas undergo natural changes, but changes have been suppressed, then management for wilderness requires imposing actions on the wilderness, thus violating the modern concept of wilderness and also perhaps violating the 1964 Federal Wilderness Act. It was possible to create a natural area, although this area might not meet the wording of the Wilderness Act.

## Wilderness as Solitude

A second solution is to focus on the additional statements in the Wilderness Act that I mentioned earlier: that a wilderness area “(1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition.” As with the Kirtland’s warbler managed habitat, the use of prescribed burning would create an area that “generally appears to have been affected primarily by the forces of nature.” It would also be possible to create areas that had “outstanding opportunities for solitude or a primitive and unconfined type of recreation” even if the area were heavily manipulated. Moreover, if the requirement is a general appearance of naturalness, where the activities of scientists are “substantially unnoticeable,” then perhaps sufficient research could be done in an unobtrusive manner, leaving the “wilderness” to “appear” completely “untrammelled.”

This is the approach that my colleague, Peter Jordan, and I took to the study of Isle Royale National Park, Michigan. This 280 square mile (540 square kilometer) island is one of the best examples of wilderness in the lower forty-eight states in the sense of an “untrammelled” place. Prior to European settlement, Indians visited the island to collect native copper, but did not settle there and had little direct affect. Since European settlement there have been several episodes of attempts to farm small portions of the island, some land was cleared. But in general little human impact occurred. Once the island became a national park, the National Park System established a series of hiking trails and campsites, along with boat access and two lodges, one at each end of the island (only one of which still exists). These alterations, however, affected only a small fraction of the landscape.

Isle Royale is famous for its high population of moose and for its wolves, both of which reached the island independent of human actions. We investigated factors that might limit the moose population of the island, focusing on a search for what nutrient chemical element might provide the ultimate limit on moose abundance. We established a statistically valid, stratified sampling scheme, sampling small plots within which we randomly selected rectangular volumes of less than a meter in diameter and three meters high. Within these, we clipped all leaves and twigs of species eaten by moose.

Few visitors to the island travel away from established trails. In his forty years of work on the island, Peter Jordan has not encountered another person when he has been at least 100 meters from a trail. The sampled areas were sparse and, given the high rate of natural disturbance of the island, especially from storms and the feeding by moose, these would be unnoticed by all but the most observant hikers and only by those that ventured long distances from trails. In short, we were able to conduct studies of the island wilderness in a way that would not leave traces obvious to others. Furthermore, the present condition of Isle Royale is greatly affected by the browsing of moose, which has led changes in the structure of the forests and to the relative abundance of

species. Spruce, which moose do not eat, has come to dominate areas where it was once a minor component. Moose have transformed areas of previously dense understory to near savannahs, where mature trees too tall for the moose to feed on remain as relatively scattered individuals, while the saplings and seedlings shorter than three meters—within the reach of the moose—are sparse. Accepting effects of the moose as “a force of nature,” visitors would find the island “generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable” meeting the appearances and the real concerns of the Federal Wilderness Act.

## Thoreau and Wilderness Science

Such a light touch approach might be possible for many wilderness areas. But some, to be managed well, require more intense intervention. What is the solution for these? Perhaps the answer lies with the idea of wilderness of Henry David Thoreau, often considered one of the fathers of modern environmentalism. His famous statement, “In Wilderness is the preservation of the world” is quoted frequently, both as an inspiration to conservationists and as an assertion of the importance of wilderness in the sense of lacking any impact of human beings. But this is not what Thoreau meant by that statement (Botkin 2000). In the essay in which that statement appears, Thoreau explains the why wilderness is essential. He wrote “From the forest and wilderness come the tonics and barks which brace mankind (Sattelmeyer 1980). The focus is on the importance of wilderness to people, not wilderness for wilderness’s sake.

Thoreau made three trips to the Maine Woods where he hiked and canoed within areas that he wrote frequently of as “wilderness.” However, many of these areas, he readily observed, had been subject to the hand of man. In his book, *The Maine Woods*, he states in one paragraph that white pine had been cut out by loggers from the area where he walked. Yet in the next paragraph or so he referred to the area as a wilderness, or described his reactions to being within a wilderness. The readily visible effects of human actions did not defer Thoreau from an experience of wilderness.

During his last trip to the Maine Woods, Thoreau became lost in Umbazooksus swamp, a large wetlands. He found that he was “soon confused by numerous logging-paths” made by lumbermen who had converted this area from “what was called, twenty years ago, the best timber land in the state” and “covered with the greatest abundance of pine.” At the time of that visit, Thoreau found pine “an uncommon tree.” He was well aware of the human impact on the woods. Yet a few paragraphs later he wrote that he went through a “wilderness of the grimmest character” occupied by dense cedar trees. The proximity of a selectively logged area to a dense stand of cedar did not affect Thoreau’s sense that the latter was a wilderness. The effects of people or their occasional presence did not destroy his *sense of being within the wilderness*. (Thoreau 1973). Nor did the existence of many dams, put there, as Thoreau notes, to make the transport of logs easier.

Thoreau distinguished between “wildness” and “wilderness.” For him, *wildness was a spiritual state existing between a person and nature, while wilderness was land or*



water unused at present by people, thus it was a state of nature. Contrary to the modern idea that wilderness must be a place untrammelled by human beings, Thoreau believed that human beings were “part and parcel” of wilderness, and that a wilderness lacking human records was a wilderness not of interest to him. In his book, *Cape Cod* Thoreau referred to the ocean as a wilderness of little interest because he could see no effect of Indians or other human culture, no touch of human history on this watery scape. For Thoreau, a wilderness without the touch of humanity and its history and effects were timeless and distant and therefore not of direct interest to him.

*Wilderness, for Thoreau, was the physical entity, was a place where a person could experience wildness or, if it was destroyed for this use, Thoreau believed that it should be converted to other humanly productive uses.*

The resolution suggested by Thoreau’s interpretation of wilderness and wildness is that it is possible to experience the sense of wildness within an area heavily affected by human activities. Thoreau distinguished between what was natural in its effects on him and other people (a place to experience wildness), and physical wilderness. If our society were to make the goal for wilderness the opportunity to experience a Thoreauvian sense of wildness, then experimental scientific research of a traditional kind would be compatible within wilderness, even if this research led to occasional, quite visible human effects on the landscape.

## Resolutions

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The resolutions to the conundrum: can there be a wilderness science? Lie with an acceptance of the naturalness of change and the lack of steady-state of ecological systems. Once this is recognized, the solutions that I have suggested follow. But as long as it was believed that a wilderness existed in steady-state, then the appropriate policy was no action. Nature knew best. Leave nature alone.

However, once that it is clear that natural ecosystems are always changing, then there is no single, simple answer to the question: what is *the* state of wilderness. There is not one wilderness state, but many. And therefore one has to ask: what is the *goal* for wilderness management for a specific wilderness area?

