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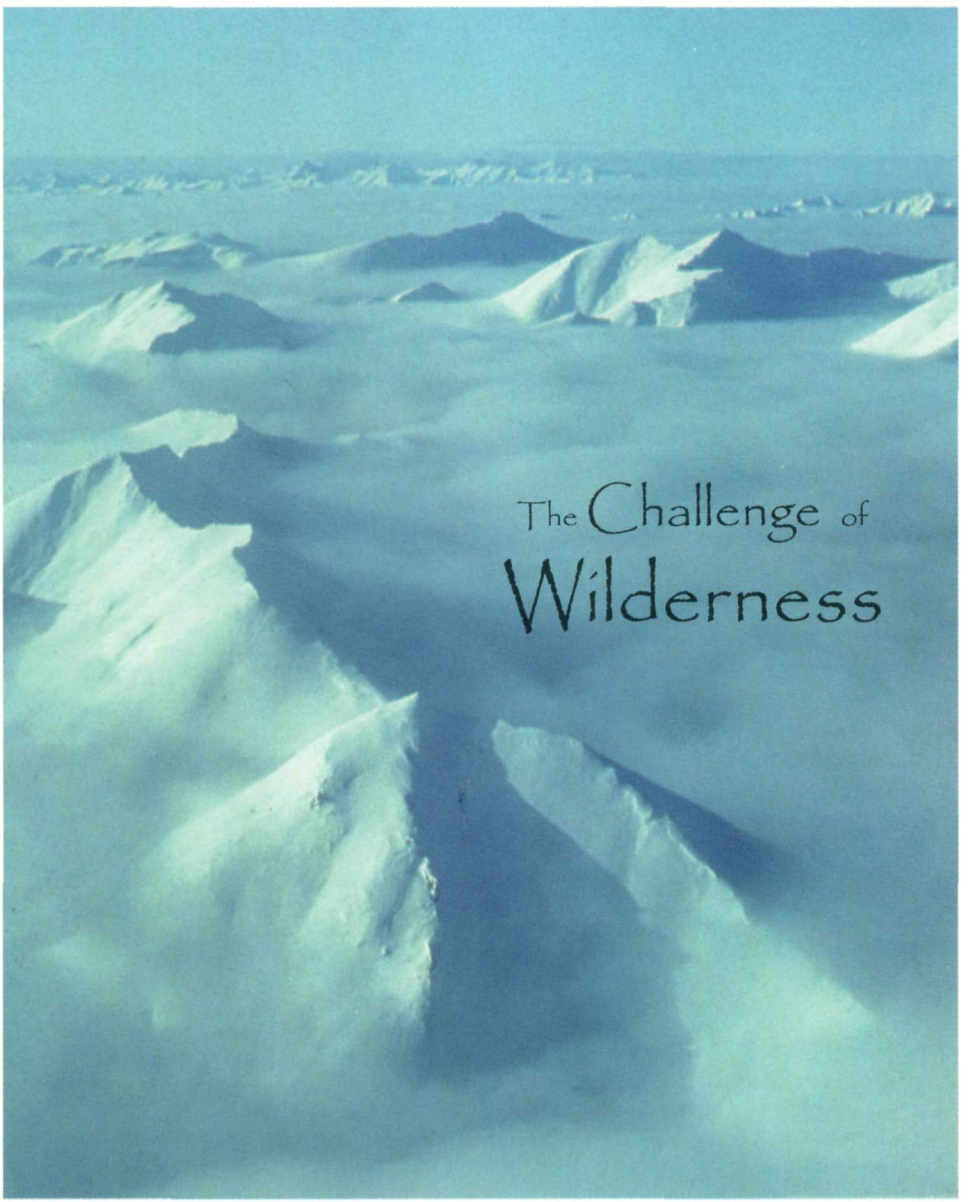

The Challenge of Wilderness

Origins

Founded in 1980, the George Wright Society is organized for the purposes of promoting the application of knowledge, fostering communication, improving resource management, and providing information to improve public understanding and appreciation of the basic purposes of natural and cultural parks and equivalent reserves. The Society is dedicated to the protection, preservation, and management of cultural and natural parks and reserves through research and education.

Mission

The George Wright Society advances the scientific and heritage values of parks and protected areas. The Society promotes professional research and resource stewardship across natural and cultural disciplines, provides avenues of communication, and encourage public policies that embrace these values.

Our Goal

The Society strives to be the premier organization connecting people, places, knowledge, and ideas to foster excellence in natural and cultural resource management, research, protection, and interpretation in parks and equivalent reserves.

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The George Wright Society is a member of
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On the cover: Gates of the Arctic National Park and Preserve (Alaska) in winter clouds.
National Park Service photo

Society News, Notes & Mail

Renewing the U.S. Biosphere Reserve Program

President Bush's decision that the United States will rejoin UNESCO has inspired efforts to renew the U.S. Man and the Biosphere Program. A reinvigorated U.S. program, and active participation in the UNESCO international network of biosphere reserves, can make an important contribution to human welfare.

The UNESCO biosphere reserve program, which representatives from the U.S. helped to design in the early 1970s, has enabled nations to improve the management and protection of the planet's important representative ecosystems. The importance of this program was clearly indicated in the summit meeting of the U.S. and the U.S.S.R. in 1974, when President Nixon and General Secretary Brezhnev signed an agreement and joint communiqué to "[d]esignate certain natural areas as biosphere reserves for protecting valuable plant and animal genetic strains, and ecosystems, and for conducting scientific research needed for more effective actions concerned with global protection."

Today there are 425 biosphere reserves in 95 countries voluntarily participating in programs of scientific research and education to sustain irreplaceable natural ecosystems and the plant and animal life they support. President Bush's decision to rejoin UNESCO has significant long-term consequences because it will enable the U.S. to participate, once again, in a program that fosters peaceful international relations and makes an important contribution to human welfare. An indication of the importance of the biosphere reserve program is expressed in the following resolution of 450 scientists and managers of protected areas who met recently at the SAMPAA Conference in Canada:

> "Participants at the Fifth Conference of Science and the Management of Protected Areas Association (SAMPAA), held in Victoria, B.C., Canada, May 12–16, 2003, acknowledge the value of the UNESCO Biosphere Reserve Program as a practical means to achieve collaborative conservation of biodiversity, through integrated ecosystem-based management with the participation of local communities and indigenous cultures. We recognize that efforts to strengthen a network of biosphere reserves in North America have been initiated at this meeting by biosphere reserve representatives from the three North American countries of Mexico, the USA, and Canada. We, the participants at SAMPAA 5, hereby resolve to support these efforts for the timely establishment of an effective and functional North American network."

Steps are being taken now to plan the renewal of the U.S. biosphere reserve program. A United States Biosphere Reserves Association has been chartered to

assist in planning a renewed program of community-centered collaborative conservation focusing on the 47 U.S. biosphere reserve areas. For further information about the U.S. Biosphere Reserves Association, contact:

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(Ed. note: Vernon C. "Tom" Gilbert was the first president of the George Wright Society, in 1980.)

Lecture Series on Conservation at the Landscape Scale

Adrian Phillips' paper "Turning Ideas on Their Head: The New Paradigm for Protected Areas," published in the last issue of *The George Wright Forum,* was first presented in February 2003 as part of the lecture series "Conservation at the Landscape Scale: Emerging Models and Strategies," sponsored by the National Park Service Conservation Study Institute and the University of Vermont. The series also included lectures by Reed Noss, conservation biology professor at the University of Central Florida, and Nancy Bell, Vermont director for The Conservation Fund.

This fall, a second lecture series on this topic includes Brenda Barrett (NPS national coordinator for heritage areas, on October 14, 2003) and Jeffrey McNeely (chief scientist, IUCN, on November 11). McNeely's presentation will be followed by a panel discussion that will be part of a distance learning broadcast on November 12, 2003. You are invited to join this interactive broadcast and to view lectures at www.uvm.edu/conservationlectures, or contact Daniel Laven, CSI fellow at the University of Vermont (Daniel.Laven@uvm.edu), for more information.

GWS Co-Publishes Yellowstone Science Proceedings

Partnering with the Yellowstone Center for Resources, the Society recently co-published *Yellowstone Lake: Hotbed of Chaos or Reservoir of Resilience?,* the proceedings of the 6th Biennial Scientific Conference on the Greater Yellowstone Ecosystem, held in October 2001. The volume contains a variety of scientific and cultural resource papers focused on the lake: its hydrology, thermophilic organisms, archeology, history, influence on artists, limnology, wildlife, and much more. The 307-page softbound volume can be purchased for $15 ($10 CD) or you can download individual papers for free in PDF format from the GWS website. For more information, go to: www.georgewright.org/01yellproc.html.

GWS Members Contribute to New Book on Park Values

A number of Society members were involved in creating *The Full Value of Parks: From Economics to the Intangible* (Rowman & Littlefield, July 2003), the first comprehensive review of the range of values associated with parks and other protected areas. Chapters from around the world examine the recreational, spiritual, cultural, identity, aesthetic, educational, scientific, peace-promoting, therapeutic, and economic values of parks. GWS executive director Dave Harmon co-edited the volume along with Allen D. Putney, the chair of IUCN's Task Force on Non-Material Values of Protected Areas. GWS members Brad Barr, Gary Davis, Dave Graber, and Mike Tranel authored or co-authored chapters. The book is a contribution to the World Parks Congress. For a table of contents and ordering information, go to www.rowmanlittlefield.com and type in "Full Value" in the search box.

MISSION STATEMENTS

Where We Need to Go—Lessons from Septima Clark

Dwight T. Pitcaithley

I am deeply honored to have been asked to speak today as we dedicate this fountain, this plaza in the name of liberty and Septima Clark. It is altogether fitting and proper that we dedicate a fountain in memory of a civil rights soldier of the twentieth century in a park dedicated to America's Civil War of the nineteenth century. The connections between the two are many and direct. The threads of history tightly bind the Civil War and this country's search for civil rights.

The Civil War ended, as every school child knows, with the passage and ratification of three constitutional amendments that profoundly changed the face of democracy in this country. None would have predicted on the occasion of South Carolina's leaving the Union that only a few years later, slavery would be abolished and former slaves would become citizens and given the right to vote. Neither side in the conflict, observed Lincoln in his second inaugural, "anticipated that the cause of the conflict might cease with, or even before, the conflict itself should cease. Each looked for an easier triumph, and a result less fundamental and astounding."

It was astounding, indeed, and difficult for this country to absorb the expansion of freedom these amendments represented. Neither side was prepared, neither side was ready to embrace and defend this "New birth of Freedom." The flowering of American citizenship for black Americans was, as we also know, short lived. After only a decade during which freedom and citizenship were exercised, the darkness of Jim Crow and black codes and debilitating segregation descended upon the country.

The racism that Septima Clark fought against had its roots in the American institution of slavery. And while the Civil War was able to abolish slavery, it was unable to abolish its underlying motivation. Septima Clark's contributions to this country were bound up in her belief that the United States Constitution had meaning for *all* the people of the country, that the thirteenth, fourteenth, and fifteenth amendments to the Constitution meant what they said and should not be ignored and subverted.

It is also fitting and proper that we dedicate this monument to Septima Clark in this place because the National Park Service has, over the past ten years, reaffirmed its responsibility as an educational institution and as a publicly funded agency, one that needs to respond to and reflect *all* the people of the United States. To that end, it has become more inclusive in the stories that it tells at these special places and more expansive in its thinking about what constitutes American history, what voices should be heard, how histories are constructed. It has moved away from presenting park stories from only one perspective and begun using different voices, different views in developing interpretive narratives. At Devils Tower in northeast Wyoming, for example, the National Park Service until only a few years ago interpreted the volcanic monolith as a geologic phenomenon and as a great place for rock climbing. The traditional and religious relationship the park held for several tribes of Plains Indians was ignored. Today, the National Park Service embraces the Indian narrative in its interpretive programs as it continues to present the geologic story.

Perhaps no other field of NPS effort better represents this expansion of thinking than Civil War parks. Beginning five years ago, the superintendents of the Civil War battlefields decided that telling only the story of the battle, while important, limited public understanding of the war and its significance to the country today. They launched an effort to include the causes of the war in their interpretive programs; to discuss the role communities played in the war effort (Petersburg, Fredericksburg, Vicksburg); to present the contribution of women, black and white, and the contributions of the United States Colored Troops. These efforts have produced several new publications and exhibits. One of the finest, in my estimation, is the exhibit on the coming of the war which stands behind you in the Fort Sumter visitor center.

For too long this country has avoided public discussions about the causes of the war. Writing from the perspective of the 1980s, Gaines Foster, a professor of history at Louisiana State University, argued that as Americans glorified the war, they failed to address the underlying causes of the war and to recognize the war's relationship to basic human freedoms. "Rather than looking at the war as a tragic failure and trying to understand it, or even condemn it," he wrote, "Americans, North and South, chose to view it as a glorious time to be celebrated. Most ignored the fact that the nation had failed to resolve the debate over the nature of the Union and to eliminate the contradictions between its equalitarian ideals and the institution of slavery without resort to a bloody civil war. Instead, they celebrated the war's triumphant nationalism and martial glory." This exhibit, and others like it, will encourage visitors to confront the causes of the war through the social, political, and economic context of *those* times. Additionally, we hope, through this effort, to prompt a discussion of the connections between then and now, to understand the consequences of the war and of the failed Reconstruction. To that end, the changing/evolving

nature of freedom in this country is not only an appropriate subject, but an essential subject if we are to understand the overpowering role the Civil War played in shaping the social and political environment in which we exist today.

Coincidentally, the Congress realized that the aggregate of national parks should also become more inclusive and represent more aspects of the American past. During the decade of the 1990s, Congress expanded the collection of *your national parks* by adding Manzanar, a Japanese internment camp during World War II; and Washita Battlefield, the site of a massacre of Cheyenne Indians by George Armstrong Custer. It also added sites associated with the modern civil rights movement, places such as the Monroe School in Topeka commemorating the Supreme Count's Brown v. Board of Education decision; Central High School in Little Rock, to commemorate the 1957 desegregation of that school; Martin Luther King, Jr., National Historic Site in Atlanta; and the Selma to Montgomery National Historic Trail, which includes the Edmund Pettus Bridge. Along with the North Bridge in Concord and Independence Hall in Philadelphia, the Edmund Pettus Bridge is arguably one of the most powerful icons to freedom and liberty this country has to offer.

Septima Clark sought, in her words, "simple justice." Freedom, equality, liberty, and justice are words that have defined this nation from its inception, growing from those powerful phrases penned by Jefferson in 1776. "We hold these truths to be self-evident," he wrote, "that all men are created *equal,* that they are endowed by their Creator with certain unalienable rights, that among these are life, *liberty,* and the pursuit of happiness." The Constitution of the United States, which followed the Declaration by a decade, began with similar intentions, but could not sustain them. "We the people of the United States, in Order to form a more perfect Union, establish *justice,* insure domestic Tranquility, provide for the common defence" and welfare and the blessings of *Liberty,* it begins. The Constitution was unable to provide justice and liberty to all the people of the United States. Its recognition of slavery in three places (without mentioning the word), established a fundamental contradiction between the ideals of the nation as represented in Jefferson's Declaration and the legal framework of the nation as represented in the Constitution. That contradiction would ultimately be settled by 620,000 deaths and the emancipation of 4,000,000 slaves.

With the conclusion of the war, liberty, justice, and equality existed in this country for one brief shining moment before the "Great Reconciliation" of 1877 refocused federal interest away from implementing the three amendments designed to create that "more perfect Union." For decades, white America was satisfied with a status quo that excluded a large percentage of American citizens from enjoying even basic human and civil rights taken for granted by the rest of the population. And then slowly and gradually a mighty army gathered itself and launched a thousand fronts:

against unequal schools, against bias in public transportation and accommodations, against long odds, and for the right to vote. Septima Clark and Bob Moses and Myles Horton and Virginia Durr and Rosa Parks and countless others forced this country to face the inequality that had come to define life in America. Collectively *they* changed the meaning of citizenship, *they* redefined equality, *they* created "a more perfect Union." This country is not where it wants to be in the area of civil rights, it is not where it should be, but it has come so much closer to realizing Jefferson's vision of equality, and it has done so because of the efforts of warriors like Septima Clark.

We are gathered today to dedicate this place in the name of liberty. As we do this, let us not forget that freedom and equality and liberty, in spite of the pledge our children make each morning that concludes, "with liberty and justice for all," will not and do not expand naturally. Freedom in this country often contracts and has repeatedly over the course of its history. We must be ever mindful that the maintenance of the high ideals we live by takes effort, takes constant effort. We must also understand our *history* and how it has shaped and continues to shape our lives. We must understand the relationship between past and present. John Lewis, Congressman from Georgia and another veteran of the modern Civil Rights movement, understands this. He concludes his wonderful memoir, *Walking with the Wind* (as I will conclude my remarks), by writing, "Know your history. Study it. Share it. Shed a tear over it. Laugh about it. Live it. Act it out. Understand it. Because for better or worse, our past is what brought us here, and it can help lead us to where we need to go." This place, this fountain, these exhibits serve as reminders of the journey this country has made from then to now, and will help lead us to where we need to go.

Dwight T. Pitcaithley is chief historian of the National Park Service and a member of the Board of Directors of the George Wright Society. He delivered these remarks on June 14, 2003, at the dedication of the Septima Clark Fountain, Liberty Square, Fort Sumter National Monument, Charleston, South Carolina.

"MISSION STATEMENTS" *is a new occasional column that presents compelling statements of values and ideals that are important to the people, places, and professions that the Society serves. We are looking for inspirational and insightful writings that touch on close-to-the-heart issues that motivate us to do what we do as park professionals. We invite readers to submit their own Mission Statements, or suggest previously published essays that we might reprint in this column. Contact GWS executive director Dave Harmon at dharmon @georgewright.org, or by phone at 1-906-487-9722.*

Science, Emotion, and Advocacy
An Interview with Richard Leakey

As part of the events associated with the opening of the Draper Museum of Natural History at the Buffalo Bill Historical Center in Cody, Wyoming, Kenyan scientist and conservationist Richard Leakey was invited to deliver several addresses, including the keynote speech during the opening ceremony on June 4, 2002.

Dr. Leakey, son of the renowned paleoanthropologists Mary and Louis Leakey, was born in Kenya in 1944. His remarkable early fossil discoveries, funded by the National Geographic Society, led to his appointment, at the age of twenty-five, as director of the National Museums of Kenya, a position he held for about twenty years. In 1989, he was appointed director of Kenya's Department of Wildlife and Conservation Management (later the Kenya Wildlife Service), a position he held until 1994, and again from 1998 to 1999, followed by a two-year term as head of civil service and secretary to the Cabinet. He continues to be embroiled in Kenya's stormy political scene, and has survived beatings, relentless political intrigues, and a plane crash in which he lost both lower legs; many still believe this crash was an assassination attempt.

Dr. Leakey's scientific achievements, his leadership in fighting political corruption and the destruction of Kenya's natural resources, and his prominence as a global spokesman for conservation have resulted in many awards, including Gold Medals from the Royal Geographic Society and the Scottish Geographical Society, the Hubbard Medal of the National Geographic Society, and numerous honorary doctorates. His books include *Origins; The Origin of Humankind; The Sixth Extinction;* and most recently, *Wildlife Wars: My Fight to Save Natural Treasures*.

Dr. Leakey. BBHC photo.

This interview was conducted by former *Yellowstone Science* editor Paul Schullery and Yellowstone chief of public affairs Marsha Karle, at the Buffalo Bill Historical Center following

the opening ceremonies for the Draper Museum. It originally appeared in *Yellowstone Science*, Volume 10, Number 3 (summer 2002).

Museums in Greater Yellowstone

YS: Let's start with where we are today, at this outstanding new natural history exhibit. To newcomers, it might seem odd that the Greater Yellowstone Ecosystem should be blessed with so many fine museums, and now we have the Draper Museum of Natural History to add to the list. With so many wonders of nature available, why are museums important in this region? In other words, why should people visiting this extraordinary region go into a museum—especially a natural history museum—when they can stay outside and experience the real thing instead?

RL: To me, as a former museum person and educator and writer, there is an initial "Wow!" value to a canyon or a forest or a bear or an elephant. And then the wow-value is quickly dissipated. To really understand what it is that wowed you, and to give it context and depth, is very rarely possible for somebody looking at the real thing, because they're generally not with people who have the time [to explain it all]. And yet if you can understand the wow, the drama, the awe, through displays and interactive information kits and things of that kind, the life of the wow, the life of the awe, is automatically increased and becomes deeper.... So I think that there is a role for museums, but the museums are very seldom tied to something as specific as one ecosystem. They're very seldom designed from the outset to do that task.

YS: But the Draper Museum is exceptionally well designed to do it.

RL: I find this museum [the Draper Museum of Natural History] exciting in that it appears that in the last four years a group of people have come together and thought about the value of having something like this. But I've said to Chuck [Charles Preston, curator of the Draper Museum], and I've said it to a number of people, I think you've done a great job getting this far but the tough work is ahead. Can you now provide the continuing excitement of the facility and make sure that the awe of Yellowstone and the ecosystem continues to be pushed at people who are coming through? Have you got the energy and the money to keep the place doing that job? And I think this is relevant to say: can you persuade people on a different turf, that is the park people, that you're a complement not a competitor? And no, this can't replace the real thing, but the real thing can't give what this gives to the average visitor. . . .

YS: Perhaps you will also be reassured to know that, though it is true that on the higher political level, the management leadership of the national park and of the community of Cody are sometimes at odds, the specialists in education in the park and the specialists here at the museum almost always are on good terms.

RL: Yes, and that's the important thing. The politics of administration and leadership of institutions and

communities is in part a turf issue of course, and I've played that game too. I know what that's about. One of the points I try to make is that I come at these questions [only] partly as a scientist. I'm a farmer; I've put quite a bit of money into land. I've been a politician, and I've been an administrator at the highest level you get, so I've seen this sort of issue from every corner of the box. And I understand the difficulties. I think it's very challenging.

Yellowstone and the Perception of Nature

YS: During the speeches you've given this week, you've said that when you were young you heard of Yellowstone and found a certain inspiration in knowing that Yellowstone was this formative force in the early conservation movement. We think it is significant that Yellowstone now often benefits from other parks in return. Yellowstone's role has changed. Where once, other nations referred to their premier park as their "Yellowstone," now Yellowstone is sometimes referred to as the "American Serengeti." As another example, for the past several years Yellowstone has been getting advice from Costa Rica in the legal and political complications of bioprospecting.

RL: There are some very interesting licensing agreement questions, I'm aware.

YS: Right. And we also imagine we can learn from the African parks. In Yellowstone we deal constantly with the very emotional issue of death in the natural world. Many Americans still tend to like their natural world to be tidy and well-mannered, and natural violence often shocks them. But that is what wild nature is about. If nature decides that this adorable little elk calf, or that baby bison, is going to be eaten by a grizzly bear, then so be it. If nature decides that the forest must burn, that is what we in Yellowstone would like to have happen. National park management has come a long way from the time, only a few decades ago, when American national parks were portrayed as peaceable kingdoms. Can you offer us any words of encouragement, from your African experience, on how to address these issues so people understand them better?

RL: I would have thought that the exposure of predator-prey interaction and the kills that predators make and people watch—the tearing apart of carcasses and flesh—this surely is something that if any visitor goes to an African park, that's what they want to see. They want to see a cheetah kill. I think basically that's easy.

I think the problem with perception is in the role of fire. I think there are plenty of arguments around as to whether parks should be burnt or allowed to burn, or what is the management regime policy that you want to adopt. And I think those are going to be issues that will continue to raise sentiment. But I think it is quite clear that a very good argument can be made for the beneficial effects of fire on certain habitats.

YS: We've made it, or at least tried to.

RL: Yeah, and I think one of the

points that needs to be made, and I think now it is beginning to happen more than it was twenty years ago is that clearly Yellowstone National Park as an entity needs a little extension in terms of area, particularly in winter foraging [lands], which are currently taken up by irrigated agriculture and ranchers. I think the fact that organizations such as The Nature Conservancy are beginning to get into negotiating easements and next-generation property rights is very positive, because you will make it easier for people to understand that a fire can be beneficial and there are other places these animals can move to as these places regenerate.

YS: But it is only part of the equation we face in reconciling the public to the realities of nature. In 1988, we had enormous fires. They were within the known size range of historical fires here, but they were shocking. Then, the following winter was the first reasonably severe winter in several years. The grazing animals lost forage to the fires, then, after several easy winters were faced with more severe winter conditions that they were not physiologically prepared for. Ecological circumstances kind of ganged up on the wildlife. The winter mortality turned into almost as ugly a controversy as the fires had been. It wasn't our finest hour in trying to celebrate the deeper beauties of wild nature.

RL: Of course. This happens in many countries.

YS: Most of us in America were raised to think of nature as a smoothly functioning machine. Yellowstone has been teaching us otherwise, and it has been a hard lesson for many people to learn.

RL: As you well know, the idea of nature being a balance is nonsense. If we had [balance] there would be no nature. It is the imbalance that provides the dynamic for diversity.

Yellowstone as a Global Asset

YS: Yellowstone is constantly embroiled in what might be called property issues. These are not so much the issues involving private property holders near the park, as they are issues involving the very idea of who owns Yellowstone. In other words, who gets to decide what's "best" for the park, and what management direction should be. It is a long-standing complaint of the park's national constituencies that the regional constituency has too much say, and the locals always feel put upon by the more remote interests.

RL: Yes, but I think if you step away from Yellowstone being the sort of property of the people who live around it and you see that Yellowstone is in fact the property of America, the United States. And indeed it is part of the globe's assets. And it would be, you know, understandable but nonetheless very selfish to perpetuate the myth that this is a local activity, any more than the Serengeti is. There are obligations.

And the constituency is not your ranchers. They are part of your constituency, but the people in Nairobi, who probably are entitled to feel that

Scientific debate continues over the ecological similarities and differences between African wildland parks and Yellowstone, but they have become almost interchangeable as symbols of the conservation of large predator-prey systems. Above: Amboseli National Park, Kenya, *Darren Ireland photo*. Below: Hayden Valley, Yellowstone National Park, *Renée Evanoff photo*.

they are part of the same constituency, you see, are ensuring that this ecosystem is sustained. That's a shift in thinking.... It is a hard shift. I can understand people getting upset if wolves eat their stock, but you know, at

the end of the day, isn't it more important to have wolves running free, and accommodate the people whose stock's being eaten?

YS: By the way, you have contributed to making that shift. In your speeches this week you have offered such hearty congratulations to the regional people who constructed this wonderful museum—a museum that interprets Yellowstone as part of a globally significant ecosystem—that you have almost certainly helped some skeptical people better rationalize the museum's message, when up to now they may not have been sure they agreed with it.

RL: Several people have said that to me.

YS: Yellowstone's problems often seem irresolvable, and vast amounts of energy and money go into trying to settle them. But at least some of the people who have listened to you describe the problems and issues facing Kenyan parks must have paused to wonder: we must seem like real whiners to you. The luxuries we've got, not only in the wealth of wild lands and wild animals but also in the economic and legal wherewithal to care for these things, don't seem reflected in the constant bickering we do over problems that are trivial compared to what you face in Kenya. An occasional group of bison or wolves cross a boundary or kill some livestock, but most of the trouble they cause is social and political.

RL: It is very true. Yeah. I mean, you know, if a troop of baboons comes onto your property, they can destroy everything. Fast. And then you talk about a herd of elephants, and it's hopeless.

YS: That leads back to this matter of how the national park gets along with its neighbors, and for that matter with its former tenants. In one of your speeches, you brought up the long tradition of guilt that plagues many national parks. Either there is guilt because the land was originally stolen from Native Americans, or it was stolen from white people who themselves stole it from Native Americans, or in some other way someone is believed to have suffered loss for the sake of creating the park.

On the other hand, you seem to be agreeing with the people who, though they acknowledge those past sins, say it's too late to keep punishing ourselves about them. These people say, "That's all true; those things happened and they were wrong. But it doesn't matter any more because these places, these last few wild enclaves and their wild inhabitants, are so important as global ecological baselines that we can no longer afford to feel guilty about what happened long ago."

RL: Absolutely right. And it doesn't help policymaking if you're doing it on a defensive starting point. If you look at what's happened to the rest of the country, and it has been taken over by motor bikes and trail riders and agriculture and irrigation, etcetera, etcetera, thank goodness somebody said, well it's not going to happen here. Because that's for the good of everybody.

YS: So, if things have reached a state that we just have to come to terms with past mistakes in dealing with the native people, how about the current local communities, which in Yellowstone's case are mostly composed of Euro-Americans? Where should they fit in the deliberations over park management? How does that work in Africa? How much say do your border towns have in how the parks are managed?

RL: Well, it's certainly very much part of the debate in Africa, the role of communities adjacent to parks as stakeholders. I would take a tougher line than I used to and say that, yeah, I understand they're stakeholders, but the people who live around a nuclear reactor are theoretically stakeholders, and the people who live around a hydroelectric dam setup are stakeholders. Why is it that national parks have to bend over backwards to give the local community greater rights, or access, or benefit, when none of the other national enterprises that benefit the whole country are similarly taxed with a double level of involvement? And I think it's this guilt thing. I think that it's different here [in the United States], but perhaps not that different. I mean, we clearly wouldn't have kept this environment as it is if it hadn't been the park.

YS: It seems certain that without the federal reservation, the Yellowstone Plateau would now be settled and its various resources intensively and commercially developed. Long ago.

RL: Yeah. You know, you can't now reverse the clock. It's a pity. But certain people say, well the Maasai have lived with wildlife for centuries; why are you telling them they can't interact? Well, of course they have, and indeed the wildlife survived because they didn't interfere with it. They didn't interfere with it because they didn't need to. They didn't have to put children through college, and buy medications for their mother-in-law, and run a vehicle, and insure it. But once you get into a modern economy, once you get into the dynamics of being part of a twenty-first century economic enterprise state, you can't any longer live with the values you had before. Sadly.

It used to be sufficient for people to harvest the forest. But there were less than a tenth of the people wishing to harvest it, and they weren't harvesting it to sell hardwood timber to make coffins for people on the west coast of America. Now, cutting down one tree per person per year doesn't pay the bills. They need to cut down a hundred trees. And there are a hundred times more people than there were then. So you can't change one side of the equation and not the other.

YS: In the past ten years or so, we've witnessed a heartening political and social process in greater Yellowstone, in which Native American tribes have been re-enfranchised in the dialogues over the management of the park. But it has also pointed up what you have just described, that the economic conditions and human population levels are so different that so far there seems to be no equitable or politically palatable way to "restore" those cultures to this landscape.

RL: It can't be done. It's a pity, but it can't be done.

YS: A challenging element of the relationship between parks and native peoples in this country is subsistence hunting. You certainly have subsistence hunting in Kenya.

RL: But not in national parks....

The Role of Scientists in National Parks

YS: The scientific community, if there is such a thing, has always been divided on the question of advocacy. Some scientists insist that their role is to stay aloof of political controversy, while others engage in it. Is it like that in Kenya? For example, in your book, *Wildlife Wars*, you talk about several biologists you've worked with who have made the choice to become advocates. How are they perceived by their colleagues? Has their activism affected their professional standing?

RL: I don't think there is any doubt at all that there is a role for everybody. Take Jane Goodall. She hasn't done any science in chimpanzees for many, many years. And yet her advocacy—the desperate state of wild chimpanzees and the need to consider ways in which the great apes can be secured for the future—I mean, it's been enormously powerful.

YS: The world seems to agree that she's a hero of the highest order.

RL: And I think the scientists may have looked down on her when she started her advocacy, but I think today Jane is widely respected for having made an enormous contribution to changing the status of the chimps and other great apes to a point where the

Wildlife (such as this lioness on a zebra kill in Masai Mara National Reserve, Kenya) kill hundreds of humans in Kenya each year. Such extensive loss of human life is a significant difference between African and North American national parks. *Darren Ireland photo.*

politics of their conservation are actually being discussed by politicians, which is how it should be.

And I think people like Cynthia Moss and Joyce Poole [elephant researchers in Kenya] and others are doing the same thing in other areas, so I think one has to be very careful. I wouldn't want to criticize those scientists who are simply committed to trying to understand systems and produce evidence upon which policy can be made. That is a very valuable and significant role. But at the same time, they [scientists] are human, and they are constituents, and they may have at times a point of view, and I think those who do go into advocacy are to be encouraged.

I think where people go wrong is that they often suggest that their [scientists'] advocacy should be more relevant because they are scientific. I don't agree. You don't have to be scientific to be relevant. And so we tend to be a little more polarized than is necessary. And I think some of the African scientists have done tremendous things for the good of wildlife. I don't look down on them. I strongly encourage them. But you know, it's very rare that you have time to do both for very long. You have to do one or the other. Without being in any way putting it down, I mean there is a certain cynicism in it, if you look at the skills of writing grant applications. I mean, even the purest scientist is having to be quite skilled at advocacy.

YS: Let's move from the philosophical to the more immediately practical. As in most American national parks, managers in Yellowstone are required by law to know a great deal about certain animal species, in order to manage them according to legislative mandates. This often involves attaching some pretty substantial technology to the individual animals. As long as there have been radio collars and other tags and markers in Yellowstone, there has been debate over their appropriateness. Is this an issue in Kenya?

RL: Oh, yes. The debate is equally heated and I'm very ambivalent. I think the research has to be done and I think it's important for us to know the answers to a lot of these questions that do require intervention. What I'm not sure is whether a lot of this scientific work has to be done on the same "patch" [of land] as your prime wildlife photography and tourism. And I think that in some of the larger parks a little more effort could be made to tag animals that are not going to be seen every day by hundreds of visitors.

I mean, there's no question that people do get annoyed if they photograph a rhino and it's got an orange collar on it. They didn't come all that way to do that. And yeah, it is important that the rhino's movements be understood, but I think there needs to be a little more sensitivity about the value of the public appreciation. Because we're in a market. I think if you're watching a group of wild dogs and some scientist comes over the horizon and starts shooting them with darts, [you are right to say] what the hell's going on here, I came from the other side of the world to see these animals, and what are you doing? Go and do it somewhere else. So there are

both sides to the story.

YS: In Yellowstone, a fundamental guideline is that research shouldn't be conducted here if it can be conducted just as well outside the park, perhaps on lands where there are fewer competing interests. But often the legal and research needs leave managers no choice. And on the positive side, visitors could easily encounter several researchers in the course of their visit, and with a little luck may come away with a heightened understanding of the animals, or of why the information matters so much here.

RL: But you don't [want to] do it to death. There is always a danger, [and I'm speaking] as a previous administrator, that we're so busy gathering data that we don't actually ever understand what the data is telling us as managers. We lose sight of the core business. And I think it's always important to try to keep a balance.

Experiencing Wildlife in Parks

YS: One of the most interesting aspects of wildlife appreciation in Yellowstone involves what might be called a personality cult of the wild animal. Ever since the early days of roadside bear feeding, visitors have come to know a surprising number of Yellowstone animals as individuals. Today, there are grizzly bears and wolves that park visitors have in some cases literally watched grow up. Many of our most serious wildlife watchers know these animals by name, or, more often, by their research number. Some of our most devoted visitors come here in good part to observe and get reacquainted with specific animals. Does that happen in your parks?

RL: I think much less so. We have very few repeat visitors in our national parks; so many of our visitors are overseas tourists who come once.

YS: But your guides probably know some animals more specifically?

RL: Guides may know.

YS: In a way, those animals that are so well known, even if they are still living entirely without human assistance (such as feeding), are kind of the sacrificial animals in the population. Their social role is to be habituated enough to make it possible for us to get this extraordinary glimpse into the life of the wild, but any time an animal is placed in that position it seems that some of its wildness—its remoteness from us—might be compromised.

RL: I think that's true, but ultimately, you know, a modern state has to have soldiers and politicians and doctors, and some of these animals are contributing to the good of their species.

YS: It is true that they are serving rather like emissaries from their species to ours.

RL: That's right. One has to be realistic, you know? They're part of the team. *(General laughter).*

YS: Another element of the visitor experience of wildlife involves professional photographers and filmers. Everybody has a camera any more, but

we're talking here about the commercial enterprises that are attracted to national parks for ease of access to remarkable wildlife viewing. How do you deal with that use in Kenyan parks?

RL: Again, in Kenya it is slightly different. I think we've been slightly too mercenary in putting a financial price on access and I think we often forget that good photographs and good films sell the product and we are dependent on visitors, and we should not underestimate the advantages we're getting without just the money.

Perhaps a second aspect is [that] some of these [Kenyan park] areas are for those who want to drive off-road. They create precedents and a lot of photographers want to do things that are possibly more dangerous than they would be here. There are many more dangerous species in an African park, and it does require a degree of knowledge and experience to get away with walking in some of these areas on foot to get the buffalo, rhino, elephant. At the end of the day, bad publicity arises from somebody getting trampled or gored and so one is careful.

But we do make concessions. I don't know if you take the *National Geographic*, but there was a Mzima Springs article [November, 2001] with underwater pictures of hippo and different fish. They had special access to one of the springs that the public can't visit, and were there for a year and a half. And so we do facilitate that sort of thing. [But] if someone wants to make a commercial ad for a four-wheel drive vehicle against a backdrop of spectacular wildlife and scenery, then we make them pay for that.

YS: So do we. Another interesting complication of managing large wild animals is human safety. One of the most dramatic differences in North American and Kenyan wildlife experiences is that we rarely have someone killed by an animal, especially in the parks.

RL: I think we have much more, absolutely, not necessarily photographers, but the number of people killed by wildlife incidents is I should think 150 or 200 a year—buffalo, rhino, and so on. It's very common.

YS: In your book, *Wildlife Wars*, you describe the revelation you experienced in Amboseli National Park in southern Kenya, when elephant researcher Joyce Poole drove you into the midst of a family of elephants. By introducing you to the animals as individuals, and explaining their little quirks, she revealed just how complex their family and social world was. You were director of the Kenyan Wildlife Service (KWS) at the time, and were engaged in stopping the catastrophic slaughter of elephants by poachers, but you said you had never had the kind of sympathetic close encounter that would allow you to understand what elephants really were. Poole was being criticized by other ecologists for introducing too much "sentiment" into her scientific study, and treating her study subjects too much like they were people. Here is what you said:

> For the first time, though, I realized that my job involved far more than merely ensuring that a certain number of elephants continued to exist in our parks. KWS was doing much more than that: we were protecting sentient creatures with babies and sisters and fami-

lies. I fell asleep laughing at myself. In the space of one hour, I had become a "sentimental" convert.

That statement resonates powerfully in today's Yellowstone. Old-time ecologists, old-time biologists and managers complain that the new constituents of wildlife are perceiving these animals as furry people. This returns to the rise of personality appeal in individual animals, mentioned earlier. As that kind of sensitivity increases, do you think it's likely that we'll reach the point in national parks that we will value the animal's lives as much as human lives? Will we get to the point where we will come out and say that a human's life in greater Yellowstone is worth no more than this grizzly bear's life?

RL: I wouldn't have thought so. I am sure people come out and say that, but it doesn't mean it's true.

It's very different to say that an animal's life has no value and only a human life does have value. I don't think there's any question that if we were a group of people together, and we were given an opportunity to help somebody, we would choose to help our family first. It doesn't make them any more valuable. You do something to save your child or your wife or your cousins, before Joe Doe over the hill.

I also think this is possibly a consequence of the Judaeo-Christian theology to have dominion over the earth, and to have that great chasm between us and them. I think what we do is say that it's not a chasm, it's part of a continuum, but it's not going to drive me to only eating lettuces. I can tell you, I'm part of the food chain. I enjoy being part of the food chain, and there it is. But it doesn't mean that I don't have a far greater appreciation in the way I conduct my life and my job when it comes to looking after my responsibilities to know that an elephant is much more than simply a four-legged chunk of meat.