The requirement that we be active participants in the conservation and management of wilderness is all the more apparent today because human induced environmental change is global, and there are few areas untouched by artificial chemicals or a human-induced change in concentration of naturally occurring chemicals. Even at Isle Royale, artificial chemicals are detected in the waters. If global warming were to occur, massive changes would take place in wilderness areas, making some no longer suitable for the purpose for which they were designed.

I believe that there are several goals for wilderness and, therefore, for wilderness science because different people

desire different kinds of wilderness. These include: (1) wilderness that offers a sense of relief from the everyday cares of the world, that opens an opportunity to achieve a spiritual, religious, or creative and uplifting experience from nature; (2) a place within which one can test one’s survival skills and ability to cope with mountain climbing, the possible contact with dangerous animals and with isolation, relying on few modern pieces of technology; (3) the opportunity to appreciate scenic beauty of a particular kind; a valuation of a kind of rare and threatened ecosystem or a specific threatened or endangered species that appears to depend on states that one attributes to “wilderness”; (4) an area that represents an ecosystem as it was at a particular past time, such as prior to European exploration of North America. This idea of wilderness can be important to a person’s imagination of the area as unaffected by human beings in specific ways—either preindustrial, or preagricultural, or prior to any human impacts, such as the use of fire and the proposed extinction of large mammals or the introduction of exotic species. Finally, (5) another idea of wilderness the “existence” rational—the belief that some or many people want a particular kind of wilderness to exist whether or not they may visit it. Its mere existence satisfies either a moral or aesthetic need.

There can be a role, and therefore a location, for each of these five kinds of wilderness. But in the modern world, like it or not, given the modern understanding that nature changes *naturally* and also that human effects are worldwide, if indirect, then we must make choices, we must understand the dynamics of wilderness, and therefore we need a wilderness science. Leaving nature only alone will not work. And, as Henry David Thoreau understood, it is not likely to meet the needs and desires of human beings.

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# Wilderness Biology and Conservation: Future Directions

Reed F. Noss

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**Abstract**—The new conservation movement—uniting scientists and activists—seeks to relook at the role of protected land. The result is a redefining of terms, the encompassing of the concept of ecosystems, incorporating both scientific and nonscientific approaches to conservation, and reconsidering management. This philosophical essay speculates on the future of wilderness and conservation biology.

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The idea of wilderness is on the defensive these days. Under attack from commodity-extraction interests and conservative politicians, the old foes, and now blind-sided by politically-correct humanists and social deconstructionists, wilderness seems to have few friends. Besieged from the right and the left, both in their own ways portraying protection of wilderness as an elitist frill, the wilderness concept might appear to have outlived its usefulness. But this would be a fallacious conclusion. Although ecosystem management, too often proposed as a substitute for protection, is the pre-eminent theme within land-management agencies today, just as sustainable development dominates the international conservation agenda, another theme may become just as powerful. A new movement, representing an alliance of scientists and activists, is taking shape.

This new conservation movement, although young and not yet entirely on its feet, seeks to redefine the role of protected areas in conservation strategy. It seeks to base a greatly expanded network of wilderness and other protected areas on the principles and findings of conservation biology. In some cases, such as the reserve designs associated with The Wildlands Project and cooperating regional groups, the goal is not just to save existing wilderness, but to *re-wild* much of what has been lost. Among other things, this means bringing large carnivores, wildfire and other inconveniences back into landscapes where they have been eliminated or reduced. More modest examples of the new conservation movement can be found in state and federal agencies, land trusts and many other traditionally moderate groups. Yet the conservation proposals coming out of some of these moderate groups—for example, state agencies in Florida—are as radical as any you would have seen in the pages of the *Earth First! Journal* just 10 or 15 years ago.

I have defined conservation biology as science in the service of conservation. But why do we need science for

wilderness? Isn't wilderness preservation more a matter of saving places of grandeur and beauty from ruination in the name of free enterprise? Aldo Leopold, speaking of his field of wildlife conservation, once pointed out that "there seems to be few fields of research where the means are so largely of the brain, but the ends so largely of the heart." Is it not time we brought the heart and the brain together?

It might come as a surprise to some wilderness activists to realize that scientists and managers have hearts, too. Ask yourself: Why do *you* want to preserve wilderness? Is it because wilderness areas rack up lots of recreation visitor days that help justify your agency's existence in these times of declining revenues? Is it because a particular wilderness area might have a 95% probability of maintaining a viable population of species X for 100 years? For most of us, deep down, it's neither of these reasons, both of which are fundamentally rational and quantitative. Rather, it's the qualitative experience that matters. Wilderness is beautiful; it's inspiring, challenging, thrilling, even heartbreaking. Occasionally, tears come to my eyes when I encounter a stunning wilderness scene or a perfect specimen of a wild creature in its native habitat. What strikes me is the beauty of that scene, in that irreplaceable moment, and also the knowledge that so many other, potentially beautiful scenes have been precluded by chainsaws, cows, and bulldozers.

Emotions and the ability to see art in nature are what inspire most of us to be conservationists. There is a problem, however. Saving lovely, primeval wilderness areas does little to confront the extinction crisis. Saving beautiful places has brought us a highly biased, biologically insufficient system of protected areas. Building a better system requires using our brains and applying the best available science. Fortunately, there is a natural connection between heart and head that we can use to our advantage (and I'm not talking about the carotid arteries and jugular veins). It is the emotional contact with nature and the aesthetic experience that perk our intellectual interest. The next, natural step is to use our intellects to figure out better ways of selecting, designing and managing protected areas.

For me, as for many others I know, conservation biology offers a way to unite our emotional and intellectual interests in nature. Our emotional interest and the aesthetic experience itself are mostly selfish, after all. No matter how pure or spiritual it might seem, love of nature, like any other love, is in part self-gratification. The most selfless love still makes us feel righteous for having it. But when we find beauty in living things, as we become intimate with them, we begin to have concern for their welfare. We begin to value each wild species, each wild place, for its own sake. We want to know that they will persist, even if we will never see them. Such are the values upon which the science of conservation biology is based—they are essentially the same values that

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underlie the wilderness movement. These values tell us where to go; the science tells us how we might get there.

I cannot understand people who see little place for science in wilderness preservation, nor do I agree with those who believe that science is the only way to make conservation decisions. Both heart and head are needed. The fact is that nonscientific criteria have dominated decisions throughout conservation history. We have selected areas because they are pretty, they are fun to hike in, and they're not good for much else. This "rock and ice phenomenon" is abundantly documented, although there are many important exceptions. By insisting that we broaden the representation of habitats in protected areas, design networks of reserves to maintain viable populations of sensitive species, and manage wilderness and other protected areas to sustain or simulate natural processes is not to place rationality above emotion and spirituality. Quite the contrary. Basing the design and management of protected areas on biological and ecological criteria is a necessary outgrowth of our emotional attachment to life, our biophilia. It means basing conservation decisions on a concern for the long-term welfare of all living things, not just on our need for aesthetic gratification. It is the most selfless love I can imagine.