But this is true of civil right, you know. There were those people who had the temerity to suggest the slaves should be slaves—that there was something fundamentally wrong in putting people in servitude and bondage. But others said, where are we going? [They asked] Where is this leading? Then you want good race relations—where's that taking us? I don't think it's just an increasingly enormously valuable storehouse of knowledge that successive generations of humans are gaining.

[Saying these wild animals have] "personality" is wrong. They have character. They have a degree of cognition that we never suspected. Now, I think that it is quite clear that a bison has sentimental feeling, but perhaps less humor than some of the social primates.

YS: Or than the wolves.

RL: Or than the wolves. But you know, as we learn more we can put some of these things in better perspective. I'm not sure if you shoot a bison that the rest of the troop feels the loss. But I'm pretty sure that if you shoot out a wolf in a pack you have a far bigger impact than with bison. And I think with elephants it's more certain, and with chimpanzees it's much more significant. With humans it is even more significant. So I don't think we

should be ashamed of being aware [of it].

And yes, the old timers don't want any sentimentality and they accuse you of anthropomorphism. Well, anthropomorphism isn't a package you get from somewhere else. It's a concept. And our behavioral traits we're beginning to see in other creatures. I think it's a little arrogant to think [these observations are] anthropomorphic, but that's the only way we can describe them. Our vocabulary is tied to our own experience. You know, what humans have done to humans is outrageous, [as is] what we continue to do to our environment, including the other species who live in it. I'm not sure it's *equally* outrageous. What is equal?

Parting Advice

YS: It's clear from the story you tell in *Wildlife Wars* that as director of wildlife management in Kenya you were able to take a thoroughly disenchanted and discouraged government department and—after you'd dismissed the corrupt people—turn it into a vital, productive agency that did its job with energy and a great deal of pride. There are many in the National Park Service today who could use a boost. What would you say to this agency's leadership that might help get us through a difficult period?

RL: I think everybody works for somebody somewhere. And I think it behooves those who have people working under them to make everybody feel part of the team and to appreciate other people's efforts. I think it's when the hierarchy of management [honors] the individual sacrifice and commitment that people are making, and when people are rewarded for that commitment—not necessarily financially but by the right words and the right actions—that you can build a much stronger team that will go through much greater difficulty than if everybody's just punching a number. That's what I would say. It is a collective effort.

David J. Parsons and David N. Cole

The Challenge of Wilderness Stewardship

The 1964 Wilderness Act and subsequent wilderness legislation have resulted in the designation of over 106 million acres of the United States as wilderness. Charged with the responsibility of protecting a significant portion of federal lands as wilderness, the federal land management agencies with responsibility for wilderness stewardship (Bureau of Land Management, Fish and Wildlife Service, Forest Service, and National Park Service) have often struggled with how to translate legislative direction into policy and management practices. The direction to manage wilderness in a manner that protects natural ecosystems and minimizes interference with natural processes provides a huge challenge for those who often feel their first priority is to fulfill the more specific missions of their individual agencies (e.g., management for healthy wildlife populations, provision of opportunities for recreation, or maximization of multiple use of forest or range lands). When coupled with rapidly changing environmental, social, and technological conditions (Vitousek et al. 2000; Stankey 2000; Watson 2000), wilderness managers are faced with immense challenges.

In recent years there have been a number of accounts of the management challenges faced by those charged with the stewardship of our wilderness heritage. A recent report by the Pinchot Institute for Conservation (2000) provides a thorough review and critique of the challenges of managing federal wilderness lands as a "system"—the National Wilderness Preservation System that was established by the 1964 Wilderness Act. That report elaborates on the difficulties the wilderness management agencies have had in developing and implementing a common set of guidelines for wilderness stewardship. Cole (2001) has articulated the need to address two major management dilemmas: providing for access while at the same time protecting natural conditions, and the difficulties of trying to maintain an unmanipulated, or wild, condition while also protecting, or restoring, natural conditions. Graber (1995) has detailed some of the challenges of managing to perpetuate native ecosystem elements and processes in national parks. Others have focused on specific threats to the wilderness system (Wolke 2003) or have detailed how individual agencies, such as the National Park Service, have struggled to fully embrace their wilderness stewardship mandate (Sellars 1999). The importance of science to the resolution of difficult management challenges has often been articulated (e.g., Pinchot Institute for Conservation 2000) but investment in

science has seldom been adequate. Several conferences focusing on science and wilderness have attempted to both highlight quality research and address the challenges of effectively applying scientific findings to policy and management issues (Lucas 1986; Cole et al. 2000).

The intense interest that the challenges of wilderness stewardship have generated in recent years led the National Park Service's National Wilderness Steering Committee to organize three symposia for the April 2003 George Wright Society / Cultural Resources 2003 Joint Conference, "Protecting Our Diverse Heritage: The Role of Parks, Protected Areas, and Cultural Sites." Wilderness science and management clearly was a dominant theme at the conference, with a number of additional sessions and individual presentations organized or presented by others. The sessions were well attended and generated stimulating discussion and interaction. This obvious interest in wilderness led us to propose that selected conference papers addressing wilderness issues be combined into a special theme issue of *The George Wright Forum.* The papers in this issue represent the results of that effort.

In the first paper, David Cole addresses the importance of recognizing the uniqueness of wilderness as well as the need for increased commitment, attention, leadership, and financial resources from the federal wilderness agencies. He is concerned that the current management environment encourages compromise between divergent purposes and values, and that while compromises may be advantageous to individual wilderness areas, they can reduce the overall value of the National Wilderness Preservation System. He calls for improved cooperation, planning, and policy development between the agencies as necessary to preserve the full intent of wilderness as a system.

Cole describes two dilemmas facing wilderness managers, one of which is the need to often choose between restoring the naturalness of wilderness ecosystems or intentionally trammeling wilderness ecosystems (by intentionally manipulating them). David Graber's paper discusses this issue in more depth, coming to the conclusion that there is nothing in legislation or National Park Service policy that precludes active ecological restoration. Further, the paper advances Graber's personal view that the values to be gained through ecological restoration far exceed those that would be lost.

Peter Landres and others outline the challenges that face those proposing to do science in wilderness as well as those assigned the responsibility of judging what kind of science is appropriate in wilderness. They build the case, based on historical, legal, and policy perspectives, for the need for a better process for evaluating the appropriateness of scientific activities in wilderness. Jack Oelfke and collaborators build on the issue of doing science in wilderness with a case study of the long-term research on wolf and moose populations at Isle Royale National Park. They review the long history of this rich data set and address the conflicting values the park had to face in deciding whether to

allow continued manipulation of the wolf population to facilitate the clear scientific values of continuing these studies.

Brian Glaspell and cooperators report on research into the wilderness experiences of recreational users at Gates of the Arctic National Park and Preserve in Alaska, which are often considered to represent the wildest end of the spectrum of conditions in wilderness. Their work attempts to better understand these experiences, as part of an effort to inform management designed to preserve these experiences. Steve Lawson and his collaborators report on a developing technology—computer simulation modeling—that can be a valued tool for wilderness recreation management. Simulation models can help wilderness managers monitor recreation more cost-effectively, as well as fine tune their management programs. The case study in Lawson's paper shows how simulation models were used to develop realistic alternatives for managing campsite use at Isle Royale National Park.

Gary Somers' paper addresses the often contentious relationship between cultural resource specialists and wilderness managers in the National Park Service. He details the various cultural resource and wilderness laws and policies that direct Park Service activities. He concludes that park managers must fully consider all relevant direction and that neither cultural resources nor wilderness should trump the other. He argues that increased dialogue and understanding between cultural resource specialists and wilderness managers is both desirable and necessary.

Finally, Wes Henry and Steve Ulvi describe recent National Park Service efforts to provide more effective direction to wilderness management in the agency through the activities of the National Wilderness Steering Committee. This group, which includes representatives from across the agency, has made significant progress in reporting on the state of Park Service wilderness as well as providing guidance on wilderness planning and a variety of difficult wilderness management issues. The committee is in the progress of developing an action plan that will provide additional direction for NPS wilderness managers.

Management of wilderness in the National Park Service, as in the other federal agencies, requires the balancing of numerous purposes and values. It is a challenge. We hope that the papers in this issue of the *Forum* provide a broad context for better understanding wilderness stewardship challenges and some of the efforts being made to address them. We also hope that these papers illustrate how science can contribute to our understanding of wilderness issues.

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David N. Cole

Agency Policy and the Resolution of Wilderness Stewardship Dilemmas

Wilderness preservation is strongly supported by the American people (Cordell et al. 1998) and a substantial portion of the public domain has been allocated to wilderness. The Wilderness Act of 1964 and more than 135 subsequent wilderness bills have created a National Wilderness Preservation System of 661 wilderness areas with a total acreage that exceeds 106 million acres. The proportion of the United States currently designated as wilderness is 4.5%. Designated wilderness constitutes more than 16% of lands owned by the federal government, 57% of National Park Service lands, 22% of Fish and Wildlife Service lands, 18% of Forest Service lands and 2% of Bureau of Land Management (BLM) lands. Moreover, wilderness acreage is likely to increase substantially in the future.

America's investment in wilderness management has never been commensurate with its investment in wilderness allocation, however. Unless adequate attention is given to the quality of conditions within wilderness boundaries, the establishment of a large National Wilderness Preservation System will fail to preserve an enduring resource of wilderness (Lucas 1973; Hendee and Dawson 2002). If wilderness character degrades substantially, wilderness may continue to exist as lines on a map but not as vestiges of the wild American landscape. A recent report by the Pinchot Institute for Conservation (2001), commissioned to assess the quality of wilderness management by the federal agencies, concluded that there is a need for stronger leadership, more consistent policy, and an increase in the financial resources invested in wilderness stewardship.

Wilderness is Unique

When the Wilderness Act was proposed, federal land management agencies were united in their opposition to the bill. They viewed it as a threat to their administrative discretion and as unnecessary (Hession 1967; Sellars 1997). Since passage of the act, official agency opposition has disappeared but subtle opposition continues, particularly in the form of personal beliefs that wilderness is not unique, that wilderness management does not require special skills, and that it can be a collateral duty. The Pinchot Institute for Conservation report questions the adequacy of wilderness leadership in all four wilderness management agencies but notes that "the BLM and Forest Service are best staffed by people with specific responsibilities for wilderness stewardship" (2001:8). The report implies that inadequate recognition of the unique characteris-

tics and challenges of wilderness is most problematic in the National Park Service and Fish and Wildlife Service, where it is not uncommon to hear leaders argue that wilderness is no different from park backcountry or that wilderness designation should not influence refuge management objectives. Sellars (1997:191) notes the prevalence of the belief that wilderness designation is "redundant" within the National Park Service leadership. Such beliefs are barriers to effective wilderness stewardship and reflect a poor appreciation for wilderness values and the support of the American people for those values.

Wilderness Stewardship is Challenging and Requires Financial Resources

Funding for wilderness management is meager in all four management agencies. For example, the Forest Service spends less than 1% of its annual allocation of about $4 billion on wilderness management, despite the fact that 18% of Forest Service lands are designated wilderness. Investment in wilderness science is even more anemic. The Forest Service provides the vast majority of funding devoted to developing a scientific basis for wilderness management, and yet Forest Service research invests less than 0.5% of its annual budget on wilderness management science. The other agencies invest considerably less.

Inadequate funding might be explained by a perception that wilderness management is a simple business. Nothing could be further from the truth, however. Management of wilderness requires as diverse an array of information and skills as any land management job (Cole 1990). Wilderness managers must maintain ecological conditions and processes, as well as provide outstanding opportunities for solitude and primitive recreation. They must develop a good understanding of the conditions and processes that make up the wilderness resource—air and water quality, wildlife, recreation, and much more. They need to develop quantifiable objectives for the conditions wilderness is to provide, monitor these conditions to see if objectives are being met, and develop and implement management strategies and action plans for dealing with situations where objectives are not being met. Moreover, management challenges are exacerbated by the remoteness of many wilderness lands, the scale and complexity of the systems involved, provisions for nonconforming uses, conflict between competing goals and, particularly, by the need to manage with a light hand (Pinchot Institute for Conservation 2001).

Wilderness Management Dilemmas

Inadequate funding and limited recognition of what distinguishes wilderness from other land classifications are two obvious problems resulting from "a lack of official attention to sound wilderness stewardship" (Pinchot Institute for Conservation 2001:4). Lack of attention by agency leadership also has resulted in confusion regarding how to resolve several fundamental dilemmas of wilderness stewardship. This is particularly true

of two dilemmas that face wilderness managers.

The first of these involves the conflict between providing access to wilderness for its "use and enjoyment" and protecting the biophysical conditions and visitor experiences that are unique to wilderness but can be degraded by recreational use. Recreation use of wilderness continues to increase (Cole 1996a) and Congress exacerbates this problem by designating heavily used lands adjacent to metropolitan areas as wilderness. How do we balance the needs of society for periodic escape from hectic lifestyles to places of personal renewal with the mandate to protect wilderness conditions from degradation? In National Park Service wilderness, this is mostly a day-use issue. Overnight visitation is usually limited, while day-use goes unmanaged and usually unmonitored. Hundreds of people per day hike popular wilderness trails in parks such as Yosemite and Shenandoah, seeking respite from the crowded city and reunion with nature. Should this be allowed or should most day visitors be turned away? Such a question is even more difficult to answer for a wilderness such as Pusch Ridge, with boundaries immediately adjacent to suburban backyards in Tucson, Arizona. Should we allow heavy use in some places or in some wilderness areas but not in others?

The second dilemma concerns the appropriateness of manipulative restoration in wilderness. This dilemma is subtle and has only recently come to light (Graber 1995; Cole 1996b). Ideally, wilderness is a place where natural conditions and processes are preserved, where conditions are little different from what they would have been in the absence of post-aboriginal humans. Wilderness is also to be "untrammeled," which means not controlled or intentionally manipulated by modern humans. I have referred to this attribute as "wildness" (Cole 2000, 2001). At one time, hands-off management was sufficient to keep wilderness both natural and wild. As the human imprint on the globe increases and is better understood, however, it is clear that wilderness conditions have been altered by such human agents as global warming, invasions of exotic species, and fire suppression. For example, whitebark pine forests in the Rocky Mountains are being decimated by an exotic pathogen (white pine blister rust). This threatens grizzly bear populations that are dependent on whitebark pine seeds for a significant proportion of their diet (Tomback et al. 2000). Should we breed rust-resistant whitebark pines and plant them in wilderness to protect natural ecosystems and grizzly bears or is manipulation of genes and populations unacceptable in wilderness? To compensate for anthropogenic impact, should we intentionally manipulate wilderness ecosystems in some cases but not in others, or in some wildernesses but not in others?

Reasons These Dilemmas Exist

The proximate reasons why these dilemmas have never been resolved are ambiguity in the language of the Wilderness Act and insufficient policy and direction from agency leadership. Consequently, different wilderness

advocacy groups interpret the Wilderness Act in different ways, advancing those wilderness values they hold most dear. Some groups interpret the Wilderness Act as a mandate for not allowing heavy recreation use anywhere in the National Wilderness Preservation System and for not manipulating wilderness ecosystems even where there are pronounced human impacts. In contrast, other groups believe it is inappropriate to restrict recreational access where recreation use has traditionally been heavy (except perhaps to avoid excessive biophysical impacts). Other groups believe it is appropriate to manipulate wilderness ecosystems, using prescribed fires or herbicides for example, to compensate for human impact and protect native ecosystems and biodiversity.

The roots of these dilemmas can be traced to the divergent purposes for which wilderness has been designated. In *Driven Wild*, Sutter (2002) offers new and enriched perspectives on the motivations of some of the earliest and most influential wilderness advocates. He makes a compelling case that the primary motivations for wilderness preservation originally had more to do with keeping automobiles and recreational developments out of wilderness than with protecting wilderness from too many people. They also had more to do with primitiveness and the absence of human control than with a concern for pristine ecological conditions. As Howard Zahniser (1963), the primary author of the Wilderness Act, famously said, stewards of wilderness should be "guardians not gardeners." This contrasts profoundly with the more recent opinion of ecologist Dan Janzen (1998) that the "gardenification" of wilderness is necessary and desirable.

The primacy of these motivations did not result from ecological ignorance or inadequate appreciation of the value of ecological preservation; rather they reflected the fact that the Ecological Society of America was working simultaneously to establish a representative system of areas protected in their natural condition. Sutter quotes a letter written in 1940 by Aldo Leopold, which states that "the [Wilderness] Society ... is mainly interested in wilderness *recreation.* Another group, the Ecological Society, is interested in wilderness *study*" (2002:280).

While the stream of thinking that led directly to the language and passage of the Wilderness Act was focused on primitive recreation in large undeveloped areas that were to be "untrammeled," these same people recognized the value of other types of land preservation. In 1932, Bob Marshall wrote the recreation sections of a congressionally commissioned report on the nation's forests (U.S. Congress—Senate 1933). He recommended the preservation of seven types of recreational areas, including both "wilderness areas" (which would emphasize primitive recreation) and "primeval areas" (which would provide representative examples of ecosystems in their natural state). Sutter describes the initial (1935) platform of the Wilderness Society, which identified the need for five "Types of Wilderness" (2002:246–247). Three of these types seem relevant to the

stewardship dilemmas we face today. "Extensive Wilderness Areas" were to be large areas free from mechanization, devoted to primitive recreation and with substantial symbolic value as reflections of human humility and restraint. "Primeval Areas" were to be tracts preserved in their natural state for scientific and aesthetic values, and "Restricted Wild Areas" were to be free from the sights and sounds of mechanization and near concentrated areas of population. The founders of the Wilderness Society recognized the need to preserve wilderness for at least three somewhat divergent purposes: primitive recreation in wild landscapes with symbolic value (their primary interest), preservation of natural ecosystems, and recreational escape from the city. Moreover, they recommended that lands devoted to these purposes be designated as different types of wilderness.

The management dilemmas we face today result primarily from Congress ignoring this recommendation. Regardless of the purpose of designation, areas are simply referred to as "wilderness" and are managed according to the language of the Wilderness Act, language that came largely from the tradition of the extensive wilderness area, where the primary motivations were primitive recreation and freedom from modernization and human manipulation. No similar land-management system has been developed to adequately provide the benefits of a system of natural ecosystems or of scenic, natural-appearing lands accessible to urban populations. The access vs. preservation dilemma results from Congress designating as wilderness both lands valued because they are large, uncrowded, and primitive and lands valued because they are primitive but provide easy access to city-dwellers. The naturalness vs. wildness dilemma results from Congress designating as wilderness both lands valued because they are free from human control and lands valued because they are representative of natural ecosystems.

Policy Needs to be Developed

In seeking resolutions to management dilemmas, the traditional approach has been to consider the merits of each situation on a case-by-case basis to arrive at an acceptable compromise between competing goals. Given the decentralized decision-making tradition of land management agencies, such decisions are typically made independently and repeatedly by mid-level officials, buffeted by the polarized arguments of opposing sides. In this environment, most decisions are likely to be made in similar fashions everywhere, causing the wilderness system to gravitate toward homogeneity and mediocrity (Cole 2000, 2001).

At a recent wilderness science conference, Foreman (2000) used "The River Wild" as a metaphor for the conservation movement. The movement grows in power and diversity as individual tributaries join together in the effort to preserve wilderness. Different tributaries include the three purposes for wilderness noted above—the interest in protecting opportunities for extended primitive recreational trips, the interest in preserving natural sanctuaries, and the interest in providing

places for crowded city-dwellers to recreate in a primitive, undeveloped, and largely natural environment. This is an apt metaphor for demonstrating that new streams (purposes and values of wilderness preservation) do not replace old streams. Each stream adds to the overall power of the river, resulting in the large National Wilderness Preservation System we have today.

The implication of this metaphor that Foreman does not explore is what happens when tributaries with divergent characteristics are joined, blending waters and diluting the original purity of each tributary. The mixing of divergent purposes within wildernesses muddies the waters, leading to loss of many of the values wilderness designation was meant to preserve.

The primary recommendation of the Pinchot Institute for Conservation (2001) is that wilderness be managed as a system. Most of the authors' emphasis, however, is on integration and collaboration between the four wilderness management agencies. Inadequate interagency collaboration is a problem, but inconsistency between agencies may actually promote diversity and enhance the value of the wilderness system. Inadequate policy and decentralized decision-making may be greater threats to the preservation of quality within the wilderness system. Policy is needed that will maintain the purity of wilderness lands designated for divergent purposes—to avoid the muddied waters and loss of values that occurs when competing wilderness purposes are compromised on a case-by-case basis. A regional and national perspective needs to be developed to help stewards of individual wildernesses make decisions about access and preservation, about naturalness and wildness. Only from this perspective is it possible for local decisions to optimize rather than dilute the values of the National Wilderness Preservation System (McCool and Cole 2001).

The Policy of Non-degradation

Non-degradation provides an example of how policy options could be assessed and decisions could be made that would have a profound effect on the future benefits of our wilderness system. Some argue that the Wilderness Act mandates non-degradation of wilderness, that actions must be taken to ensure that wilderness conditions (e.g. natural, wild ecosystems and opportunities for solitude) not be allowed to degrade following wilderness designation (Worf 2001). Worf (2001) asserts that, within the Forest Service at least, non-degradation has always been official policy. However, there are numerous examples where research and monitoring have shown increases in biophysical impacts and in crowding in Forest Service wilderness since designation (e.g., Cole 1993, 1996a). This suggests that we in the Forest Service are not currently managing wilderness according to the principle of non-degradation. It also begs the question, should we do so?

This is the question at the core of the access vs. preservation dilemma. It is my opinion that educational programs, such as Leave-No-Trace, and other management actions have already reduced *per capita* impact almost as much as might be expected.

If so, further increases in recreational use will inevitably cause further degradation of wilderness. Therefore, if we pursue a policy of non-degradation, we must immediately limit recreation use everywhere in the wilderness system (in fact, a strict interpretation would require reductions in use across the system). Our choices and their implications are clear. In my opinion, we need to use clarifying concepts such as non-degradation to assess costs and benefits and to debate the merits of alternative policies. These hard but decisive choices carry such profound long-term implications that they should be made at the highest levels of the land-management agencies instead of being delegated to mid-level management.

Conclusion

The stewardship needed to preserve wilderness values in perpetuity depends on increased recognition of the uniqueness of wilderness and increased commitment, attention, leadership, and financial resources. Given the uniqueness of wilderness and the complexity of wilderness stewardship, increased attention needs to be given to wilderness science, as well as wilderness management, particularly by agencies other than the Forest Service. Equally important is the clarification of polices regarding the purposes of wilderness designation. Currently, wilderness stewards facing management dilemmas have little option other than to compromise between divergent purposes and values. Compromise is the best way to optimize the value of an individual wilderness. However, compromise does not optimize the value of the National Wilderness Preservation System. Ironically, to preserve divergent values within the system, individual managers should choose between competing values. The need I envision is for a referendum on the legitimate purposes and values of designated wilderness. Then wilderness management agencies must cooperate and develop the institutional capacity to preserve wilderness values in perpetuity. To the degree that legitimate wilderness values conflict, cooperation and institutional capacity has less to do with making consistent decisions and more to do with planning to preserve the purity of varied streams of wilderness purpose.

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Ecological Restoration in Wilderness: Natural versus Wild in National Park Service Wilderness

Introduction

The Wilderness Act of 1964 (Public Law 88-577) derived substantially from ideas first proposed by Howard Zahniser in the 1940s when he was executive director of the Wilderness Society (Brower 1964). It was a piece of legislation that, by the time of its enactment into law, had been intensely discussed, reviewed, and edited both by the wilderness community and by Congress. Unlike many laws, its final language was carefully crafted, including its ambiguities. However, like many other laws, it is a prisoner of its time: It is limited to an understanding of the world that existed in 1964. Both the degree of our understanding and the world itself have changed substantially since then.

Two key elements of the Wilderness Act are the phrase "wilderness character," and the word "untrammeled." This paper proposes that *ecological restoration*, which is defined here as human activities intended to take landscapes toward a more natural condition, is often both appropriate and legal in designated wilderness within the National Park System. However, the nature of that restoration and the means by which it is achieved are constrained by the Wilderness Act.

Wildernesses are Wild to Varying Degrees

In *The End of Nature*, Bill McKibben demonstrated that no places on Earth are entirely free of anthropogenic influence (McKibben 1989). Industrial gasses, and their effects on climate and radiation, are omnipresent. Transportation systems have transplanted organisms of all kinds to all but the remotest corners of the planet, where they have not infrequently decimated some of the native inhabitants. Nonetheless, McKibben would have been more accurate had he conceded that nature still exists, but that it is, to varying degrees, less wild.

It was an important organizing principle of America's national parks, as well as of the American wilderness system, that they had captured primeval landscapes unaltered by human activities (Leopold et al. 1963). It is now generally accepted among both ecologists and anthropologists that human beings began making wholesale alterations in their new North American home shortly after they arrived more than ten thousand years ago (e.g., Martin 1986; Martin and Klein 1987). These changes

included the extirpation of some large mammal species, and the modification of vegetation over large areas by the use of fire (Stewart 1963).

Moreover, the traditional notion that wild landscapes were stable or homeostatic over millennia, even in the absence of human beings, has been replaced, in ecology, by the paradigm of change, often catastrophic, induced by change in climate or the arrival of new species that change competitive relationships. Fire, or less commonly volcanism or seismic activity, regularly "reset" some wild landscapes.

Wildernesses, like other reserve lands, are parts of larger systems. They lie within a landscape matrix that is, to varying degrees, altered, and which in turn affects the functioning of ecosystems in wilderness. Organisms, chemicals, light, sound, and many ecosystem processes such as fire move into wildernesses from those adjacent landscapes. Many of the smaller wildernesses in the eastern United States are merely ecosystem fragments.

Many wildernesses have lost native species, particularly large carnivores. Non-native plants and animals have become established nearly everywhere except the polar regions. Many wilderness areas contain pre-existing hydrological diversions, or are downstream of them. Fire regimes continue to be altered both by suppression and by anthropogenic ignition from surrounding areas, and often by the political or practical necessity of controlling fire on the wildernesses themselves. The sounds of aircraft and motor vehicles penetrate deeply into many — even large — wildernesses, while the lights of large cities alter the night sky for scores of miles around them. Lastly, wildernesses, like the rest of the planet, are being altered—in some cases radically—by anthropogenic climate change.

Ecological Restoration: An Increasingly Critical Tool for Nature Conservation

At a time when wildlands continue to be converted to human use, and those that remain become progressively more compromised, the restoration of ecosystems has become an important tool in nature conservation. Removing alien elements, reintroducing extirpated species, aiding the recovery of native ecosystem processes (e.g., fire and hydrologic regimes) to more natural parameters, restoring native landforms, and mitigating anthropogenic stressors where possible are all actions that potentially lead to more natural ecosystems and better preservation of native biodiversity. The National Park Service (NPS) has, in recent decades, increasingly turned to taking compromised lands and returning them to more natural and—often more homeostatic—conditions. This is well represented in the alien plant and animal removals from Hawaii Volcanoes and Haleakala national parks to restore native forest systems, and the removal of roads, restoration of landforms, re-vegetation of stream banks, and thinning of recently cut-over redwood forests in Redwood National and State Park. On a broader scale, programs to restore native fire regimes or their surrogates, and teams that identify and remove invasive alien plant species, are now

widespread in the National Park System.

Restoration activities, because of their manipulative nature, have the potential for unintended consequences less desirable than the pre-restoration condition. Some widely accepted attributes of a successful ecological restoration project are that it:

- Is based on accepted scientific principles;
- Utilizes place-based information;
- Selects a clear, rational, and accepted target condition;
- Is attainable and sustainable;
- Acknowledges that it is experimental; and
- Builds in monitoring and adaptive management.

The Wilderness Act

With regard to both the activities of ecological restoration and the long-term outcomes of those actions, the Wilderness Act has a number of relevant passages. Some of its most important language includes the following (emphasis added):

> *Section 2 (c):*
> "A wilderness, in contrast with 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 untrammeled by man....* An area of wilderness is further defined to mean ... land *retaining its primeval character and influence,* without permanent improvements ... which is protected and managed so as to preserve its natural conditions and which ... generally *appears to have been affected primarily by the forces of nature,* with the imprint of man's work substantially *unnoticeable...."*

These words clearly reflect an earlier, romantic notion of scenic primeval landscapes, with the importance of present *appearance* perhaps greater than the reality of past land use and natural history (Franklin and Aplet 2002:272). The Wilderness Act specifically permits hunting and grazing except where otherwise prohibited: The degree of "trammeling" imposed by intense cattle and sheep grazing in many (non-NPS) wildernesses of the Pacific and Intermountain West is profound both ecologically and visually.

> *Section 4 (a)(3):*
> "... the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act *shall in no manner lower the standards evolved for the use and preservation of such park,* monument, or other unit of the national park system in accordance with the Act of August 25, 1916, the statutory authority under which the area was created, or any other Act of Congress which might pertain to or affect such area...."

This language concedes that wildernesses in the National Park System are nonetheless governed by the same statutory authorities as other NPS lands, and that NPS lands typically benefit from a higher level of preservation than those of the other three wilderness management agencies. The arguable (or litigable) point, however, is whether that higher standard indicated would call for interven-

tion into disturbed wilderness ecosystems, or refraining from such activity.

Section 4 (b):

"Except as otherwise provided in this Act, each agency administering any area designated as wilderness *shall be responsible for preserving the wilderness character of the area* and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, *conservation,* and historical use...."

Here there is an apparent conflict between the agency's responsibility for preserving *wilderness character* (which was defined earlier) and devoting wilderness to conservation as one of its public purposes. Taken as a whole, however, it would appear that wilderness character takes precedence over conservation.

Section 4 (c):

"Except as specifically provided for in this Act ... there shall be 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 purpose of this Act ...* 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."

This section speaks directly to the means by which ecological restoration may or may not be achieved. Yet if the purpose of the act includes conservation and its administration, and if that, in turn, requires otherwise unsanctioned devices or structures, to what extent is such restoration activity permitted? Ultimately, such determinations are made through agency policy, and sometimes litigation.

The National Park Service is guided in this area by Director's Order 41: Wilderness Preservation and Management. The reference manual for DO-41 says the following:

6.3.7 Natural Resources Management:

"The principle of non-degradation will be applied to wilderness management, and each wilderness area's condition will be measured and assessed against its own unimpaired standard. Natural processes will be allowed, in so far as possible, to shape and control wilderness ecosystems. Management should seek to sustain natural distribution, numbers, population composition, and interaction of indigenous species. Management intervention should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and the influences originating outside of wilderness boundaries. Management actions, including restoration of extirpated native species, altered natural fire regimes, controlling invasive alien species, endangered species management, and the protection of air and water quality, should be attempted

only when the knowledge and tools exist to accomplish clearly articulated goals."

This policy language very clearly supports ecological restoration. There is no legal nor regulatory barrier to ecological restoration, at least in principle. On the other hand, a reference to appropriate vs. inappropriate tools is not provided.

Can Unnatural be Wild?

It has been popular in recent years to contrast "natural" with "wild." Both Cole (2000) and Landres et al. (2001) find a significant difference between these words, particularly as applied to wilderness, while Turner (1996) unapologetically and passionately argues that "wild" precludes intentional human intervention. On the other hand, the author has argued (Graber 1985, 1995), as did McKibben (1989), that the pervasive and insidious magnitude of human activity has largely rendered the distinction moot. This is particularly true in many of the small, eastern lands that Congress has set aside as designated wilderness. There is, for example, very little that is wild about Cumberland Island Wilderness on Cumberland Island National Seashore, which includes roads, motor vehicles, many introduced species, and several key species extirpated. Yet through time, if this were desired, alien species could be removed, natives species reintroduced, a natural fire regime re-started, and human construction removed. Surely the product would be closer to the wild Cumberland Island that its first European settlers saw. Similarly, other small pockets of nature, albeit wounded nature, are wildernesses in name only. They require urgent intervention and long-term maintenance simply to preserve what remains—and often what remains is quite irreplaceable. To put it another way, their value as managed reserves of biodiversity exceeds their value as "wilderness."

One of the largely unintended flaws in the Wilderness Act is its ecological naiveté from a 21st-century perspective (a naiveté shared by most legislation and even much science of the period viewed with today's hindsight). The *appearance* (Sec. 2[c])of wildness is in the eye of the beholder: An ecologist or scientifically educated naturalist sees anthropogenic alteration where someone not so schooled does not. The reality is that the landscape is compromised. The elegant use of "untrammeled" in the act refers to *intentional* control or manipulation of the "community of life" (Zahniser 1963; Scott 2001). But ecological consequences are the same regardless of the degree or distance of intention. In his passionate polemic, *Guardians not Gardeners*, Zahniser both failed to understand how altered many of his beloved wildernesses already were, and failed to recognize that walling them off with a law would not protect them from further deterioration. In his powerful and beautiful essay, "Thinking Like a Mountain," Aldo Leopold (1949) discussed the loss of wildness on a mountain when the last wolf had been shot. Surely he would have approved of putting it back.

The pace of landscape change in the United States and the rest of the world is accelerating. So is human appropriation and alteration of the

very air and water that is the stuff of life. Yet locally, and perhaps only temporarily, those changes can be largely stopped, even reversed, with sufficient knowledge and effort.

It is likewise important to remember that wilderness landscapes have always been subject to both natural and anthropogenic changes. The disturbances introduced by ecological restoration—the loss of wilderness character—need not represent permanent loss.

A Way to Think About Ecological Restoration in Wilderness

In wilderness, appearances do matter. There are some real trade-offs on NPS lands between the conservation of nature and the intent of the Wilderness Act. Both have value and importance to humanity and the future of planet Earth. Determining how to reconcile the two can be assisted by a cost/benefit analysis. I have attempted to classify common kinds of ecological restoration activities into three groups, representing the degree—in magnitude and longevity—to which wilderness character is compromised. None of these activities, in my opinion, is necessarily precluded by statute, regulation, or policy. However, by the time one is considering the activities listed in Class III, one must carefully weigh the benefits against the significant impacts on wilderness character, and consider whether the proposed restoration activity is sufficiently beneficial to outweigh the impacts on wilderness character. An excellent and far more comprehensive discussion of the management and restoration of wilderness ecosystems is provided by Franklin and Aplet (2002).

Class I: Short-term wilderness disturbance, long-term wilderness character enhancement. This class includes:

- Reintroduction of self-sustaining native species;
- Extirpation of invasive alien species;
- Restoration of natural fire regimes; and
- Restoration of natural hydrologic regimes.

This class of activity entails one-time reversals of anthropogenic changes that, once accomplished, are self-sustaining. Users of wilderness might well encounter restoration activities that would typically result in impacts to wilderness character lasting a season to perhaps several years. Some of this, such as dam removal, might require heavy equipment. Upon completion, however, traces of the restoration activity would be extinguished over a short period of time, while the benefits of "re-wilding" to wilderness character would be long-term.

Class II: Long-duration or recurring entry, with benefits and costs to wilderness character. This class includes:

- Periodic control of persistent introduced species;
- Indefinite extent of planned ignitions;
- Reintroduced species requiring continuing support; and
- Mitigation of acidified waters.

Many ecosystems that include wildernesses suffer anthropogenic disturbances for which we lack the knowledge, the legal authority, or the financial resources to correct permanently

at the present time. For example, introduced weedy plants often invade natural areas from adjacent lands, and require regular removal and frequent monitoring. Periodic liming of some eastern streams mitigates acid precipitation and permits continued survival of native fish and amphibians that otherwise would be entirely eliminated from the ecosystem—at least until the source pollution is eliminated. Pyrophytic ecosystems that lie adjacent to developed lands may no longer receive sufficient natural fire ignitions, or those ignitions are no longer politically acceptable; however, periodic managed ignitions may accomplish most of the objectives of maintaining the natural structure and composition of the native biological community. Small, anthropogenically isolated populations of large mammals, such as mountain sheep, may lack the demographic or genetic size for long-term viability. However, periodic infusions of additional animals can help assure survival. These nature-maintenance activities reflect the sad reality that many designated wildernesses, and other kinds of nature reserves, are simply too small or isolated to sustain their full suite of ecosystem functions without intervention. The National Park Service manager must ultimately weigh the restoration benefits to the ecosystem against the impacts to wilderness character.

Class III: Support of laws or NPS policies; don't directly enhance wilderness character. This class includes:

- Habitat modification for endangered species;
- Regulation of predator or prey numbers when an area is too small for natural regulation or natural controls have been lost;
- Control of native pests or dangerous species to protect life or property outside wilderness; and
- Removal of native organisms in support of restoration elsewhere.

These activities represent severe impacts on wilderness character. They clearly violate the intent of the Wilderness Act. Some of these, such as control of pests, reflect the incapacity of some landscapes designated as wilderness to function as such either ecologically or politically. On the other hand, some severe interventions, such as the removal of native organisms for restoration elsewhere, illuminate the fundamental and unavoidable connectedness between many wildernesses and their surrounding, more modified landscapes. Ultimately, decisions in this category must move to a public forum for their ultimate resolution.

Wilderness is a (profound) social construct. Nature simply *is*. Cultural expectations of wilderness will continue to evolve. A personal interaction with wild nature may or may not continue to be an important component of human life. But for the indefinite future, aggressive actions will be required to preserve even a semblance of the elements that comprise natural ecosystems. Let's not throw away any parts.

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The Challenge of Doing Science in Wilderness:
Historical, Legal, and Policy Context

Lands designated by Congress under the Wilderness Act of 1964 (Public Law 88-577) offer unique opportunities for social and biophysical research in areas that are relatively unmodified by modern human actions. Wilderness designation also imposes a unique set of constraints on the methods that may be used or permitted to conduct this research. For example, legislated restrictions on mechanical transport potentially make access difficult in large and remote wildernesses, while restrictions on motorized equipment and installations may prevent use of certain tools, data loggers, standard monumentation methods, and other routinely used scientific techniques. Wilderness is also managed by four federal agencies in two departments (the Forest Service in the Department of Agriculture and the National Park Service, Bureau of Land Management, and Fish and Wildlife Service in the Department of the Interior) that may interpret wilderness legislation differently, and have different policies regarding scientific activities in wilderness (Butler and Roberts 1986). Legal restrictions and agency differences, combined with a general lack of effective communication between managers and scientists, have led to increasing concern among wilderness managers (Bayless 1999; Barns 2000) and scientists (Franklin 1987; Bratton 1988; Peterson 1996; Eichelberger and Sattler 1994; Stokstad 2001) over lost opportunities for advancing science and improving wilderness protection.

Differences in perspective and motivation between scientists and managers are well known (e.g., Huenneke 1995; Bradshaw and Borchers 2000; Wilson and Lantz 2000), and may cause each to not consider the context, needs, and constraints of the other. For example, natural resource scientists may not fully understand the philosophical and legal basis, or policies, that are used to manage wilderness, nor the impacts their activities may cause to a wide range of social and experiential values in wilderness (Underwood 1995). Commenting on these problems, Franklin (1987) suggested that "scientists can be arrogant and cryptic in their relations with managers and ... some may feel that research gives them a license to do whatever they please." Similarly, wilderness managers may

not fully understand or consider the potential benefits of a proposed activity to the local wilderness, or to the broader system of natural areas nationwide and to society at large.

The purpose of this paper is to improve the understanding of both managers and scientists about scientific activities in wilderness by selectively reviewing key aspects of the historical, legislative, and policy and management context for conducting scientific activities in wilderness. Throughout this paper, we refer to "scientific activities" as all activities related to the collection of natural, cultural, and social resource data, including research or inventory and monitoring activities, conducted by academic, private, or agency personnel. While the legal mandate for wilderness is unique, the challenges and concerns discussed in this paper may also apply to other areas similarly managed for their natural values. This paper is based on the premise that mutual understanding will lead to improved communication between managers and scientists, in turn improving the likelihood that science will be one of the "principal tools in assuring the future preservation of wilderness" (Parsons and Graber 1991)—a goal common to both groups.