If you accept my notion that we need to unite scientific and nonscientific approaches to conservation, what specifically does science suggest that we do differently? First, we need to acknowledge the limitations of our current network of protected areas (reserves) in this country and elsewhere and make a serious attempt to fill the gaps. The national gap analysis program (GAP) of the U.S. Department of Interior provides a wealth of information on habitats and species currently unrepresented or underrepresented in protected areas. More detailed investigations in particular regions provide more information. The picture is basically the same everywhere: The most productive habitats, and often those richest in biodiversity, are the least well-protected. In the West and much of the East, these underrepresented habitats tend to be at low elevations and have the richest soils. Conversely, in Florida and other areas in the southeastern coastal plain, most underrepresented habitats are at the opposite end of the topographic spectrum: The wilderness areas are in the swamps and marshes, and the well-drained uplands are unprotected. Most of the productive, poorly represented habitats nationwide are in private ownership and devoted to agriculture or urban uses. Nevertheless, some significant conservation opportunities remain in these landscapes. We must work quickly.

Improving the representation of habitats and biodiversity in protected areas cannot rely on traditional wilderness preservation campaigns. Whether private or public land, some of the most critical areas are too degraded to meet criteria for wilderness designation. They often need substantial, hands-on restoration to regain their full biological potential. The problem is that there is virtually no type of public-land designation that is appropriate for these areas and would provide sufficient protection from exploitation. For example, the Late-Successional Reserves (LSRs) established under President Clinton's Northwest Forest Plan better represent biodiversity than the system of wilderness areas in the region. Nevertheless, not only are many of the LSRs already heavily roaded and fragmented, they remain open to uses incompatible with conservation objectives.

Old-growth timber sales have been conducted in several designated LSRs since their designation, mostly under the infamous salvage logging rider. (Timber sales for restoration were not prohibited by the Plan, but conservationists did not expect to see old growth logged.) And now—amazingly—the Winema National Forest in Oregon is trying to push through a major ski development in one of its LSRs. And we wonder why activists distrust the agencies and are unwilling to grant them more discretionary power?

Besides using scientific information to better represent our native ecosystems and hotspots of biodiversity in true protected areas, we must use science to design reserve networks that are more likely to retain their biodiversity over time than our current network of mostly small, isolated protected areas. Most designated wilderness areas and national parks are tiny relative to the area required to maintain complete, naturally functioning ecosystems with viable populations of all native species. For example, 55 percent of national park units are smaller than 1000 ha (2500 acres), and only 12 percent of wilderness areas are larger than 100,000 ha (250,000 acres). (See discussion and graphs in chapter 5 of R. F. Noss and A. Y. Cooperrider. 1994. *Saving Nature's Legacy*. Island Press, Washington, DC). We have learned a lot about how to design effective reserves over the last couple decades of research in conservation biology. Sure, there is still much left to learn, but time is running out in many places, and we must start applying what we know without unreasonable delay. Foundations and individual donors must start funding, in a big way, scientifically defensible conservation planning in every region. With adequate dollars, and for less than the U.S. government has spent for management plans in just two regions (the Pacific Northwest and Interior Columbia Basin), we could have a scientifically credible reserve design for the entire continent of North America within, say, three years, a lot faster than it takes conservation legislation to move through Congress.

Among the things we have learned from experiences with our existing protected areas system, and from the theory and empirical results of conservation biology, is that small areas, especially when isolated, tend to lose diversity over time. Bill Newmark's studies of mammals in national parks, for example, showed that mammal species have been lost from all but the largest complexes of parks in North America. The smaller the park, the greater the losses. Many other studies, both theoretical and empirical, have demonstrated the vulnerability of populations to happenstances of demography, genetics and environment, as well as to deterministic processes, such as edge effects and direct exploitation or persecution of wildlife by humans. These findings brought us a series of empirical generalizations or principles of conservation biology, such as: (1) Species well distributed across their native range are less susceptible to extinction than species confined to small portions of their range; (2) large blocks of habitat, containing large populations, are better than small blocks with small populations; (3) blocks of habitat close together are better than blocks far apart; (4) habitat in contiguous blocks is better than fragmented habitat; (5) interconnected blocks of habitat are better than isolated blocks; and (6) blocks of habitat that are roadless or otherwise inaccessible to humans are better than roaded and accessible

blocks. This last principle is especially germane to wilderness conservation, as wilderness is defined by roadlessness.

I worry, however, that some conservationists take these empirical generalizations at face value, without wanting to do the necessary research to determine just how they apply in particular cases. The application of these principles to reserve selection and design is not necessarily straightforward. You have to know quite a bit about the system and the individual species concerned in order to interpret these principles wisely and see the inevitable exceptions. Yes, all else being equal, bigger is better. But how big is big enough? The answer to that question depends on such things as the home range size, demography and life history characteristics (including dispersal capacity) of the species; the quality of the habitat; the nature of surrounding habitat; and how well connected the habitat patch of concern is to other suitable patches. Habitats that seem close together might as well be a thousand miles apart if they are separated by a highway or other barrier insurmountable to the species of interest. Connected is not necessarily better than disconnected if the corridor is unusable or if it increases the risk of mortality. Empirical generalizations can be useful when site-specific information is lacking, but they can only be taken so far.

Yes, we have learned a few things in conservation biology, but a substantial amount of case-specific research is needed to design a reliable reserve network. I emphasize this point because it is here that the new alliance of scientists and activists is possibly most fragile. Activists, and the foundations that fund them, often want quick, easy answers. Rules of thumb and design principles are grabbed at like candy and consumed rapidly, without taking the time to catch the subtleties of flavor. This is a mistake. If we're going to create a conservation network on this continent that has a high assurance of meeting conservation goals, it must be a science-based network, not simply a science-informed network based on a few general principles and the casual advice of a scientist or two. As I opined earlier, putting a basic reserve network in place need not be enormously expensive in time or money. More detailed and extensive research, however, will be needed to learn how to manage these areas competently in the long run.

This brings me to another weak area in the new conservation movement based on an alliance of scientists and activists: the issue of management. Wilderness enthusiasts have traditionally ignored management issues. Even the land-managing agencies, which are generally not adverse to management, have let many wilderness areas go essentially

unmanaged. I have visited many designated wilderness areas containing fire-dependent plant communities, such as grasslands, longleaf pine and ponderosa pine communities, that are terribly degraded by active or passive fire suppression. They now require active, restorative management, which must include maintaining or mimicking ecological processes. It seems, however, that *wilderness* and *management* are seen by many as opposing concepts. They are not. Only the largest wilderness areas are, possibly, self-managing. The others are too small or too degraded by external and internal influences to manage themselves and retain the native species and communities we count on them to retain. The ecological consequences of not managing these areas could be as severe as those that come from poor management. Much of the wilderness science agenda in coming decades should be devoted to testing alternative restoration and management treatments in wilderness and other natural areas. Especially important is learning how to manage ecosystems in the least obtrusive ways that still get the job done. Perhaps designations other than "wilderness" are appropriate for many of these areas, but I would hate to see them become what the agencies now manage as multiple-use or "adaptive management" zones. Can we manage nature and still retain wildness? We're going to have to figure out how. Again, heart and head must be united.

The future of wilderness science, and of wilderness, will parallel the future of the conservation movement generally. Its success will depend on the success of the new alliance of activists and scientists, but it must go a couple important steps farther: It must be generally accepted by society and then implemented by managers. These steps will require significant cultural change. It is clear that an increasing number of people are coming to see that our culture has gone down the wrong track for too long. That's probably unfair. It wasn't really the wrong track, not at first. It was the only track we knew, battling the wilderness, exterminating the dangerous animals, pushing back the frontier until there we were, at the shores of the Pacific with nothing solid left to push. Yet we keep pushing, destroying the last stocks of wild fish in the oceans, along with the last fragments of wilderness on the land. We've gone too far, and some of us are finally seeing that our only salvation, as a culture, is making amends to nature. Not only saving the last vestiges of wilderness, but letting wilderness grow. Biologists and other natural scientists have a key role to play in this movement by defining the biological requirements for success. But it is going to take everyone in the movement, of all stripes and professions, to achieve that success. Let's get back to work.

# Mapping the Geography of Hope

Daniel L. Dustin

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**Abstract**—What is the nature of humankind’s relationship with the natural world? To what extent can social science shed light on this relationship? What are the most pressing research questions? What limitations present themselves? Drawing from the experiences of a 16th century cartographer, Fra Mauro, the author addresses the prospects for successfully mapping the meaning of wilderness in contemporary life.

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I have been waiting my whole life to give this talk. You see, like John Steinbeck confessed in *Travels with Charley* (1962), I, too, am in love with Montana. When I was a youngster growing up in Michigan, my parents used to bring me to the edge of the Bob Marshall Wilderness every other summer on vacation and turn me loose.

I fished mostly. I waded the streams in blue jeans and tennis shoes, floating grasshoppers over the riffles into the deeper holes, trying to entice a brook or rainbow trout to splash at my offering. When I got thirsty, I dipped my baseball cap into the water at my feet and drank to my heart’s content.

Later on, when I was a teenager, my dad taught me to fly fish on the South Fork of the Sun River, and I replaced grasshoppers with an imitator called the Crazy Goof that I purchased at Dan Bailey’s Fly Shop in Great Falls. I rode trail horses, too, with names like Skeeter and Buster. They were plodders mostly, setting their own pace, delivering me in their own good time to places I wanted to fish—places like Pretty Prairie—and to other places from which I could gaze deeper and deeper into “The Bob”—places like the fire lookout atop Patrol Mountain.

As a geography major at The University of Michigan, I returned to the Bob Marshall Wilderness with a friend to backpack into the Chinese Wall. Lo and behold, spring floods and a Forest Service airstrip had changed forever the Benchmark area where I fished as a boy, and for the first time, I entertained thoughts of dedicating my life to the protection of wilderness.

Now, 30 years later, I still count those Montana summers as the happiest days of my life. Viewed retrospectively, they provided not only a wonderful context for my boyhood adventures, they provided fertile ground for stimulating my imagination, for exploration and make-believe, and for dreaming my future. They also provided, as it turns out, the inspiration for my life’s work. Obviously, the Bob Marshall Wilderness had a significant effect on me, and the fact that

I am standing here before you today is clear trace evidence of the depth and durability of the meaning of wilderness in my life.

But, of course, the case for wilderness cannot stand on one story alone. As Bev Driver once wrote, “Who cares what wilderness means to any one individual? The important question is what does it mean or not mean to representative samples of users and nonusers” (Driver 1988, p. 55). Bev was right, I suppose, at least from a scientific perspective. So you might ask Perry Brown about his boyhood excursions into the Sierra Nevada, or Roderick Nash about hiking as a ten year old in the Grand Canyon, or Gary Snyder about his youthful forays into the wilds of the Pacific Northwest. Or take a more formal survey of others at this conference, in this town of Missoula, in this State of Montana, in these United States of America, or, for that matter, in most any other place on this planet, about the origins of their love of nature. Like Snyder, many people, I think, would speak of an immediate, intuitive, deep sympathy with the natural world that was not taught them by anyone (Oelschlaeger 1991).

It is this deep sympathy, this deep sense of affiliation with nature, that I most encourage wilderness social scientists to explore. Where does this sympathy come from, if it comes at all? How does it express itself? What other forces influence it? Can it be taught? And how does this deep sympathy affect our behavior, our sense of place in the world and, ultimately, our growth and development as human beings?

Theologian Sally McFague reasons that “all things living and all things not living are the products of the same primal explosion and evolutionary history and hence are interrelated in an internal way from the very beginning. We are distant cousins to the stars,” McFague says, “and near relations to the oceans, plants, and all other living creatures on our planet” (Rockefeller and Elder 1992). If she is correct, a deep sense of attachment to the land should come as no surprise. We are, after all, made up of the same ingredients.

Environmental psychologists Rachel and Stephen Kaplan explain these same deep stirrings in terms of our species’ age-old penchant for information about the natural world to enhance our prospects for survival in it (Kaplan, R. and Kaplan, S. 1989). If the Kaplans are right, a deep sense of connectedness to nature should also come as no surprise. We are, after all, intimately dependent on the natural world for our sustenance.

Then there are the poets and philosophers among us, many of whom see wild nature as the divine manifestation of God (Nash 1989). If they are right, a feeling of sacredness toward the land should not surprise us either. We are, after all, the self-conscious part of His creation, the part that, by design, reflects on the meaning and purpose of things (Oelschlaeger).

I don’t know to what extent any of these speculations about our relationship with nature reflect a ray of truth, but I do know that I am intrigued by the possibilities. Indeed, throughout the first half of the 1990s, I worked on

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a book called *Nature and the Human Spirit: Toward an Expanded Land Management Ethic* with 50 other contributors from many walks of life, all of whom felt that a spiritual bond with nature is a palpable, researchable topic (Driver and others 1996). While I remain optimistic about our ability to shed light on these hard-to-define and hard-to-measure spiritual values through the practice of social science, I am going to confess a doubt or two about the prospects of ever reaching the full depth of their meaning. And while I'm at it, I might as well also confess that even though I have spent much of my adult life pondering the meaning of wilderness to humankind, I often wish I were that little boy again in Montana who simply loved to fish and drink the water at his feet without having to think.

## The Mapmaker's Dream

I speak to you not so much as a social scientist as a wilderness enthusiast, as one who feels the call of the wild even as I have trouble articulating it. But that, of course, is the challenge—to tease out the meaning of wilderness to people like me, however inadequate our self-reports, however inef-fable our feelings. The challenge is magnified by the fact that what we are seeking to understand is invisible (Schumacher 1977). Mapping what Wallace Stegner once called “the geog-raphy of hope” is really mapping the geography of the human mind, a geography that more often than not seems unfathom-able (Benson 1996).