Historical Context for Science in Wilderness

The contribution of natural areas such as national parks and wilderness to science, and the contribution of science to the long-term preservation and stewardship of these areas, is reviewed by Stankey (1987), the National Research Council (1992), Parsons (2000), and Graber (2002). This mutually beneficial relationship was recognized early on by Albright (1933), who described the contribution of science to improving management of the national parks, as well as the "incalculable value of the national parks and monuments as research laboratories." Several of Aldo Leopold's writings speak to the importance of science in wilderness (Nash 1982). For example, Leopold (1941) commented that "all wilderness areas ... have a large value to land science.... [R]ecreation is not their only or even their principal utility."

Howard Zahniser, principal author of the Wilderness Act of 1964, demonstrated his support for the scientific value of wilderness in several ways. He wrote that "the wilderness has profoundly important scientific values" for both education and research, and that wilderness provides two research uses: "they afford the scenes for fundamental investigations of the natural world of living creatures unmodified by man" and "they afford also 'check' areas where none of the factors being compared in a particular study (land-use research, for example) have been operative" (Zahniser 1956). Zahniser also expressed concern that the scientific purposes of wilderness might be compromised by recreation use (Leopold 1960). In congressional hearings on the proposed Wilderness Act, Zahniser (1962) commented that "the scientific potentials in wilderness preservation should be strongly emphasized. This was well done in the statement presented by Ernest Dickerman.... I should like to be associated with his brief but urgent presen-

tation of the scientific, or research, values of wilderness." In these hearings, Dickerman (1962) stated that "it is entirely possible that the sort of scientific study which can be conducted only in wilderness ... will yield knowledge concerning the laws of nature that will become one of the greatest values derived from wilderness." Later, Zahniser (1963) commented that "it may be that the scientific values will come to be considered the greatest of all the values of wilderness and wildland natural areas."

Legislative Context for Science in Wilderness

The Wilderness Act of 1964 recognizes the scientific value of wilderness in two ways: by defining wilderness in Section 2(c) as an area that may also contain scientific value, and by stating in Section 4(b) that wilderness "shall be devoted" to a variety of "public purposes," including scientific use. In Section 4(c), the act also lists specific activities that are prohibited in wilderness, stating that "except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act ... 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." In other words, *if* a proposed activity is "necessary" for the "minimum requirements for the administration of the area for the purpose of this Act," *then* these prohibitions may be relaxed. However, "necessary" and "minimum requirement" are not defined in the Wilderness Act or in other wilderness legislation, leading to different criteria used by different people in different situations for defining which types of scientific activities are appropriate in wilderness. Anderson (1999) offers an example of how this phrase from the 1964 Wilderness Act was interpreted in evaluating a proposal for theoretical geological research in Death Valley Wilderness in California. In this case, the administering office determined that the project fulfilled the "necessary for the administration of the area" mandate of the Wilderness Act, and negotiations with the researcher led to extensive modifications in the proposed methods to protect the wilderness resource.

The phrase "for the purpose of this Act" in Section 4(c) is also interpreted differently by different people. Some consider the "purpose" of the Wilderness Act to be the protection and preservation of the "wilderness character" of the area. This notion is reinforced by the testimony before Congress of Zahniser (1962), who stated that "[t]he purpose of the Wilderness Act is to preserve the wilderness character of the areas to be included in the wilderness system, not to establish any particular use." Others consider this "purpose" to be much broader: to secure "the benefits of an enduring resource of wilderness," and that these benefits are "recreational, scenic, scientific, educational, conservation, and historical use" (Sections 2(a) and 4(b), respectively, of Wilderness Act of 1964). This broader view considers scientific activities to be an integral part of wilderness. Recent wilderness legislation, such as

the California Desert Protection Act of 1994, supports this latter interpretation by stating that one of the goals of this Act is to "retain and enhance opportunities for scientific research in undisturbed ecosystems" (Public Law 103-433, Section 2(1)E).

Policy and Management Context for Science in Wilderness

In keeping with the broad legislative intent of the Wilderness Act of 1964, the four wilderness agencies developed policies that generally support the conduct of scientific activities in wilderness. These policies also contain specific constraints on research and other scientific activities (Parsons 2000). The Forest Service manual (Section 2324.4), for example, states that Forest Service policy is to "encourage research in wilderness that preserves the wilderness character of the area," and then directs managers to "review proposals to conduct research in wilderness to ensure that research areas outside wilderness could not provide similar research opportunities." These policies and constraints have been translated into a few formal and many informal procedures for evaluating whether scientific activities should be approved or denied.

Currently, only the National Park Service has a formal agency-wide permit system for research and collecting specimens (Bayless 1999). This permit system (accessible over the internet; National Park Service 2003) contains guidelines to researchers for submitting proposals, asking them to describe how the project adheres to wilderness "minimum requirement" and "minimum tool" concepts. None of the other agencies have agency-wide guidelines, leaving evaluation procedures to the individual, often local, administrative offices. While such practice allows local flexibility, inconsistent evaluation procedures may lead to the perception of arbitrary and capricious decisions in approving or denying proposals for scientific activities in wilderness. Eichelberger and Sattler (1994), for example, discuss their frustration with the administrative process for reviewing their proposal, which took three years and cost $1 million, to study volcanic features in the Katmai Wilderness in Alaska. They conclude that the review process was so difficult because "there is no clear policy on research in parks and wilderness," and that "although it was clear from the outset that [our] proposal raised major policy issues, these were not addressed until years into the [review] process."

Despite differences in interpreting legislative intent and policies among and within agencies, the following three questions, in various forms, are common to nearly all evaluations of proposed scientific activities in wilderness:

- Is the scientific activity necessary for the management of the area as wilderness?
- Is it necessary to conduct the scientific activity in wilderness?
- Will the scientific activity cause unacceptable impacts to wilderness?

The first question is based on wording in Section 4(c) of the Wilderness Act ("except as necessary to meet minimum requirements for the

administration of the area for the purpose of this Act") and has already been discussed.

The second question is largely based on the assumption that scientific activities are an intrusion and sometimes a threat to wilderness, and if the activity *could* be conducted outside wilderness, then it *should* be. While a valid consideration, exclusive emphasis on minimizing impacts may also lead to a lack of information about biophysical conditions, the meanings people derive from their wilderness experiences, and the effectiveness of management decisions and actions. In the long term, this lack of information may hinder protection and stewardship of wilderness, and make it more difficult to plan for its future.

Both Graber (1988) and Bratton (1988) argue that scientific activities that cause no more harm to wilderness than permitted recreation activities should be allowed. Bratton goes on to suggest that "wilderness managers should in some cases try to attract projects that could be done elsewhere so they obtain basic data on the wilderness site. Wilderness managers should consider the potential long-term benefits of gathering scientific information, even if it does not appear to be immediately useful; we are, after all, frequently short-sighted about what will be ecologically useful in two or three decades." In other words, what information might be lost if the proposed activity was *not* conducted inside the wilderness? Graber's and Bratton's arguments are based on the premise that designated wilderness provides an increasingly unique opportunity to learn about the composition, structure, and functioning of relatively unmodified natural ecosystems, and that scientific activities clearly fit under the "recreational, scenic, scientific, educational, conservation, and historical" uses described in the Wilderness Act of 1964.

The third question is perhaps the most difficult since nearly all human activities cause impacts to wilderness. Acceptability of this impact, however, varies from one activity to another, from one situation to the next, and from one person to another, often with little consistency and without adequately defining what is meant by "acceptability" or "impact." Acceptability can also change over time. For example, relatively pristine wilderness conditions are increasingly unique, and many scientists believe that ecological and social science activities within wilderness are of increasingly greater value beyond the boundaries of the wilderness to society at large. Many managers, however, are unwilling to accept impacts to an individual wilderness from scientific activities that provide only broad-scale and more loosely defined or potential societal benefits.

In addition, agency policies may direct managers to consider wilderness values first and foremost in deciding what types of activities are appropriate. For example, Forest Service Wilderness Manual direction (Section 2320.6) states that "where a choice must be made between wilderness values ... or any other activity, *preserving the wilderness resource is the overriding value*. Economy, convenience, commercial value, and comfort are not standards of management or use of

wilderness" (emphasis added). Under this policy, it is appropriate for management staff to question all scientific activities that may adversely affect the ecological or social values of wilderness, and to place wilderness values above other values.

This question about unacceptable impacts may lead to further questions about the appropriateness and acceptability of the methods used in the scientific activity. Scientific activities may be done in a variety of ways, each with specific trade-offs. Fire chronologies, for example, are needed to understand if current fire activity is within the natural fire regime of the wilderness. A fire chronology may be derived using a chain saw, but this approach clearly violates the motorized equipment prohibition of the 1964 Wilderness Act, and likely violates visitors' sense of what is appropriate in wilderness. On the other hand, chain saws allow more precise cuts which damage the tree less, and a greater number of high-quality samples can be taken allowing more accurate and precise understanding of historic fire regimes. Hand saws are more appropriate in wilderness, but typically hand saws result in more tree damage and fewer, lower-quality samples resulting in less understanding of historic fire regimes. Oelfke et al. (2000) discuss these trade-offs regarding wolf research in the Isle Royale National Park wilderness, asking whether the ends (in this case, the restoration of wolf populations) justify the means (the handling and radio collaring of wolves). In such cases as this, decision-makers must weigh their need for information against the impacts caused by gathering the information.

Conclusions

The clash between the cultures of management and science presents a formidable obstacle to using science to its maximum potential in protecting wilderness and in developing new knowledge about the functioning of natural and social systems in wilderness. The historical context shows that two leaders of the wilderness movement, Aldo Leopold and Howard Zahniser, clearly supported the scientific value and the scientific use of wilderness. The legislative context codifies this support for science in the Wilderness Act of 1964. The Wilderness Act also allows scientific activities that would otherwise be prohibited in wilderness, if these activities are "necessary to meet minimum requirements for the administration of the area for the purpose of this Act." Based on this historical and legislative context, we conclude that there is an active and positive role for science in wilderness. The policy and management context, however, shows that there are several opportunities for ambiguity and differences in interpretation, and therefore confusion and frustration regarding the conduct of scientific activities in wilderness.

To help reduce confusion and frustration, and improve communication between managers and scientists, we suggest that guidelines be developed for evaluating proposals for scientific activities in wilderness. These guidelines would explicitly address the contextual issues raised in this paper, and provide a structured process to comprehensively and systematically evalu-

ate the benefits and impacts of proposed scientific activities. Such guidelines would provide the means for documenting the many assumptions and judgments inherent in the evaluation process. Importantly, a structured process would provide managers the means to explain and defend their decision regarding a proposed scientific activity. Such a process would also provide scientists the means for understanding how their proposal would be evaluated. When both managers and scientists understand and use such a process, there is strong incentive for both to communicate and negotiate with one another: for the scientist, to improve the likelihood of the proposal being approved; for the manager, to maximize benefits and minimize impacts of the proposed study. Adopting such guidelines across all four wilderness-managing agencies would be a small, yet important step towards greater integration and consistency in stewardship across all units of the National Wilderness Preservation System.

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Wolf Handling at Isle Royale: Can We Find Another Approach?

Introduction

The Wilderness Act of 1964 lists "scientific use" as one of the public purposes of wilderness, yet it is evident that the recognition and/or acceptance of this wilderness use varies within those federal agencies that administer wilderness lands. Parsons (2000) discussed the legislative history that clearly supports the role of the scientific use of wilderness while at the same time noting the differences in agency philosophies and policies regarding the management of scientific activities within wilderness. In general, there is no common approach for managers to address the typical concerns associated with research activities in wilderness, such as requests to use motorized equipment or to conduct manipulative research. The resulting inconsistent responses by wilderness managers to research requests can lead to frustration for both parties.

Graber (1988) and Parsons (2000) argue for the values of scientific activities within wilderness. In the case of Isle Royale National Park, scientific activities have significantly enhanced the public appreciation of the wilderness character of the park and/or aided park management in managing for wilderness values. Such varied research projects in the park as the long-term study of wolf–moose relationships (Peterson 1977; Peterson et al. 1998), common loon productivity related to recreational use impacts (Kaplan et al., in press), social science research to identify the wilderness values sought by park visitors (Pierskalla et al. 1997), an inland lakes fishery inventory (Kallemeyn 2000), and the presence of contaminants in park wildlife and waters (Kaplan and Tischler 2000; Swackhamer and Hites 1988) are but a few examples of a wide range of important research activities that have contributed to the management of this island wilderness. Each of these research projects, however, involved debate and consideration of how to minimize the operational impacts of the research to wilderness values while still accomplishing the research objectives.

What follows is a case study from Isle Royale that describes the formal thought process that park managers and external researchers went through to address concerns about ecological and social impacts related to continuing the long-term wolf–moose research program in the park.

Particular aspects of this research project provided an opportunity to discuss the values of a specific research program within the broader context of managing the park as wilderness. Although elements of this case study have been described elsewhere (Oelfke and Wright 2000), this paper reports on the continuing evolution of that story.

Background

The wolves of Isle Royale National Park, Michigan, have been the subject of an intensive research and monitoring program since 1958. The benefits of this long-term project have been widespread and enduring, ranging from influencing park management practices and regulations (particularly in relation to visitor use of this island park) to the dissemination of natural history information on the species—information that played an influential role in reversing anti-wolf sentiment in North America beginning in the 1960s. The study has been a model research program within the National Park Service (NPS), highlighting the values of a commitment to long-term research and its value to park management.

On equal footing with the importance of the wolf in this park is the perception of the park as a unique wilderness resource, as a remote island archipelago where many of the direct influences of modern-day civilization are absent. Congressional designation of 99% of the land base of the park as wilderness in 1976 legislated this perception into law and NPS policy, necessitating management of the land base for wilderness values.

However, the needs of these two programs—the highly popular wolf research program and wilderness management of the park—occasionally come into conflict (Oelfke and Wright 2000). The natural tension that can exist between research methods and tools and minimizing their intervention on wildlife populations within wilderness requires thoughtful consideration of alternatives to balance the needs of each program's values.

The Isle Royale Landscape

Although the dual Isle Royale icons of wolves and wilderness are found elsewhere in North America, the setting in which they are found represents a unique wilderness resource. Isle Royale lies a minimum of 25 kilometers from the mainland of Ontario, Canada, across the cold, deep waters of Lake Superior. This separation has protected Isle Royale from excessive development and recreational use, including a lack of roads and hunting, both of which often impact wolf populations. The lack of adjacent land boundaries largely eliminates the issues of habitat fragmentation common to other protected areas and the political issues and ecological influences associated with terrestrial wildlife emigration/immigration, which can often heighten the need for active management of wildlife resources. Although certainly there have been human influences on park wildlife, the relative isolation of these populations permits consideration of managing wildlife for that elusive wilderness characteristic of "wildness," as a baseline of *wilderness* wildlife management at one end of the

wildlife management spectrum. Whereas the "hands-off" approach to wildlife management today has less usefulness in many other parks and wilderness areas, the unique characteristics of this landscape permits the consideration of this approach at Isle Royale primarily because of these values of wildness.

The Wolf Research Program

Now in its 45th year, the wolf and moose research program at Isle Royale has chronicled the rise and fall of these populations, and park management, the public, and the research community have appreciated the on-going reporting of that story (Figure 1). The unique landscape previously described, which has effectively isolated the wolf population, coupled with the "hands-off" research approach employed from the beginning of the research program in 1958, combined to make the wolf population and the research program immensely appealing for both their scientific and aesthetic values. The idea of an "untouched" wolf population became a hallmark feature. Documentation of the status and trends of the wolf population was adequately gathered through aerial surveys in the winter, and for the first 30 years of the program that was enough intrusion into their world. Wilderness management policies direct that the minimum requirement or tool be used when completing any action (including research) within wilderness, but the desire to perpetuate the aura of the untouched wolf population also con-

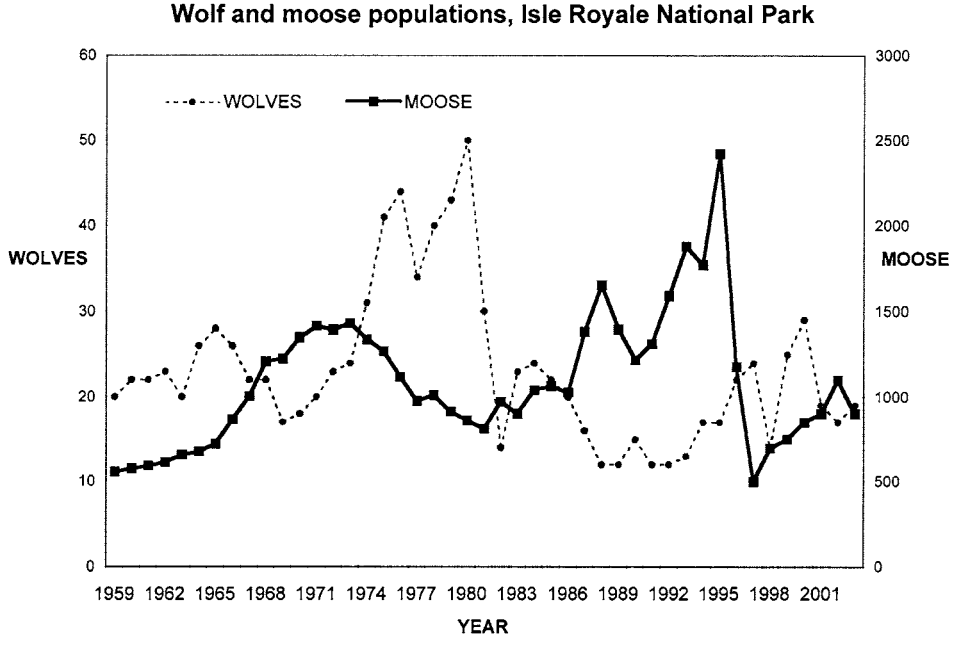

Figure 1. Comparison of wolf and moose population trends, Isle Royale National Park, 1959–2003

Table 1. Wolf and moose populations, Isle Royale National Park, 1959–2003

YEAR	WOLVES	MOOSE (est.)	YEAR	WOLVES	MOOSE (est.)
1959	20	556	1984	24	1,041
1960	22	576	1985	22	1,062
1961	22	591	1986	20	1,025
1962	23	612	1987	16	1,380
1963	20	656	1988	12	1,653
1964	26	675	1989	12	1,397
1965	28	720	1990	15	1,216
1966	26	865	1991	12	1,313
1967	22	1,002	1992	12	1,590
1968	22	1,207	1993	13	1,879
1969	17	1,222	1994	17	1,770
1970	18	1,348	1995	17	2,422
1971	20	1,416	1996	22	1,178
1972	23	1,395	1997	24	500
1973	24	1,430	1998	14	700
1974	31	1,337	1999	25	750
1975	41	1,268	2000	29	850
1976	44	1,117	2001	19	900
1977	34	976	2002	17	1,100
1978	40	1,010	2003	19	900
1979	43	912			
1980	50	862	**Avg.**	**23**	**1,090**
1981	30	811	**Max.**	**50**	**2,422**
1982	14	972	**Min.**	**12**	**500**
1983	23	900			

tributed to this research approach.

By 1980, the island's wolf population stood at 50, a density (one wolf per every four square miles) that was not sustainable. The population crashed, dropping to 14 animals by 1982. Expectations were that the wolf population would rise again to more stable levels. Indeed, the wolf population did rise over the next two years, but a sharp, prolonged decline occurred thereafter. By 1988, when the wolf population remained in the low teens despite an apparently ample food base, it was clear that something was awry in the population. Park management sought advice from both within the NPS and the external research community, and a peer-reviewed proposal in 1988 recommended the need to handle wolves on the island to assess the persistent wolf population decline and the high mortality rate. The practice of handling

wolves continued following a meeting of specialists that reviewed the first-year findings. During that period, no "end-date" for how long the handling was to continue was discussed; rather, most experts involved believed that answers to the questions of the wolf decline would be gained quickly and resolve the issue. Ultimately, disease was implicated as a major factor in the island's persistent wolf decline (Peterson et al. 1998).

Although the key focus of wolf handling was to assess the population decline, the insight gained into the population's genetic decline was quickly recognized for its scientific value on a broader scale (Wayne et al. 1991; Lehman et al. 1991; Peterson et al. 1998). The island's wolf population offered an unprecedented opportunity to examine the significance of genetic losses for long-term viability in a small, isolated population.

Wolf handling has continued to the present, with 20 wolves having been handled from 1988–2002. The wolf population remained low until a significant upturn started in 1994; by 2003 the population was only slightly below the study period's long-term average of 23 animals.

Values of the Wolf Research Program

There have been several substantive decisions made by park management that are the direct result of the wolf research program. Several of these decisions significantly affect visitor use in the park, including (1) a complete park closure to visitor use from November 1 through April 14 of each year, largely to facilitate the research program and prevent harassment of the wildlife through winter recreational activity; (2) prohibition of overnight camping in approximately 50% of the park to protect wolf denning sites and to keep visitors from coming into close contact with wolf pups, thus preventing habituation to humans; and (3) a prohibition of mammalian pets on the island to reduce the potential for disease introductions.

Other recognized values of the research program have included the wide dissemination of natural history information on the wolf and moose populations of the park, particularly as it has described these populations in an environment free of human harassment and interference. The public and scientific communities remain keenly interested in the annual updates of these populations.

Finally, as an example of the value of long-term data that will be sought through the developing NPS Inventory and Monitoring Program, the 30 years of wolf population data provided a compelling argument that significant change had occurred within the population. This change, recognizable in good part because of the length of the population dataset, helped convince park management that more intensive investigation was warranted, ultimately leading to the decision to begin the intensive handling of the wolf population.

Assessing the Issue of Wilderness Values and Wolf Research Program Needs

By the late 1990s, with the wolf population numbers back to the long-

term average and the question of the wolf decline largely settled, it was appropriate to examine the reasons for continued wolf handling in the park. As noted above, information from the wolf research program had enabled park management to make several science-based decisions in support of resource protection, and offered the scientific community and the public a fascinating look into the life history of this wolf population. Some of this insight was possible only through the live-capture and handling of individual wolves. At the same time, as understanding of the specific wolf decline episode became clearer, a timely argument to again examine the rationale for wolf handling was voiced. Admittedly, that voice came largely from park staff (as opposed to the public or external wilderness advocacy community), but it was appropriate that preservation of the wildness of the park's wildlife populations receive full consideration. The suite of characteristics that define the wilderness essence of Isle Royale—the isolated island landscape within the vastness of Lake Superior, a highly charismatic carnivore species with a history of minimal human influence, and the minimal developed nature of the island—all contribute to a unique wilderness personality of the park that established the seriousness of this debate. It was obvious that compelling arguments for and against continued wolf handling could be made; there simply was the need and desire to objectively address the issue.

Thus, park management brought together an independent scientific panel to assess the wolf handling issue and recommend a course of action to the NPS. It was felt an outside panel could provide an objective and scientifically valid opinion on the merits (and impacts) of continued handling. The scientific review followed the suggestions outlined by Meffe et al. (1998). The panel convened in April 1999, and consisted of three experts: two from the U.S. Geological Survey Biological Resources Division (USGS-BRD) and one from the interagency Aldo Leopold Wilderness Research Institute, along with participation from NPS employees and the project's principal investigator, Rolf Peterson. Panel members were selected based on expertise in wolf research and wildlife management and/or familiarity with wilderness and wildlife management in the NPS.

The expert panel reviewed pertinent information on the Isle Royale wolf population and the wilderness values associated with the park. The panel was then asked to provide a recommendation to park management on whether it was necessary to continue to handle wolves in the park or if the research program could return to a "non-handling" approach.

Review Panel Findings

The panel reviewed the relevant information and identified the advantages of handling and not handling wolves as a means to determine a recommendation. That information, with a recommendation, was submitted to park management in a summary report (Isle Royale National Park 1999).

Although there are numerous advantages of handling wolves in terms of the quality and quantity of

information that can be obtained, the most important advantage identified was that handling permitted the ongoing assessment of genetic change within a small population. This assessment is considered to have broad regional or global application and significance for understanding the genetics of isolated populations. The key advantage to not handling wolves, aside from the obvious removal of possible trapping injury or mortality to them, was the value of minimizing human influence on the population.

Ultimately, a consensus was reached that the scientific value to be gained from tracking the loss of genetic diversity of this population warranted the continued handling of the population. The panel recommended that handling should continue for the next five years (2000–2004), which was considered an adequate period to seek other methods for obtaining the genetics information. The park and researchers were also challenged to aggressively pursue other data gathering techniques that would not require handling, with wolf fecal-DNA as a source of genetic material identified as a possible technique to consider.

Both recommendations were followed, and research into the use of wolf fecal-DNA as a source of genetic material was initiated in 2001 through NPS and USGS-BRD funding and effort, with field collection of scat samples occurring in 2001–2002 and analysis continuing in 2003. Researchers were specifically asked to evaluate wolf fecal-DNA as a useful source of genetic material for monitoring genetic diversity within the island's wolf population.

Preliminary Findings of the Wolf Fecal-DNA Work

Seventy-two scat samples from the 2001 winter research program were analyzed for microsatellite DNA. Of these, DNA could be amplified in 38 (53%) of the samples. From these samples, 18 unique genotypes were detected, implying a population of 18 wolves. Aerial surveys conducted during the 2001 winter research program detected 17 wolves. It is not clear which estimate is correct; it is possible to miss a wolf during aerial surveys, but unlikely to overcount the population. It is possible to misidentify a wolf's genotype, and thereby over- or undercount wolves. However, this preliminary analysis indicates that fecal-DNA provides a very useful tool for monitoring the genetic diversity of the island's wolf population. Other estimates from the fecal-DNA, such as the sex ratio within the population, revealed less conclusive results based on the 2001 samples.

What is Next?

Wolf research at Isle Royale is unquestionably a valued activity within the park (to the point of being highlighted in the park's 1998 general management plan), in particular for monitoring and reporting on the genetic diversity within the population (as recommended by the expert review panel in 1999). The ability to return to a research program that does not include wolf handling to track that diversity appears feasible through the non-invasive fecal-DNA method. However, such an approach would come at the cost of readily tracking disease concerns within the popula-

tion, presently only obtainable through blood samples—which requires wolf handling. The advantages of tracking radio-collared wolves in terms of quantity and quality of observational data are also lost if handling is discontinued, but it is worth noting that high-quality observational data were obtained for the first 30 years of the study through purely non-invasive observational means.

Preliminary answers to the specific question asked of the recent wolf fecal-DNA research appear to provide the park with critical information for an important issue: that of balancing research methods with wilderness values. It is not a simple issue to resolve, as is true for many wilderness/minimum requirement issues in a park. Further, this particular issue of wildlife handling is fairly specific to Isle Royale, in the sense that such a restrictive view of wildlife handling is largely available for debate because of the unique landscape characteristics that are rarely found elsewhere.

That said, there are broader implications of this case study that should be of use in other wilderness areas. The specific non-invasive research methods employed in the Isle Royale wolf fecal-DNA project hold great promise for their applicability elsewhere, and complete results of that effort will be reported on following the 2003 analysis period. Perhaps more importantly, we believe the expert panel review approach offers the opportunity for an objective assessment of an issue that can be difficult for the principal parties to sort through (in this case, Isle Royale park management and the principal investigators) due to their long-term connection to the park and project. Although there is significant value in the intimate knowledge that both the researchers and park managers have of the park-specific issues of wolves and wilderness, there is also much to gain from consulting the objective minds of those with no direct or close ties to the issue.

Finally, it is somewhat ironic that the wolf research program, lauded for providing so much information that has aided park management in the past, has been called upon to provide new information that may make the continued *operational aspects* of the program a more difficult task. But resolving that question may ultimately come to this: is the enhancement of the wildness of the island's wolf population, so closely linked to the wilderness character of the island, worth enough to warrant returning primarily to the research methods last employed some 15 years ago?

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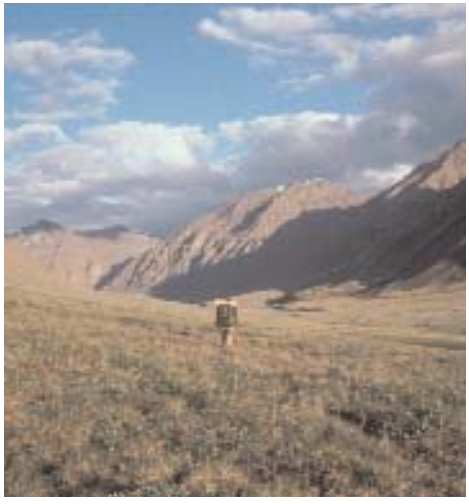
Selecting Indicators and Understanding Their Role in Wilderness Experience Stewardship at Gates of the Arctic National Park and Preserve

Introduction

The Limits of Acceptable Change (LAC) and other indicator-based planning frameworks (e.g., VERP, Visitor Experience and Resource Protection; VIM, Visitor Impact Management) have been widely adopted by wilderness managers. A central feature of these frameworks is the selection of indicators of conditions that influence experience quality, and which managers can efficiently monitor. However, identifying meaningful influences on visitor experience quality and selecting appropriate indicators remains a persistent challenge. Managers often have little knowledge of which indicators are most significant at their respective areas, and, as a result, they sometimes choose indicators simply because they have been used elsewhere (Watson and Roggenbuck 1997). Moreover, research designed to support the selection of indicators has often failed to uncover the predictable relationships between social setting conditions and experiences that the notion of an indicator presupposes (Cole 2001).

At Alaska's Gates of the Arctic National Park and Preserve ("Gates" for short), unique conditions exacerbate this challenge and highlight the need for a better understanding of the nature of wilderness experiences and the various factors that threaten or facilitate them. Wilderness visitor studies have typically focused on participants' evaluations of pre-determined dimensions (such as solitude) by using surrogate measures (such as perceived crowding). In contrast, the project described here began with a qualitative investigation that allowed



visitors to describe in their own words the important dimensions of their experiences and the factors that influenced them. A second phase of the project measured the distribution and saliency of those dimensions across the Gates visitor population, and the significance of various potential factors of influence. Results from this study point toward experience indicators that managers at Gates may choose to monitor, and they also provide insight into the role of indicator-based planning frameworks with respect to protecting wilderness experience opportunities.

Gates of the Arctic National Park and Preserve

Gates represents the culmination of a long history of wilderness advocacy in northern Alaska. The region first began to receive national attention when Robert Marshall identified two peaks on the southern flanks of the Brooks Range as the "gates to the arctic" in his 1933 book, *Arctic Village* (Glover 1986). In 1980, after almost 50 years and numerous proposals for permanent protection of its wilderness character had come and gone, Gates of the Arctic National Park and Preserve was finally established with passage of the Alaska National Interest Lands Conservation Act (ANILCA). Referring to the park's unique history and founding purposes spelled out in ANILCA, the 1986 Gates general management plan states: "Within the broad spectrum of resources and opportunities reserved in national parks, only Gates of the Arctic was established with such strong emphasis on wilderness purposes" (NPS 1986:3).

Consistent with those purposes, Gates is currently managed as a single vast wilderness area. The park encompasses over 8 million acres of rugged mountains and Arctic tundra. There are no roads leading into it, no maintained trails or campsites, and no permanent NPS facilities located on park lands. Beyond the park boundaries to the east and west is a series of other protected areas. With Gates in the middle, these areas form an almost contiguous collection of undeveloped wildlands stretching from the Canadian border westward to the Arctic Ocean. For visitors, primary access is by air, and travel within the park is by foot, raft, canoe, or kayak. Most visitation occurs during the four-month period from June through September, with July and August being the busiest months. Overall recreation use numbers have been assumed to be fewer than 2,000 visitors per year. A recent attempt to systematically estimate 2002 summer use (as part of the study reported here) produced a 95% confidence interval of between 336 and 424 visitors emplaning in Fairbanks (the primary park portal) and between 64 and 174 visitors entering from the Dalton Highway (a secondary portal). Visitors are encouraged to practice minimum impact camping techniques, but there are no regulations regarding campfires, campsites, or length of stay.

At present, Gates represents what some people consider to be a nearly ideal setting for visitors to enjoy wilderness experiences. The challenge for managers is to describe those experiences in sufficient detail to know

when they are at risk of changing or degrading, and to develop methods for monitoring conditions and assuring that unacceptable changes do not occur.

Approaches to Understanding Wilderness Experiences and Selecting Indicators of Quality

The 1964 Wilderness Act famously defines wilderness as a place where "man is a visitor who does not remain" and where "outstanding opportunities for solitude or a primitive and unconfined type of recreation" exist. From these phrases, solitude has emerged as the dominant criterion for evaluating wilderness visitor experiences. Few studies, however, have attempted to measure solitude directly; instead, most researchers have focused on surrogate measures such as perceived crowding. Although crowding (or the lack thereof) is rarely mentioned in the philosophical or popular wilderness literature, it has been the most studied aspect of wilderness experiences. Hypothesized crowding influences, such as inter-visitor encounter rates, are regarded as being among the primary threats to wilderness solitude, and have been widely adopted as indicators of experience quality.

Studies of crowding and crowding influences have yielded useful findings, but they have significant limitations with respect to developing a deeper understanding of the overall nature or quality of wilderness experiences. (To be fair, many of these studies were never intended to address the overall nature of experiences.) It is important to note that solitude is only one of many potential dimensions of wilderness experiences and crowding may, in fact, influence other dimensions in complex ways (Watson and

Roggenbuck 1997). Borrie and Roggenbuck (2001) suggest that the writings of wilderness philosophers reference numerous important experiential dimensions other than solitude, including primitiveness, timelessness, oneness, humility, and care. They further suggest that "[t]he ideas of these writers not only heavily influenced the authors of wilderness legislation, but also continue to play a guiding role in the management of wilderness; they likely also influence how current users construct the meaning of the wilderness" (2001:211).

The last part of the preceding quotation points toward a second limitation of previous wilderness-experience studies. Those investigations have typically viewed wilderness experience as a kind of response by a goal-directed individual to a collection of objective setting attributes. A common purpose of research adopting this perspective is to identify and quantify levels of setting attributes (e.g., visitor density, encounter rates) that elicit consistent responses from visitors (e.g., perceived crowding, behavioral responses). Emphasis on generalized site attributes and consistent responses may obscure or simply fail to capture what is uniquely valuable about a particular wilderness place or an individual's experience of it. In the alternative perspective implied by Borrie and Roggenbuck, wilderness experiences are viewed as windows into participants' on-going constructions (emergent stories) of the world and their places in it. Rather than responding in predictable fashion to site attributes, wilderness visitors in this latter perspective are understood to *relate* to places, which are geographic spaces imbued with personal and cultural meanings (Williams and Patterson 1999). Researchers adopting this perspective usually gather, analyze, and report on data in qualitative (narrative) form.

The goal-directed perspective on experience is understandably attractive because it purports to link the nature of wilderness experiences to objective setting conditions, some of which might be easily monitored and manipulated by managers. However, with respect to crowding influences in particular, research has so far shown few consistent relationships between setting conditions and visitors' evaluations of the overall nature or quality of their experiences (Cole 2001). It may be that further methodological refinements will tease out these relationships, but it might also be argued that, in order to understand the full range of wilderness experience dimensions, a wholly different perspective is called for, one capable of capturing "the depth and durability of the meaning of wilderness in [visitors'] lives" (Dustin 2000:55). An expanded perspective on wilderness experience research seems particularly appropriate at a place like Gates, where extremely low use numbers mean that crowding is unlikely to be a salient experience dimension for most visitors, and a long history of wilderness advocacy has resulted in a rich layering of landscape meanings.

Unfortunately, qualitative knowledge from studies of the deeper meanings of wilderness experiences has not typically been incorporated into management planning efforts. Almost by

definition, a perspective that emphasizes the emergent and deeply personal nature of experiences is at odds with indicator-based planning frameworks, which call for "knowledge that is prescriptive and predictive" (Borrie and Birzell 2001). However, the study described in this paper was developed from the perspective that the application of multiple approaches can yield greater understanding, and ultimately better stewardship, of wilderness and wilderness experiences (Borrie et al. 2001; Watson and Roggenbuck 1997).

Qualitative approaches are useful for exploratory research, when little is known about the nature of experiences or significant influences on them. More importantly though, qualitative approaches can be used to understand the meanings that visitors associate with a given place and the experiences they receive there, and how wilderness and wilderness experiences fit into the larger context of their lives. Traditional quantitative approaches, on the other hand, have typically focused on the events of a trip—what visitors encounter, rather than what they take home with them. While qualitative approaches are important for understanding the nature and significance of experiences, quantitative approaches are invaluable for developing the kind of generalizable, predictive knowledge that indicator-based planning frameworks call for. With these respective strengths and weaknesses in mind, the Gates study was conducted in two separate phases: the first relying on qualitative visitor interviews, and the second on quantitative data gathered via a mail-back questionnaire.

Study Methods

Thirty-two separate interviews were conducted with a total of 94 visitors during the 2001 summer season (June–August). Visitors were purposefully selected to represent different combinations of several stratifying variables (exit location, guided/independent travelers, activity, time of season) in an effort to capture a range of different types of experiences. All interviews were conducted in one of three park access points, immediately following the completion of participants' trips. Interviews were open-ended and flexible. However, the interviewer employed a written guide that included a series of themes and lead-in questions to assure that interviews produced relevant and comparable information (Patterson and Williams 2002). All interviews were tape-recorded and transcribed verbatim. A rigorous interpretive analysis produced a list of experience elements and factors of influence that were prevalent within the collection of interview texts. The experiential elements were then organized into hypothesized dimensions of visitor experiences to facilitate discussion and presentation.

The experience elements and factors of influence identified in the first phase of research were used to develop a questionnaire, which was the primary data collection tool used in Phase II of the study. Two hundred forty-two questionnaires were mailed to the homes of visitors who had been contacted in park gateways at the beginning of their visits. A total of 201

Kobuk River at Walker Lake.

questionnaires were completed and mailed back (83% response rate). Common factor analysis was used to identify dimensions (factors) of wilderness experiences at Gates, based on visitors' indications of agreement with each of 41 experience statements (responses could range from "strongly disagree" (-2) through "not applicable" (0) to "strongly agree" (+2)). Common factor analysis was also used to identify general groups of factors of influence from a list of 26 potential influences on visitors' experiences that was included in the questionnaire. In addition to these items, trust in the National Park Service—assessed via a scale created from six questionnaire items—was examined as a potential factor of influence on experience dimensions at Gates. Next, a series of regression models was used to assess the relationship between specific dimensions of visitors' experiences, and grouped factors of influence. Finally, results from the factor and regression analyses were used to inform the discussion of potential experience indicators.

Study Findings

Phase 1. Over 1,000 pages of transcription were produced from the Phase I qualitative interviews. In the

process of analyzing these texts, a number of prevalent experience elements were identified (Table 1). Visitors described their experiences in terms that reflected some of the central themes within the Wilderness Act, but the exact nature of the themes they described, and the relationships between them, are not wholly captured in that legislation. For instance, solitude was not a prevalent theme in visitors' narratives, but the related feeling of remoteness was frequently described. Seeing few other people was clearly important to visitors' experiences of remoteness, but at the same time, actual encounters were often mediated by the perception of shared values, and some visitors described their encounters with others as highlights of their trips. For example, Paul and George had this to say:

P: And the human encounters were actually very much more pleasant and personable and even intimate than you would have with a stranger in the city....

G: Out here, the few experiences we had with other people had kind of like a caring aspect. Like, are you doing OK? Do you need anything clean or dry?

Like solitude, relative freedom from management influence ("unconfined recreation") is often interpreted from the Wilderness Act as an important element of wilderness experiences. Visitors at Gates enjoyed the lack of access restrictions, and their many opportunities to freely make and change plans, and practice self-reliance. However, as the following interview excerpt illustrates, they did not always view the lack of management influence in a positive light.