We are not unlike Fra Mauro, the 16th century cartogra-pher to the Court of Venice, whose lifelong dream was to make a perfect map, one that represented the full breadth of Creation. “I speculate,” he confessed. “Mapmakers are en-titled to do so, since they readily acknowledge that they are rarely in possession of all the facts. They are always dealing with secondary accounts, the tag ends of impressions. Theirs is an uncertain science. What they do is imagine coastlines, bluffs, and estuaries in order to make up for what they do not know. How many times do they sketch in a cape or bay without knowing the continent to which it might be attached? They do not know these things because they are constantly dealing with other men's observations, no more than a glance shore-ward from the rigging of a passing ship” (Cowan 1996, p.11).

I'll let you draw your own analogies. Suffice it for me to say that since we cannot really see what is going on inside other people's heads, since we must rely on secondary accounts and the tag ends of impressions, ours, too, is an uncertain science. I say this not to discourage us from our quest for understand-ing, but to emphasize that when it comes to mapping the invisible worlds of others, there is always a danger of seeing something that is not there and not seeing something that is there. Any notation of landmarks, and their subsequent assignment to continents, should thus be understood as the most tentative of undertakings.

## Emergent Meanings

What I am hinting at here, and what I am celebrating in my own way, is the incredibly rich, diverse and often unique makeup of that part of each and every one of us that is not body (Bloom 1987). While we social scientists may make sketch maps of the human mind that are useful in very

general ways for wilderness planning and management, as we probe deeper and deeper into the invisible worlds of others, the landmarks we uncover inevitably become more specific, more personal and unique. The resulting maps, while richly textured and finely detailed, are not likely to be very useful for predictive purposes. This was Driver's point about personal accounts of wilderness meaning. They may be fascinating to read, but they are seldom generalizable.

There is an indeterminism in all this that I find wonder-fully maddening. It feels wonderful to the poet in me. It feels maddening to the social scientist in me. What to do? How to handle it? If, as Roderick Nash reasons, wilderness is not so much a place as it is our response to a place, we humans have considerable latitude in terms of what we make of wilder-ness (Nash 1982). It is this openness of meaning, I think, that is our hope for the future. Wilderness symbolizes unbridled potential. It represents the wellspring from which all blessings flow. It is a source to be interpreted creatively. The question, it seems to me, is not so much what wilderness means to us, but what do we want it to mean?

## Conclusion

Wilderness experience, as Mike Patterson, Alan Watson, Dan Williams and Joe Roggenbuck recently conceived it in a paper in the *Journal of Leisure Research*, may be thought of as human experience characterized by situated freedom, in which the wilderness sets boundaries that constrain the nature of the experience, but within those boundaries people are free to experience wilderness in unique and variable ways (Patterson and others 1998). The authors go on to characterize wilderness experience as an emergent phenom-enon motivated by the not very well-defined goal of acquir-ing stories that enrich our lives.

I began with a personal story that has taken 45 years to unfold, a story, I might add, that remains unfinished. Multi-ple my story by countless others waiting to be told by wilderness enthusiasts across the Earth, each of whom, through encounters with wild nature, comes to better under-stand her or his place in the world. Pay attention to each and every detail of their stories and rejoice in the thickness of your data. Pencil in your landmarks, and assign them to continents as best you can. Then, like the 16th century cartographer, Fra Mauro, prepare yourself for the world's infinite capacity to surprise.

Thank you, Montana.

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# Wilderness Management Dilemmas: Fertile Ground for Wilderness Management Research

David N. Cole  
William E. Hammitt

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**Abstract**—Increasingly, wilderness managers must choose between the objective of wildness (“untrammeled” wilderness) and the objectives of naturalness and solitude. This dilemma has surfaced with awareness of the pervasiveness of human influence in wilderness and that regulation is often the only way to maintain outstanding opportunities for solitude. Should we trammel wilderness to compensate for unnatural effects of human activity or, to avoid trammeling wilderness, should we allow conditions to become increasingly unnatural? Should we restrict access and behavior to preserve opportunities for solitude, knowing this will exacerbate supply/demand problems and deny visitors a sense of freedom and spontaneity? This paper discusses this dilemma and opportunities for research in support of different objectives.

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The goals of wilderness management are to keep wilderness wild and “untrammeled” while preserving natural ecosystems and opportunities for high quality experiences, characterized by solitude, primitiveness and lack of confinement. When working toward these goals, managers have frequently turned to science for help. Science can often help management by identifying potential problems and useful approaches, by evaluating the effectiveness of alternative approaches and by describing the pros and cons of alternative courses of action. However, science is less helpful in deciding between alternative management objectives when fundamental goals are in conflict. Ideally, applied science—like management—should be conducted within the context of objectives that have already been clearly defined by society.

As scientific understanding has progressed, recognition of the magnitude and complexity of information needed to support wilderness management has grown. We have learned recently that we must confront dilemmas in wilderness management that were not envisioned or at least underappreciated at the time the Wilderness Act was passed. A half-century ago, it was generally assumed that undisturbed ecosystems were static, in balance and would remain so if left untouched. Today, we understand that undisturbed ecosystems change continuously, idiosyncratically and

unpredictably (Botkin 1990). This suggests that management should allow wilderness ecosystems to continue to change in these ways, without being fettered by human influence or human intention.

We have also discovered that human activities have had global effects, that even the most remote portions of wilderness have been and are being altered by human activity. Many different human activities, most of them outside the control of wilderness managers, threaten wilderness conditions. We have learned that the cumulative effects of these multiple threats are often synergistic rather than additive, and they affect all components of wilderness ecosystems and all levels of biological organization (Cole and Landres 1996). The more science advances, the more intractable conflicts and dilemmas appear to be and the more inadequate current scientific understanding seems as a support for wilderness management.

Wilderness management is made especially difficult by the fact that few of the human activities that alter wilderness ecosystems are internal uses readily subject to managerial control. Recreation and grazing by domestic livestock are probably the two most common internal uses of wilderness that are both substantial threats and subject to managerial control. Even for these uses, managers’ discretion to limit use to preserve wilderness conditions is constrained by political interests. Where uses are subject to control, research is needed on the effects of these activities and their significance. Efficient monitoring protocols need to be developed, and potential management strategies need to be identified and evaluated.

Recreation impacts on vegetation and soil have been well-studied and provide a good example of the value of science to management (Leung and Marion, this proceedings). Managers understand most of the primary impacts on trails and campsites, where recreation use concentrates, and have an enlightened perspective on the significance of these impacts. They have considerable information about factors that influence the magnitude and extent of impacts, which allows them to evaluate the pros and cons of alternative management strategies. The effectiveness of various management techniques have been evaluated, and efficient monitoring protocols have been developed (Cole 1989). Perhaps the most glaring information gap involves recreation impacts to soil biota and the biotic-abiotic interface, a gap which severely constrains efforts to restore damaged recreation sites (Zabinski and Gannon 1997).

Recreation impacts on animals and water have also been frequently studied, but these studies have not provided as firm a support for management (Hammitt and Cole 1998, Knight and Gutzwiller 1995, Liddle 1997). Impacts have

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often been identified, but results are often contradictory, and perspectives on the significance of impacts are poorly developed. Efficient monitoring protocols are lacking, and few potential management strategies have been advanced or evaluated.

Domestic livestock grazing has also been studied intensively but usually in situations that are only partially applicable to wilderness (McClaran, this proceedings). More research is needed to improve our understanding of how natural ecosystems have changed in response to domestic livestock grazing and how to develop grazing practices that are more compatible with the goals of wilderness than the goal of maximizing sustainable animal production.

We have also learned over the past 50 years that the desire to use wilderness is ever increasing. The experience Aldo Leopold appreciated, a two-week horse-packing trip without seeing anyone else, is now rare. Today, most wilderness visitors may be day-trippers, and encounters with many other groups is the norm (Watson, this proceedings). The social sciences have advanced our understanding on such important topics as wilderness solitude, unconfined use, use encounter standards and other attributes of wilderness experiences. However, this research has also uncovered unexpected complexities.

Progress has been substantial in the development and application of alternative management techniques (Manning and Lime, this proceedings). The use of permits, zoning of use and party size standards are fairly well established and effectively used by managers. The use patterns and characteristics of users are understood (Cole and others 1995). Areas needing more research involve the solitude and privacy needs and preferences of wilderness users, and the functions that solitude serves (Hammit and Rutlin 1995). The functional process of how use encounters affect solitude and privacy in wilderness is not well understood. Thirty years of norms research have been quite successful in advancing scientific knowledge concerning visitor preferences and evaluations of encounters. However, some consider these evaluations to be “norms” (Shelby and Heberlein 1986; Shelby and Vaske 1991), while other researchers question the existence of norms for encounters among wilderness visitors (Roggenbuck and others 1991). This argument has critical implications for management application. Are these evaluations of how visitors think they would respond to different numbers of encounters, or are they well-thought-out prescriptive statements of how many encounters ought to be allowed (as norm terminology suggests), offered with full cognizance of the tradeoffs involved in any decision? This controversy is not the fault of normative research, but rather, the reward of an extended period of research that has uncovered the complexities of this topic.

Despite considerable progress along some avenues of wilderness management research, many challenges remain. The more profound challenges to ecological science and management, we believe, involve impacts that cannot be minimized through on-site management of the uses which cause those impacts. How, for example, should managers respond to the effects of acid deposition resulting from regional pollutants (Tonnessen, this proceedings)? How should they respond to the widespread invasion of exotic pathogens that decimate native populations? How should they respond to the regional absence of top-level predators or

frequent fires? How should they respond to anthropogenic climate change?

The prevalence of impacts caused by human agents that cannot be controlled by wilderness managers raises a profound dilemma that is only now being clearly recognized. Should we emphasize naturalness or wildness in the management of wilderness ecosystems? The challenge to social science is how to reconcile demand for access to wilderness and the desire to keep wilderness experiences unconfined, with the fact that many attributes of the ideal wilderness experience, with its emphasis on solitude, deteriorate as use levels increase. Should we emphasize solitude or wildness in the management of use in wilderness?

## The Dilemma of Naturalness, Solitude, and Wildness

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The Wilderness Act of 1964 mandated preservation of natural conditions and opportunities for solitude. The concepts of naturalness and solitude have been defined in many different ways. In wilderness, objectives usually stress minimizing the influence of modern technological society and maintaining relatively uncrowded conditions. The Wilderness Act also stated that wilderness was to be “untrammelled by man” and a place for an “unconfined type of recreation”. “Untrammelled” is an unfamiliar word that is often misread as untrampled, and even more frequently misinterpreted as implying undisturbed or uninfluenced conditions. A trammel is a net for birds or fish or a shackle used to make horses amble. Synonymous with unconfined and unrestrained, an untrammelled wilderness is one that is wild, self-organizing and autonomous (Turner 1996), not manipulated or directed by humans for any purpose. In this paper, we use the more common word “wild” to denote the freedom from human control that is a desirable attribute of both wilderness ecosystems and wilderness experiences.

At the time the Wilderness Act was passed, it was probably assumed that keeping wilderness wild would keep wilderness natural and *vice versa*. However, now that we better understand the ubiquity of ecosystem change and human disturbance, we know this is not the case. We have learned that we cannot have wilderness that is truly wild or natural—let alone have wilderness that is simultaneously wild and natural. Management must emphasize either wilderness or naturalness. It must either intentionally manipulate wilderness to compensate for the unnatural effects of human activity or, to avoid exerting human control, it must allow conditions to become increasingly unnatural (Graber 1995).

The same is true for wildness and solitude. Management cannot have wild use (unrestricted and unconfined) and provide outstanding opportunities for solitude where demand for access to wilderness is high and supply is limited. Use restrictions, permits, and even trail/campsite construction constrain (trammel) the use patterns of wilderness users. Unrestricted, uninfluenced and unmanipulated use often results in lost opportunities for solitude and other important attributes of the wilderness experience. Manipulation of wilderness to keep experiences solitary takes away the wildness of wilderness experiences as it does the wildness of wilderness environments. Only in very low use areas and/or wilderness areas with very difficult and limited

access can wildness be maintained along with outstanding opportunities for solitude.

In choosing between the lesser of these two evils, science has less to offer than a careful evaluation of societal values. Valuable attributes will be lost with any choice of action or with inaction. As has been argued elsewhere, aggregate value might be optimized with a compromise in which wildness is pursued to a high degree on some wilderness lands, and naturalness is pursued to a high degree on others (Cole 1996; 1997). The contribution of science to this decision should be to clarify the costs and benefits of alternative choices.

To date, science has contributed substantially to understanding the benefits of pursuing naturalness and the costs of a “hands-off” management policy that emphasizes preserving wildness. For example, extensive research has been conducted on historic fire regimes and stand structure, invariably leading to conclusions that fire suppression policies have had adverse impacts (Agee, this volume). This has promulgated recent attempts to restore historic fire frequencies, even where this necessitates intentional management ignitions. Recent research has shown that fire suppression in conjunction with invasion of an exotic fungus, white pine blister rust (*Cronartium ribicola*), is decimating populations of whitebark pine (*Pinus albicaulis*) in the northern Rocky Mountains. Restoration of more natural conditions will require such manipulative actions as management ignitions and genetic intervention to develop rust-resistant trees (Kendall and Schirokauer 1997). In the wilderness social science literature, there has been a similar emphasis on the importance of solitude, visitors evaluations (or norms) for encounters, and management actions needed to maintain solitude (Manning and Lime, this proceedings).

In contrast, the benefits of not manipulating wilderness lands and wilderness experiences and the costs of manipulation and regulation have not received serious scientific scrutiny. This is unfortunate because the managers who must decide between options are left with an unbalanced scientific perspective on costs and benefits. A partial explanation for this inequity, applicable to the ecological sciences, is the difficulty of studying the potential adverse outcomes of extensive ecosystem manipulation or loss of wildness. There is no reference for comparison analogous to historic conditions or uninfluenced ecosystems. Another explanation of this inequity is the predominant worldview of ecological science, with its emphasis on the value of natural systems and its faith in the competence of ecological understanding as a foundation for ecological manipulation. In the tradition of all Western science, most ecologists believe in the value of and their ability to control and manipulate systems for human purposes, in this case the restoration of more natural conditions in wilderness. Similar explanations might pertain to the surfeit of social science research on the benefits of unconstrained experiences and the costs of regulation.