Troy: Most places we've ended up going I've noticed that the Park Service at least keeps track of how many people go in or out, as a minimum [by requiring visitor registration]. That was not apparent here ... it was unclear to me whether Gates was well enough watched over.

Table 1. Prevalent experience elements identified within Gates of the Arctic visitor interviews

Contrast to Other Parks or Wildernesses	Far from Help	Changing Plans
Remoteness	Risk	Freedom
Far North	Navigating	Feeling of Being the First Visitor
Timelessness/Arctic Time	Physical Challenge/Facing Adversity	Interaction with Wildlife
Large Scale	Scenic Beauty	Visiting as a Statement of Values
Human History	Wildlife	Perception that Visitors Share Similar Values
Weather	Little Evidence of Humans	Preserving Wilderness Qualities
Mosquitoes	Uncertainty/Limited Information	Management

Space limitations preclude a more complete discussion of the various experience elements that emerged from the visitor interviews. However, the preceding short excerpts illustrate a few of the complexities inherent to wilderness experiences, and the ways that visitors embed their experiences in the larger context of their lives. For Paul and George, encounters were highly positive precisely because of the contrast they offered to daily life in the city. Similarly, Troy's experiences at other parks influenced his interpretation of regulations as signs of good stewardship rather than as restrictions on his personal freedom.

Phase II. Common factor analysis with oblique Varimax rotation was used to assess patterns across visitors' responses to the experience statements that were included in the Phase II questionnaire. Five underlying factors (dimensions) of visitors' experiences were identified. All of the items (experience statements) within each of the five dimensions loaded significantly on only that dimension. The five dimensions and the statements they represent (verbatim from the questionnaire) are presented in Table 2.

The remoteness, similarity of values, and stewardship themes briefly described in the preceding section are all captured within the "Taste of Gates" experience dimension. Almost the entire sample of visitors (98.5%) agreed or strongly agreed that they experienced this particular dimension. Similarly, the vast majority of respondents agreed that they experienced the "Untrammeled Wildlife" dimension (94.5%), and the "Freedom from Rules and Regulations" (93.5%) dimension as well. Just over half of respondents (58.5%) agreed with having experienced the "Challenge of Access" dimension, and one-third of them (32.5%) agreed with having experienced the "Risk and Uncertainty" dimension.

After the broad experience dimensions were identified, mean influence scores were calculated for each of the different potential items of influence. Visitors were asked to indicate how each item affected their Gates experience, and responses were converted to a metric three-point scale with values of (-1) representing "negative," (0) for "both negative and positive" or "no influence," and (1) for "positive." Common factor analysis with orthogonal Varimax rotation was used to assess patterns across visitors' responses to the influence items. Five general factors of influence were identified, and are presented with their significant component items (factor loading scores >0.40) and mean influence scores in Table 3.

With the addition of the trust scale that was also included in the questionnaire, a total of six factors of influence (out-group interaction, management interaction, wildlife presence, air flight, human behavior, trust) and five experience dimensions were identified. Regression modeling showed that the "Taste of Gates" experience dimension was significantly influenced by the factors "management interaction" and "trust in the NPS." The "Freedom" dimension was also significantly influenced by "management interaction." At current levels, management interaction and trust

Table 2. Factors (dimensions) of visitor experiences at Gates of the Arctic, with corresponding significant items (factor loading scores >0.40)

Factor and Items[a]	Factor Loading
Factor 1: "A Taste of Gates"	
The managers at Gates are doing a good job.	0.644
Most Gates visitors are concerned about limiting their impacts.	0.545
The landscape felt big.	0.489
Management practices at Gates are effective at protecting wilderness qualities.	0.489
I felt a sense of discovery.	0.488
My visit says a lot about my personal values.	0.477
I felt that I was free from the clock.	0.446
In some places I felt like I might have been the first visitor.	0.430
I felt that I was far from civilization.	0.413
Factor 2: "Freedom from Rules and Regulations"	
I did not feel constrained by park management practices.	0.916
I did not feel constrained by regulations.	0.616
Factor 3: "Challenge of Access"	
It was difficult to find information about the destination or travel route I had planned.	0.777
It was difficult to find information about Gates.	0.749
Getting to Gates was difficult.	0.424
Factor 4: "Untrammeled Wildlife"	
I saw a lot of wildlife.	0.798
I saw a lot of evidence of wildlife.	0.683
I enjoyed seeing animals in their natural habitat.	0.518
The animals were not used to seeing people.	0.494
Seeing animals in Gates was different than seeing them in other places.	0.419
Factor 5: "Risk and Uncertainty"	
I often felt my safety was at risk.	0.614
I was frequently uncertain about what would happen next .	0.508
I encountered challenging weather conditions.	0.461

a. Common factor analysis with generalized least squares extraction and oblique Varimax rotation was used to identify experience factors (dimensions).

both influence these dimensions in a positive manner. There were no major factors of influence that significantly affected the "Challenge of Access" dimension; however, the "air-flight" factor combined with the individual item "physical development by humans" did have a significant negative influence on this dimension. The "Untrammeled Wildlife" dimension was significantly influenced by the "wildlife presence" factor. Lastly, the "Risk and Uncertainty" dimension was significantly influenced by "management interaction" and "out-group interaction." For the one-third of visi-

Table 3. Factors of influence on visitor experiences at Gates of the Arctic, with corresponding significant items (factor loading scores >0.40) and mean influence scores

Factor and Items[a]	Factor Loading	Mean Influence[b]
Factor 1: "Out-group interaction"		0.30
Encountering groups of more than 6 people	0.909	0.13
Encountering guided commercial groups	0.882	0.16
Being aware of other visitors camping nearby	0.637	0.01
Number of other visitor groups encountered	0.537	0.39
Factor 2: "Management Interaction"		0.41
Receiving a backcountry orientation from a park ranger	0.923	0.34
Registering with the Park Service	0.685	0.40
Receiving information about Leave-No-Trace techniques	0.644	0.49
Interaction with park employees in the office or town	0.544	0.65
Availability of free bear-barrels from the Park Service	0.444	0.45
Factor 3: "Wildlife Presence"		0.90
Observing behavior of wildlife	0.988	0.90
Seeing animals in their natural habitat	0.803	0.92
Seeing evidence of wildlife	0.601	0.93
Factor 4: "Air Flight Influences"		-0.21
Seeing or hearing scheduled commercial planes	0.878	-0.27
Seeing or hearing other types of aircraft	0.772	-0.18
Seeing or hearing bush planes	0.736	-0.13
Factor 5: "Human Behavior Influence"		0.16
Behavior of other visitors	0.724	0.16
Encountering subsistence activities	0.537	0.05

a. Common factor analysis with generalized least squares extraction and orthogonal Varimax rotation was used to identify factors of influence.

b. Means represent influence on overall experiences, based on a metric three-point scale with values ranging from (-1) to 1. Both the direction and magnitude of influence may differ for specific experience dimensions.

tors who experienced this dimension, the effect of management interaction was positive and the effect of out-group interaction was negative.

Discussion and Conclusions

This study began with an expanded perspective, one that was relatively unconstrained by the Wilderness Act or previous research that has typically focused on a few selected aspects of the wilderness experience. Visitors were allowed to describe their experiences in their own words, and what they described were events made meaningful by comparison and contrast with a variety of other life situations. Findings from the first, qualitative phase of this study allow managers to see beyond mere trip characteristics to understand the deeper nature of Gates visitor experiences, as well as their own stewardship roles relative to those experiences.

In the second, quantitative phase of this study, certain experience dimensions were found to be widely distributed across the Gates visitor population. Any attempt to select indicators that are relevant to current experiences at the park clearly needs to address these dimensions, described here as "A Taste of Gates," "Freedom from Rules and Regulations," and "Untrammeled Wildlife." While not as broadly distributed, "Challenge of Access" and "Risk and Uncertainty" are also important dimensions of current park experiences that managers may choose to protect. In fact, these dimensions may represent what is most unique about the experience opportunities available at Gates.

Measuring the distribution of experience dimensions is useful for assessing the relevance of potential indicators, but relevance is just one of the numerous desirable characteristics of indicators that have been identified. Previous literature (e.g., Stankey et al. 1985; Merigliano 1990) has suggested that indicators also be measurable, reliable, cost-effective, significant, sensitive, responsive, and efficient. Roggenbuck et al. (1993) focused on the efficiency criterion (ability to capture or reflect multiple conditions in order to reduce the number of parameters that must be monitored) by using factor analysis to group items that may influence wilderness experiences. The study reported here builds on that work by similarly determining groups of influence items (factors), and then going a step further to link those factors with experience dimensions that are specific to Gates. Combined with the deep understanding developed in the first, qualitative phase of investigation, knowledge generated from this quantitative work provides managers with a solid foundation for selecting indicators that are both relevant and efficient. Actual selection of indicators might occur as follows.

Regression modeling determined that the multifaceted "Taste of Gates" experience dimension was positively influenced by the "management interaction" factor. A closer examination of the items included in this factor shows that the highest-loading item was "receiving a backcountry orientation from a park ranger" (Table 3). From the qualitative interviews, it is known that at least some visitors regard management actions and interactions as signs of good stewardship. Therefore, it makes sense that this item would positively influence visitors' experiences—or, conversely, that lack of management interaction could negatively affect experiences. The high factor-loading score indicates that this item is strongly correlated with the other items in the group. In other words, it could serve reasonably well as a surrogate for any of the other items. Therefore, based on Phase I qualitative data and this quantitative analysis, "the proportion of visitors receiving a backcountry orientation" would be a relevant and efficient indicator of the "Taste of Gates" experience dimension. This indicator would differ from more common LAC-type indicators in that it calls for setting some minimum standard (e.g., "at least xx percent of visitors receive an orientation") rather than establishing a standard of maximum acceptable impact as a means of balancing con-

flicting objectives.

This potential indicator, and any others selected in a similar manner, would all share the desirable characteristics of relevancy and efficiency. However, it is important to remember that monitoring indicators such as these would tell only part of the story about wilderness experiences at Gates. The LAC and other indicator-based planning frameworks focus attention on visitor responses to on-site conditions, but, as visitors' own words reveal, the full story of a wilderness experience necessarily extends beyond the spatial and temporal boundaries of an individual wilderness visit. Expanded conceptual and methodological approaches to studying wilderness experiences are clearly useful for informing the selection of indicators, but their real value may be found in helping managers to identify what is uniquely valuable about wilderness experiences and to understand the emerging and evolving relationships that visitors share with wilderness places.

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Computer Simulation as a Tool for Developing Alternatives for Managing Crowding at Wilderness Campsites on Isle Royale

Introduction

Since the establishment of the National Wilderness Preservation System in 1964, recreational use of wilderness has grown steadily and continues to be on the rise today, particularly in the national parks (Cole 1996). In the face of burgeoning public demand for outdoor recreation, national park and wilderness managers must make decisions that integrate a broad array of public values. For example, wilderness recreationists value, to varying degrees, opportunities for solitude, pristine resource conditions, and recreation opportunities unconstrained by management restrictions. Decisions about how to integrate these diverse values are complex and involve trade-offs among potentially competing values (Lawson and Manning 2002b).

This study uses computer simulation modeling to quantify trade-offs associated with management options for improving backcountry camping conditions at Isle Royale National Park. The results of this study are assisting park managers in understanding current crowding-related conditions in campgrounds, comparing current conditions to proposed standards of quality for camping-related indicators, testing the effectiveness and implications of alternative management strategies, and informing the public about the implications of various management alternatives.

Isle Royale National Park

Isle Royale National Park is located in the northwest corner of Lake Superior, approximately 75 miles from Houghton, Michigan, and 20 miles from Grand Portage, Minnesota. Approximately 99% of the park's land base is designated wilderness. The park has a system of 36 campgrounds, with a total of 244 designated tent and shelter sites dispersed along lakeshores and a network of 165 miles of trails. Primary recreation activities at the park, which is open to visitors from mid-April until the end of October, include hiking and camping. During the 1990s, visitation to Isle Royale National Park grew at a rate of 4–5% annually, and, on a per-acre basis, the park has one of the highest number of backcountry overnight

stays in the National Park System (Farrell and Marion 1998).

Visitors interested in backcountry camping at Isle Royale National Park are required to obtain a permit. As part of the permitting process, visitors are asked to report their anticipated itinerary, identifying the number of nights they plan to be in the park and the campground they intend to stay at each night of their camping trip. However, visitors are not required to follow their proposed itinerary and there are no restrictions on the number of permits issued for camping in the park. While visitors do have the option to obtain special permits for off-trail hiking and camping, the vast majority choose to camp at the designated campground sites (Farrell and Marion 1998).

Isle Royale National Park's approach to backcountry camping management is designed to maximize public access to the park and to maintain visitors' sense of spontaneity and freedom. However, recent research suggests that this management approach, coupled with increased backcountry visitation at the park, has resulted in campground capacities commonly being exceeded during peak periods of the visitor-use season. Campers who arrive in full campgrounds are asked to share campsites with other groups, and most campers surveyed indicated that having to double-up with other camping groups detracted from the quality of their experience (Pierskalla, Anderson, and Lime 1996, 1997).

Park managers have decided to address this backcountry camping issue by formulating a standard for campsite sharing (Manning 1999). As park staff attempt to identify an appropriate and feasible standard for campsite sharing, they are faced with a number of difficult questions. For example, to what extent would use limits or fixed itineraries need to be imposed in order to reduce sharing to achieve alternative standards? Could efforts to provide public access, visitor freedoms, and reduced campground crowding be optimized by redistributing use temporally and/or spatially? Could alternative standards for campsite sharing be achieved by adding new campsites to the park, rather than by limiting use? If so, how many additional campsites would be needed, and where would they need to be located? Answers to these questions can assist managers in more precisely describing what the alternatives are and how they affect visitor freedoms, spontaneity of visitor experiences, public access, facility development, natural resource protection, and opportunities for camping solitude. This paper shows how computer simulation modeling of visitor travel patterns can assist managers in answering such questions.

Methods

Data collection. Backcountry camping permits issued by park staff during the 2001 season provided the primary source of data needed to construct the travel simulation model. Information from the permits concerning the starting and ending date of each group's trip, camping itinerary, and group size were used as inputs to the simulation model. Data needed to test whether the simulation model out-

puts are valid estimates of on-the-ground conditions were gathered through a series of campground occupancy observations conducted throughout the park's 2001 visitor-use season. (For a more detailed discussion of the data collection and validation processes, see Lawson and Manning, in press.)

Computer travel simulation model. The travel simulation model developed in this study was built using Extend software (Imagine That 1996; Lawson and Manning, in press; Lawson et al., in press; Wang and Manning 1999). The structure of the simulation model consists of objects called "hierarchical blocks" that simulate various aspects of the park's camping system. Entrance blocks generate simulated visitor groups and assign values for a set of attributes to groups (e.g., group size, camping itinerary) designed to direct their travel through the simulated backcountry camping trip. The model contains entrance blocks for each of the primary entry points to the park. Entrance blocks allow the user to control the simulated amount and spatio-temporal distribution of backcountry camping use by specifying the simulated average daily number of trips starting from each of these locations. Routing blocks direct simulated visitor groups to the next (or first) campground on their itineraries, at the beginning of each simulated day, and direct groups that have completed their itineraries to exit the park. Campground blocks record the number of groups camping at each campground and the number of groups sharing campsites on each night throughout the simulation period.

Model runs. Simulation runs were conducted to estimate the extent of campsite sharing in the park under status quo conditions. Model runs were also conducted to estimate the effectiveness of various management actions at reducing or eliminating campsite sharing, including imposing a permit quota, requiring fixed itineraries, and increasing the number of campsites on the island. In addition, a workshop was conducted to instruct park staff how to use and modify the simulation model to continue meeting their planning needs. The park staff's use of the simulation model is ongoing, allowing them to evaluate management strategies as new ideas emerge throughout the park's backcountry and wilderness planning process.

Results

Backcountry camping permit data. All 3,810 backcountry camping permits issued by the park during the 2001 season were used as inputs to the computer travel simulation model. These data include permits issued to backpackers, kayakers, canoeists, power boaters, and sail boaters. Data reported in Table 1 indicate that, on average, 27 more permits were issued per day during July and August than during the remainder of the season (hereafter referred to as the July/August peak and the low-use period of the season, respectively). The permit data indicate that substantially more visitor groups started their backcountry camping trips on a weekend than on a weekday. Most visitors access the park by commercial boat,

Table 1. Mean number of permits issued per day, by trip starting location—2001 visitor-use season.

	Windigo	Rock Harbor	All Other Locations	All Locations Combined
July/August, weekdays	12.8	19.0	2.3	34.2
July/August, weekend days	17.9	29.8	4.3	52.1
July/August, all days	14.2	22.0	2.8	39.1
Low-use period, weekdays	2.4	5.0	1.4	8.7
Low-use period, weekend days	6.4	9.5	2.6	18.5
Low-use period, all days	3.6	6.3	1.7	11.6

landing at either Windigo (on the west end of the park) or Rock Harbor (on the east end). Consequently, the vast majority of backcountry camping trips started at Windigo or Rock Harbor.

Model output. Table 2 summarizes the results of simulation runs conducted to estimate the current extent of campsite sharing in the park and the effectiveness of alternative strategies for reducing or eliminating campsite sharing. The alternatives outlined in Table 2 were selected for analysis with the simulation model because they reflect a range of management approaches that emphasize campsite solitude, visitor freedoms, public access, and facility development to varying degrees.

Park managers have the option of managing backcountry camping to maintain status quo conditions. Under this alternative, an average of about 39 permits would be issued per day, there would be no new campsite construction, and visitors would not be required to follow prescribed itineraries. Simulation results for the "Status Quo" alternative suggest that under the park's current management approach, an average of about 9% of groups are required to share campsites per night during July and August, with 24% sharing during the busiest two weeks of this period. Less than 1% of groups are estimated to share sites during the low-use period of the season.

Simulation runs were conducted to assess the effectiveness of a permit

Table 2. Management alternatives quantified based on simulation model output

Wilderness Values	Status Quo	Permit Quota	Fixed Itineraries	Campsite Construction	Temporal Redistribution
Public Access	Current use	22% reduction in July/August use	30% increase in July/August use	Current use	Current use (shift 22% of peak)
Facility Development	No new campsites	No new campsites	No new campsites	13 new campsites	No new campsites
Visitor Freedom	No fixed itineraries	No fixed itineraries	Fixed itineraries	No fixed itineraries	No fixed itineraries
Camping Solitude, July/August	9% of groups share sites/night	5% of groups share sites/night	<1% of groups share sites/night[1]	7% of groups share sites/night	5% of groups share sites/night
Camping Solitude, Low-Use Period	0.4% of groups share sites/night	0.4% of groups share sites/night	<1% of groups share sites/night[1]	<1% of groups share sites/night	1.4% of groups share sites/night

[1]Assumes permits are issued to achieve 80% occupancy rate to adjust for non-compliance.

quota at reducing or eliminating campsite sharing. Under the "Permit Quota" alternative, there would be no new campsite construction and visitors would not be required to follow prescribed itineraries. However, the average number of permits issued per day during July and August would be reduced to ensure that an average of no more than 5% of groups share campsites per night (a standard for campsite sharing that the park is considering). Such an approach would continue to emphasize visitor freedoms and place limits on facility development in wilderness, while allowing for greater camping solitude than the status quo for those groups able to obtain a permit. However, some individuals who wanted to take a backcountry camping trip during July or August would not be able to obtain a permit to do so. The simulated "Permit Quota" alternative suggests that the park would need to reduce visitor use during July and August by nearly 25% to ensure that an average of no more than 5% of groups share campsites per night.

Decisions to limit public use of national parks and wilderness are inherently controversial. To avoid this

controversy, park managers could institute a fixed itinerary system, rather than a permit quota, to reduce or eliminate campsite sharing. Under this approach, everyone who wanted to take a backcountry camping trip would be able to obtain a permit to do so and no new campsites would be constructed. However, visitors would potentially have fewer choices of itineraries and would lose the freedom to spontaneously alter their camping itinerary during the course of their trip. The results of the simulated "Fixed Itineraries" alternative suggest that, by requiring visitors to follow prescribed camping itineraries, the park could issue approximately 30% more permits than they did during the 2001 visitor-use season, while at the same time virtually eliminate campsite sharing.