Clearly, science needs to provide a better understanding of how human activities are causing wilderness ecosystems to diverge from the trajectories they would take in the absence of modern technological society. Perspectives on the costs of these divergences (loss of biological diversity, loss of scientific information, etc.) need to be sharpened.

Science also should continue to study the erosion of solitude opportunities in wilderness and the costs involved. However, a more critical need at the present time—when actions are being taken that will decide the degree of naturalness, solitude opportunity and wildness of the future wilderness system—may be more scientific input on the value of preserving a high degree of wildness on at least some wilderness lands. This might lead to more enlightened and balanced decisions about the future emphasis of management in wilderness.

The relative importance of various types of scientific information will be greatly influenced by the extent to which naturalness and solitude are emphasized as wilderness management goals, at the expense of wildness. The pursuit of naturalness and solitude will require extensive manipulation of ecosystems and users. Ecological restoration, as well as solitude restoration, will take on greater importance. Because it is closely allied with the notions of ecological and social engineering, this approach implies a much higher degree of precision in defining management objectives, monitoring wilderness conditions and implementing management prescriptions than the pursuit of wildness. It places much greater demands on the quantity, reliability and sophistication of scientific information than does management for wildness.

## Research to Support Managing for Naturalness

Substantial scientific knowledge is needed to restore the naturalness of wilderness ecosystems with any degree of precision. Studies of past and present ecological conditions must be undertaken to assess the extent to which current conditions deviate from a natural state. Science needs to contribute to a better understanding of the impacts of many different human activities on various ecological components and at different spatial and temporal scales (Cole and Landres 1996). Managers need to define targets, both for restorative manipulations and for future ecosystems (Bonnicksen and Stone 1985). Historic conditions, particularly the concept of historic range of variability, have been advanced as a tool for defining targets (Morgan and others 1994). The general notion is that, where naturalness is a goal, current conditions ought to lie within the range of conditions that existed in the past. For some ecosystem components, such as fire frequencies or long-lived tree species, relatively precise estimates of historic conditions are possible (Swetnam 1993). For components that are short-lived or for processes that leave little trace, information about historic conditions is less adequate. If this research is to be useful, several important philosophical issues about how to define naturalness need to be resolved (Anderson 1991, Haydon 1997). What time period should be used as a reference for “natural” conditions? Should aboriginal humans be considered part of the natural landscape?

Management prescriptions need to be developed that are capable of realigning existing conditions with those that would exist in a natural state. Probably the foremost ecosystem management challenge in most wilderness areas is the restoration of more natural fire processes. Considerable research effort, some of it reported at this conference, is

going into restoring native forest stand structure through management ignitions and, in some cases, mechanical removal of vegetation (Agee, this proceedings). Considerable research is being undertaken to find effective means of eradicating alien species and restoring native biotic components in ecosystems heavily infested with invasive species (Randall, this proceedings). Water bodies in many wildernesses have been highly altered by such diverse actions as regulation of upstream flows, pollution, acid deposition and the introduction of alien fisheries. The success of any restoration will largely depend on our understanding of how systems have changed in response to human activity and on the development of practical techniques for reversing those changes.

Once restorations are undertaken, ecosystem conditions need to be monitored in order to assess the effectiveness of prescriptions and to refine future management targets. At the current time, wilderness monitoring is virtually nonexistent. Considerable research needs to focus on developing effective monitoring protocols and this must be accompanied by an effort to obtain political support for the resources to adequately monitor wilderness lands (Landres and others 1994).

Can science provide the foundation needed to rigorously approach natural conditions in wilderness? There are several reasons for concern. The historic range of conditions might be appropriate for defining present targets for ecosystem conditions. However, what we have learned about natural ecosystems suggests that the future state of a natural system will be very different from the present state and not a predictable extension of recent ecosystem trajectories. Ecosystem manipulation and ecological restoration practices (for example, natural fire regimes) allow natural processes to be reintroduced in wilderness on the basis of past records, but there is no guarantee that these processes will produce an end-state similar to the past nor that they will play the same ecological role they did in the past. Climatic conditions and other determinants make these processes vary in unpredictable ways over time.

Once wilderness systems have been extensively manipulated, they can no longer provide independent information about "natural" ecosystem manipulations. Historic conditions will increasingly become the only undisturbed reference conditions available for developing targets. It seems inevitable that we will tend to consider a future ecosystem trajectory that lies within the bounds of historic variation in conditions to be natural and one that goes beyond those bounds to be unnatural. This tendency would lead to future management prescriptions that push systems toward their past state, regardless of the trajectory of natural change. If all wilderness ecosystems have been manipulated, there will be no way to know whether our actions are pushing systems toward or farther away from a natural state.

Another concern is that manipulative prescriptions may effectively restore one ecosystem component but not another. For example, management ignitions during times of low fire danger are a possible prescription for restoring natural fire frequencies and tree stand structures. However, fires set during seasons when they would not naturally burn may cause unnatural changes to forest soils or to forest components other than dominant tree species. In attempting to restore naturalness, we may inadvertently promote

the protection of dominant ecosystem components—long-lived, well-studied, charismatic elements—at the expense of other ecosystem components.

One type of restoration may make it more difficult to achieve a different restoration goal. For example, attempts to restore fire may increase vulnerability to invasions by alien plants (Cole and Landres 1996). Finally, attempts to restore ecosystem processes in a localized area might thwart efforts to conserve biological diversity at larger spatial scales. For example, in response to the establishment of alien salt-cedar (*Tamarix chinensis*) riparian vegetation along the dam-regulated Colorado River in Grand Canyon, several rare riparian birds, such as Bell's vireo (*Vireo bellii*) have expanded their range (Johnson and Carothers 1987). Attempts to eradicate alien salt-cedar or to restore pre-dam flow regimes would further endanger the survival of these species in the region.

## Research to Support Managing for Solitude

Recreational carrying capacity, acceptable use encounters and solitude are issues that have been studied extensively in wilderness research. Beginning with the early thoughtful analysis by Wagar (1964) and 35 years of empirical research by agency and university scientists, much effort has been devoted to understanding the influence of use levels and encounters on wilderness experiences and solitude opportunities (Shelby and Heberlein 1986).

This relatively long and rich history of use level and solitude research has evolved in many directions, concentrating on various dependent measures. For example, use levels and encounters have been thought to influence satisfaction, density, crowding and solitude. In recent years, perceived crowding and normative explanations have been dominant. As summarized by Heberlein (1977), recreation researchers have used normative kinds of approaches in at least three ways. First, various researchers have developed measures of wilderness purism, aimed at identifying particular subgroups of wilderness users who share more sensitive beliefs about wilderness resources and solitude experiences. Second, normative perspectives have been used to explain the phenomenon of asymmetrical antipathy that exists between different types of wilderness users (for example, campers and horse packers). A third way that norms have been used is in the development of contact preference curves and encounter preference standards. A contact preference standard is "a normative construct based on shared beliefs about the appropriate number and type of encounters for a particular setting. The standard establishes an acceptable level for the number of encounters, and capacity can be specified if use level or some other management parameter affects encounters" (Shelby and Heberlein 1986).

Various normative approaches have been taken by wilderness researchers in trying to understand the relationship between wilderness solitude and use levels or encounters. Early research was able to determine encounter preference curves and standards for user reaction to various suggested levels of use. For example, canoeists were asked their reaction to seeing 1,2,3,5,7,9,15,20 and 25 other canoeists, inner-tubers or anglers. Encounter preference curves were developed from

these data to describe canoeist norms for contacts with other canoeists, inner-tubers and anglers. However, these encounter preference curves were based on researcher-suggested use levels and user preference responses, rather than actual response to field encounters.

Most recent research has evaluated visitor tolerance for optimum contact levels, essentially a measure of maximum preferred contacts. Visitors are asked to give their highest tolerable contact level (Shelby and Heberlein 1986). Tolerance standards have been derived for various use parameters and in various levels of wilderness settings. In addition to asking recreation users for the maximum level of encounters/contacts they will tolerate, users have been asked for the use level that would be most acceptable (the ideal). Based on descriptive measures of central tendency (such as mode or median) and dispersion (standard deviation) of visitor tolerance responses, normative standards and curves of use have been developed for wilderness management.

Tolerance/acceptability curves and standards are useful for investigating recreation user reaction to use levels, and they offer a means of formulating management standards of tolerable and acceptable use levels; but these standards still involve a preference rather than actual reaction to use levels. Some researchers have criticized the procedure because it forces respondents to formulate tolerance standards when, in fact, they may not care about use encounters and thus have not formulated valid tolerable and acceptable limits of use (Roggenbuck and Williams 1994).

A current question in use encounter, use norms and solitude research in wilderness is to what degree encounter norms actually exist among wilderness users, and if they do exist, what influence actual encounters on-site have on wilderness solitude and associated experiences. For example, fewer than half of New River whitewater rafters had norms about appropriate encounter levels for most types of experiences (Roggenbuck and others 1991). Many said encounters made no difference, or that they made a difference but could not give an encounter number. For those who had norms, consensus was not strong. Patterson and Hammitt (1990) found similar results when they examined the influence of actual encounter levels on solitude experiences. Although 83% of backcountry backpackers reported encountering more parties than their acceptable norms, only 34% of the backpackers reported that the number of encounters detracted from their solitude experience.

Controversy among social scientists continued at this conference over the validity of encounter norms as indicator standards for manipulating solitude opportunities in wilderness. While there are different schools of scientific thought on this topic, one thing is certain. Solitude is an important aspect of wilderness management, use encounters have to be involved, and it is the responsibility of wilderness scientists to develop more sophisticated research in order to validly support managing for solitude in wilderness ecosystems.

## Research to Support Managing for Wildness

Managing for a high degree of wildness does not require nearly as much science as managing for naturalness or solitude. Managing for wildness would preclude options for

extensive manipulation of wilderness ecosystems or of wilderness users. Localized, intensively impacted sites, such as recreation sites, former roads, old mines or localized alien infestations, could be restored without substantially jeopardizing the wildness of most wilderness. For these types of impact, it is relatively easy to identify appropriate target conditions because disturbed sites can be compared with adjacent, undisturbed sites. There is no need to use historic conditions as a reference. Consequently, concerns about the tendency to manage for a static state are reduced.

It may be more challenging to develop management prescriptions for localized disturbances than for extensive disturbances because localized disturbances are usually more intense. Consider, for example, the difference in intensity of impact between a forest subjected to fire suppression and a compacted campsite or mine tailings full of heavy metals. The forest has experienced some structural and compositional change, but every aspect of the structure, composition and function of the campsite and mine tailings has been radically altered. Advances in the science of restoration ecology would make a substantial contribution to the success of efforts to restore localized impacts. Failed localized restorations—while costly in terms of resources expended—would not be as costly to wilderness values as failed extensive restorations because most wilderness would remain unmanipulated and wild, regardless of the success of prescriptions.

It may also be possible to restrict use and behaviors in some portions of wilderness while still managing for wildness. For example, research data indicate that intensively impacted sites and areas of concentrated use where solitude opportunities are in jeopardy typically comprise less than two percent of wilderness ecosystem acreage (Hammitt and Cole 1998). With behavioral restrictions, large numbers of people could continue to visit these popular locations, leaving the rest of the wilderness relatively unused. If use of these low-use places increases, it might be necessary to restrict access to them (Cole 1997), but wildness could be maintained by minimizing the use of behavioral restrictions once one gains access.

When wildness is the primary goal of wilderness management, the same types of scientific understanding are needed as when naturalness and solitude are the primary goals. It is still important to understand the influence of human agents of change and their significance and to monitor wilderness conditions in relation to management objectives. However, science in support of maintaining wildness need not be as precise, comprehensive or sophisticated as science in support of maintaining naturalness and solitude, because there is less emphasis on the prescription of target conditions and restorative manipulations. Moreover, scientific inadequacy is much less costly where management emphasizes wildness.

## Conclusions

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Wilderness management, with its goals of preserving natural conditions and solitude opportunities while avoiding intentional human control, is arguably the most challenging task confronting land managers. To succeed, the

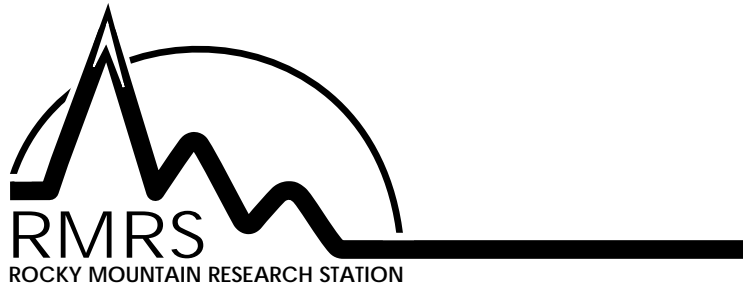
quantity and quality of scientific knowledge need to be increased dramatically. We need better information about the influences of a wide range of human activities, from recreation and grazing to fire, pollution and the influence of adjacent land practices. The more rigorously we pursue the protection and restoration of natural conditions and solitude opportunities in wilderness, the greater the demands on science. The most prudent course of action might be to (1) work to increase the resources allocated for wilderness research and (2) temper our zeal for pursuing naturalness, solitude and manipulation inside wilderness with a healthy skepticism about the adequacies of our knowledge and abilities. Wilderness stewardship is a delicate balance between the paralysis that can come from too little faith in existing scientific knowledge and the excessive engineering of wilderness that can come from too much faith in science.

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