Rather than institute a permit quota or require visitors to follow prescribed itineraries, park managers could try to reduce or eliminate campsite sharing by building new campsites. The park's recently adopted general management plan allows for construction of up to 13 additional campsites in specific campgrounds. If the park were to adopt this "Campsite Construction" alternative, the simulation results suggest that, without instituting any limits on use, the park could reduce campsite sharing by about 2%, resulting in an average of approximately 7% of groups sharing campsites per night.

As the results of the simulated "Status Quo" alternative indicate, campsite sharing is a problem primarily during the months of July and August, while there is virtually no campsite sharing during the low-use period of the season. Further, results of the "Permit Quota" alternative suggested that park managers would need to reduce the number of permits issued during July and August by about 25% to ensure that an average of no more than 5% of groups share sites per night. However, rather than turning those visitors away completely, park managers could shift "surplus" peak-season use to the low-use period of the season. This "Temporal Redistribution" approach would allow managers to maintain season-wide visitor-use levels, reduce campsite sharing during July and August, avoid building new campsites, and maintain visitors' freedom with respect to camping itineraries. Results of the simulated "Temporal Redistribution" alternative suggest that campsite sharing would increase from an average of approximately 0.4% of groups per night during the low-use period of the season, to just over 1% of groups per night.

Simulations conducted to estimate the effect of redistributing visitor use evenly across the two primary starting locations for backcountry camping trips (Windigo and Rock Harbor) or evenly across the days of the week suggest that neither strategy would reduce campsite sharing. Therefore, the results of these simulations are not included in Table 2.

Results of simulation runs conducted to test the validity of the model indicated no statistically significant differences between observed campground occupancies collected by park staff during the 2001 season and travel simulation model output. More

importantly, there were no *substantive* differences between the observed campground occupancies and the corresponding model output. This suggests that the travel simulation model accurately represents backcountry camping conditions at the park during the 2001 season. (For more information about the validation of the simulation model see Lawson and Manning, in press.)

Park staff's use of the simulation model is on-going. For example, park staff have used the model to estimate the effect of shifting some use to secondary entry points; differentially altering the visitation levels of hikers, paddlers, and powerboaters; and setting alternative standards for campsite sharing at different times of the season. In addition, park staff have used the model to estimate where and how many new campsites would need to be added to the park to eliminate campsite sharing during peak-season demand. Using simulation results as a guide, park staff conducted site visits to determine the feasibility and desirability of campground development needed to meet peak camping demand, based on considerations of physical constraints of wetlands, fragile habitats, and topography as well as appropriate size of campgrounds in different areas of the park. In Isle Royale's case, the number of new sites the simulation model estimates would be needed to accommodate peak demand is greater than the number of sites that could be added to the park, given the constraints listed above. However, the new sites could mitigate campsite sharing to some extent.

Discussion and Management Implications

The findings from this study have implications for management of backcountry camping use at Isle Royale National Park in particular, and for management of visitor use in parks and wilderness in general. Isle Royale managers have made a commitment to adopt campsite sharing-related indicators and standards of quality and to develop and implement strategies to improve social conditions in campgrounds while also protecting park resources. To do this in an informed manner, park managers not only need to identify feasible management options, they must also understand the effects of alternative options on a diverse array of wilderness values (Cole 2002). This study assists park managers in defining and assessing management alternatives not only in terms of how effective they are at reducing or eliminating campsite sharing, but also in terms of their consequences with respect to visitor freedoms, public access, and resource impacts associated with facility development. Consequently, the simulation modeling results aid managers in better informing the public of the costs and benefits of different management options, resulting in more effective public involvement in the planning process.

Results from this study are consistent with findings from previous research at Isle Royale National Park, suggesting that campsite sharing is prevalent during certain periods of the visitor-use season. Although it would be possible to reduce campsite sharing through backcountry camping use

limits alone, results from the travel simulation model suggest that the park would have to issue approximately 22% fewer permits during July and August to ensure that an average of no more than 5% of groups share campsites per night.

The outdoor recreation literature generally suggests that use limits should be considered a last resort for managing crowding, and that less intrusive alternatives should be considered first (Behan 1974, 1976; Dustin and McAvoy 1980; Hall 2001; Hendee and Lucas 1973, 1974). The computer simulation model developed in this study helps managers identify effective management actions with relatively low "costs" to visitors and avoid those that are less effective or that come at a relatively high "cost" to visitors. In Isle Royale's case, modeling suggests that the extent of use limits necessary to achieve certain standards for campsite sharing could be minimized by also redistributing use and/or modifying campground capacities.

Although this study provides managers with descriptive information related to backcountry camping at Isle Royale National Park, managers are still faced with difficult judgments concerning the most appropriate strategies for managing backcountry camping. These judgments require managers to reconcile trade-offs among potentially competing wilderness values. For example, do the costs in visitor freedoms and spontaneity associated with a fixed itinerary system outweigh the benefits of increasing use and eliminating or substantially reducing campsite sharing? Is it in the public's interest to limit backcountry camping use during the peak period of the season in order to minimize campsite sharing? If so, to what extent should use be limited to achieve a greater degree of camping solitude? Is it acceptable to shift a percentage of peak-season use to the low-use period of the season, or does the historically low-use period of the season offer a type of wilderness experience that should be preserved? While these judgments must ultimately be made by managers, a growing body of recreation research has been conducted to provide managers with a more informed basis for making such judgments (Lawson and Manning 2001a, 2001b, 2002a, 2002b; Manning and Lawson 2002).

The simulation results from this study formed the basis of a visitor survey conducted at Isle Royale National Park during the 2002 visitor-use season (Lawson and Manning, in press). The visitor survey was designed to assess public attitudes toward management alternatives derived from the simulation model. Results of the visitor survey provide managers with estimates of the proportion of current visitors that support alternative strategies for managing backcountry camping (Table 3). Each alternative in Table 3 is defined in terms of the amount of backcountry camping use permitted, the number of new campsites constructed, whether visitors are required to follow a prescribed itinerary, and the extent of campsite sharing during July and August. The last row of Table 3 reports the proportion of visitors estimated to support each alternative.

The results suggest that the great-

Table 3. Preference proportions for management alternatives

Status Quo	Permit Quota	Fixed Itineraries	Campsite Construction
Current use (39 permits/day)	22% reduction in use (31 permits/day)	30% increase in use (52 permits/day)	Current use (39 permits/day)
No new campsites	No new campsites	No new campsites	70 new campsites
No fixed itineraries	No fixed itineraries	Fixed itineraries	No fixed itineraries
9% of groups share campsites/night	5% of groups share campsites/night	<1% of groups share campsites/night[1]	<1% of groups share campsites/night
36%	39%	6%	19%

[1]Assumes permits are issued to achieve 80% occupancy rate to adjust for non-compliance.

est support among visitors is for the "Status Quo" and "Permit Quota" options, with 36% and 39% of visitors estimated to support each of these alternatives, respectively. While the "Campsite Construction" alternative is less popular than the "Status Quo" and "Permit Quota" alternatives, nearly 20% of visitors are estimated to support this option. The "Fixed Itineraries" alternative is substantially less favorable to visitors than any of the other alternatives, with just over 5% of visitors estimated to support this option. These findings suggest that visitors would prefer to tolerate some amount of campsite sharing in order to ensure that the park does not build a large number of new campsites or require visitors to follow prescribed, fixed itineraries. In this way, the simulation model provides managers with information about the consequences and benefits of alternative management strategies, and the visitor survey assists managers in evaluating public acceptance of those consequences and benefits.

This paper describes how simulation modeling can be used as a tool to contribute to improved management of parks and wilderness. In particular, simulation modeling can more precisely describe the "packages" of attributes (social, environmental, managerial) that are the real management alternatives from which one future must be selected. The simulation results can be used to focus visitor surveys and other public input processes on assessing public support for real management options. In these ways, simulation modeling can be a very effective way of communicating with the public and informing decisions throughout the planning process.

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Cultural Resource Management in National Park Service Wilderness Areas: Conflict or Cooperation?

The National Park Service has a clear, and long-standing, mandate to preserve, protect, and manage cultural resources in all units of the National Park System. The legal mandates include, but are not limited to, the Antiquities Act of 1906, the National Park Service (Organic) Act of 1916, the Historic Sites Act of 1935, the National Historic Preservation Act of 1966, the Archeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the National Parks Omnibus Management Act of 1998. There are regulations pursuant to these laws, as well as National Park Service policies, especially Management Policies 2001 and Director's Order 28, Cultural Resource Management and its accompanying guideline. The agency also has a legal mandate that is almost 40 years old to preserve, protect, and manage wilderness areas within National Park System units. This mandate is the result of the Wilderness Act of 1964 and National Park Service policies, specifically Management Policies 2001 and Director's Order 41 and Reference Manual RM 41, Wilderness Preservation and Management. No one can question the validity of either of these mandates, yet when the two come together they seem to generate more conflict than cooperation, more strife than common sense, and more strongly held opinions than legally supported positions. As a result, the presence and appropriate treatment of cultural resources in wilderness areas within units of the National Park System has been an issue of considerable and, at times, contentious debate within the agency for a number of years. This paper will examine some of the underlying reasons for this conflict, explore whether or not there is a basis in law and policy for the conflict, and make recommendations on how to move from conflict to cooperation.

As stated in Sections 1(b)(2), (3), and (4) of the National Historic Preservation Act, "the historical and cultural foundations of the Nation should be preserved..."; "historic properties significant to the Nation's heritage are being lost ... with increasing frequency"; and "the preservation of this irreplaceable heritage is in the public interest...." Pursuant to these guiding principles, cultural resource management in the National Park Service generally involves five types of resources and six different professions. The resources are archeological sites, ethnographic resources, museum collections, historic structures and cultural landscapes. The professions are archeologist, cultural anthropologist, museum curator, historian, historical architect, and historical landscape architect. The resources sit on

or under the ground or in a museum and largely behave themselves. It is the practitioners, the professionals, who have conflicts with one another, not the resources. What is it about cultural resource managers that could lead to conflicts with wilderness managers?

Regardless of the profession, all cultural resource managers have many years of training in areas of study that have well-developed and often explicit codes of conduct and professional standards. Those standards tend to pertain to a particular type of resource and not necessarily to the entire universe of cultural resources. This leads to a high degree of specialization, which doesn't always lend itself to an open mind when it comes to differing points of view regarding how a resource, especially a resource within that area of specialization, should be treated. This can result in highly professional work that is important to the preservation and protection of the resource in question, but which does not necessarily entertain a great deal of flexibility when new and different constraints, e.g., the requirements of the Wilderness Act, are thrown into the mix.

Wilderness management consists of much less clearly defined professions, but is no less professional and specialized. The National Park Service Resource Careers Initiative, implemented by the director in December 1999, included a benchmark position description for an interdisciplinary wilderness coordinator position, which was to be either a biologist or a physical scientist. Clearly not every biologist or physical scientist would qualify for a wilderness coordinator position, but only those that have the necessary training and experience. What is it about wilderness managers that could lead to conflicts with cultural resource managers?

Like cultural resource managers, wilderness managers have standards and beliefs that guide their approach to their jobs. Those standards and beliefs tend to be rooted in the Wilderness Act and the relevant literature that exists both before and after passage of the act. One of the guiding principles, as expressed in the *Wilderness Act Handbook,* is "to preserve some of the country's last remaining wild places in order to protect their natural processes and values from development" (The Wilderness Society 2000:1). This reflects the part of Section 2(c) of the Wilderness Act which states that wilderness is "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." The preservation of cultural resources does not fit neatly into such standards.

On top of this double set of seemingly mutually exclusive standards and beliefs, is the all-too-human tendency to have tunnel vision when it comes to reading and interpreting laws, regulations, and policies. Cultural resource managers tend to know the laws and policies very well, but only in their fields of expertise or responsibility. Wilderness managers tend to know the parts of the Wilderness Act and relevant policies that support their own standards and beliefs, but not necessarily the parts that allow actions

in wilderness they do not support. This tendency for selective interpretation of the laws and policies, combined with narrowly defined professional standards and beliefs, creates an environment that is ripe for conflict when managers from cultural resource and wilderness perspectives come together armed with what they perceive to be mutually exclusive mandates.

A few examples may help to illustrate this point. At a national park unit in the Pacific Northwest an outside organization is taking the National Park Service to task for not protecting the wilderness adequately. To quote from their own web page: "[Park officials] think aging ... structures are cultural treasures, more significant than the wildlands they were built to protect." Additionally, "the park needs to demonstrate precisely the overwhelming cultural significance of these structures that cause them [to] trump wilderness protection." The overwhelming sentiment is that cultural resources do not belong in wilderness and somehow having them there threatens wilderness protection. This same sentiment resulted in park officials in an Alaskan park with over 2,000,000 acres of wilderness deciding to let a historic structure go to ruin because its presence somehow "threatened" the wilderness. These attitudes and actions on the part of wilderness advocates and managers have resulted in cultural resource advocates and managers becoming more combative, instead of cooperative.

A good illustration of this is a 17-page document that a National Park Service cultural resource manager in Alaska prepared to justify the use of helicopters to conduct archeological site identification and evaluation fieldwork in a very large area of wilderness. While his justifications are sound and well reasoned, he felt the need to go well beyond a minimum requirements analysis and justification and to attack the concept of wilderness and its advocates. "Just as the experiential concept of wilderness is falsely assumed to protect the naturalness of areas, so too is it frequently and incorrectly assumed that primitive methods, if employed by all users, will best preserve the 'wilderness resources' of 'wilderness areas'. This notion is rooted in several 18th and 19th century philosophical trends." Continuing this line of thought, "in many places today, 'primitive tool' use in wilderness has been elevated to ceremonial practice, believed to be essential for transcending to a natural condition and justified in an empty rhetoric of environmental protection."

What seems to be lost on many of the "combatants" in this "feud" is that there is no basis in law and policy for this conflict. The Wilderness Act clearly directs our stewardship of cultural resources in wilderness areas. In its definition of wilderness in Section 2(c), the act states that "an area of wilderness ... may also contain ecological, geological, or other features of scientific, educational, scenic or historical value." The act further addresses cultural resources in Section 4(b) when it clarifies the use of wilderness areas. That sections states, "[W]ilderness areas shall be devoted to the public purposes of recreational, scenic,

scientific, educational, conservation, and historical use."

For National Park Service wilderness areas Section 4(a)(3) is even more specific. Not only does it state that "nothing in this Act shall modify the statutory authority under which units of the national park system are created," but goes on to state that designation of wilderness areas "shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with the Act of August 25, 1916 [the Organic Act], the statutory authority under which the area was created, or any other Act of Congress which might pertain to or affect such area, including, but not limited to, the Act of June 8, 1906 [the Antiquities Act] ... and the Act of August 21, 1935 [the Historic Sites Act]." It is significant that Congress specifically mentioned the Antiquities Act and the Historic Sites Act because in 1964 they were the foundation of the historic preservation/cultural resource programs. They have since been expanded by the Archeological Resources Protection Act of 1979, as amended, and the National Historic Preservation Act of 1966, as amended.

National Park Service policies provide further elaboration on the inclusion of cultural resources in wilderness. As stated in Director's Order 41: "There has been extensive prior human use in most areas now designated as wilderness, resulting in archeological sites, historic structures, cultural landscapes and associated features, objects and traditional cultural properties that are contributing elements to wilderness. It is important to recognize that laws ... intended to preserve our cultural heritage, are applicable in wilderness.... [A]ctions involving all cultural resource types in wilderness must comply with cultural resource laws, such as compliance actions and inventory requirements mandated by NHPA [the National Historic Preservation Act]" (National Park Service 1999a:C4). In addition, "[h]istoric properties eligible for the National Register of Historic Places that have been included within wilderness will be protected and maintained according to the pertinent laws and policies governing cultural resources, using management methods that are consistent with preservation of wilderness character and values. These laws include the Antiquities Act of 1906 and the Historic Sites Act of 1935, as well as subsequent historic preservation legislation, including the National Historic Preservation Act, the Archeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act" (National Park Service 1999b:sec.6.3.8).

The Wilderness Act does not supersede or override historic preservation laws, such as the National Historic Preservation Act and the Archeological Resources Preservation Act. Section 4(a) of the Wilderness Act states: "The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and wildlife refuge systems are established and administered...." As declared in the 1916

National Park Service organic act, "the purpose [of National Park System units] is to conserve the scenery and the natural and historic objects and the wild life therein...." As stated above, for units of the National Park System this idea of being "within and supplemental" was reinforced in Section 4(a)(3) and the historic preservation laws were specifically cited.

At the same time historic preservation laws do not supersede or override the Wilderness Act. Managers must comply with all of the historic preservation laws in all areas in all units of the National Park System, whether they are wilderness or not. If the cultural resources are in a wilderness area, however, the provisions of the Wilderness Act must also be complied with when conducting cultural resource activities, such as inventory, monitoring, treatment, and research.

Since Congress specifically included cultural resources as part of wilderness, historic structures and other cultural resources do not need to be removed from wilderness areas to protect wilderness values. In Section 2(c), Definition of Wilderness, Congress stated that "an area of wilderness is further defined to mean in this Act an area of undeveloped Federal land ... which (1) *generally appears* to have been affected *primarily* by the forces of nature, with the imprint of man's work *substantially* unnoticeable" [italics added]. The qualifiers in this portion of the sentence are significant. The area does not have to be "pristine" or "pure." It does not have to have no imprint from human activities. Simply put, it only needs to *appear* that way with the human imprint *substantially* unnoticeable. A landscape can have hundreds of prehistoric and historic archeological sites on it and still appear to have been affected primarily by the forces of nature. Even a maintained historic structure could be substantially unnoticeable if it were surrounded by many acres of land that did not contain other structures.

In addition, as declared in Section 2(a) of the act, the intent of Congress was to stop the "increasing population, accompanied by expanding settlement and growing mechanization" from "occupy[ing] and modify[ing] all areas within the United States." As noted above, Congress also clearly included historic resources within wilderness areas. With this understanding, the prohibition on structures and installations in wilderness areas in Section 4(c) clearly refers to modern, not historic, structures. This does not mean that all historic structures in wilderness areas have to be maintained, but it also does not justify the assertion that they all have to be removed.

The National Historic Preservation Act does not require that all historic structures be preserved, whether in wilderness or not. They can be removed, but it is not a quick or easy process. As stated in National Park Service policies for wilderness management, maintenance or removal of historic structures will additionally comply with cultural resource protection and preservation policies and directives (National Park Service 1999b:sec.6.3.10). As stated in National Park Service policies for cultural resource management, "demol-

ishing a historic structure or deliberately allowing it to decay naturally is justifiable only when all alternatives have been determined infeasible in the planning process" (National Park Service 1997:123). No historic structure can be removed or deliberately neglected without review by cultural resource specialists and approval by the regional director. If removal or deliberate deterioration is approved, documentation of the structure must be recorded according to law and policy before that happens.

In addition, removal would also have to comply with the minimum requirement aspect of the Wilderness Act. The same is true of cultural resource activities, including research and resource treatment actions. Section 4(c) of the Wilderness Act states: "[E]xcept as necessary to meet minimum requirements for the administration of the area for the purpose of this Act ... there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, or other form of mechanical transport, and no structure or installation within any such area." Reference Manual 41 states that scientific activities—which Director's Order 41 (National Park Service 1999a) specified as being both natural and cultural—"must also be evaluated using the minimum requirement concept and include documented compliance which assesses impacts against benefits to wilderness. This process should assure the activity is appropriate and utilizes the minimum tool required to accomplish project objectives" (National Park Service 1999b:sec. 6.3.6.1).

National Park Service policies properly and accurately incorporate cultural resource stewardship requirements into the management standards for wilderness areas. They accurately reflect the requirements of the Wilderness Act as well as numerous pieces of cultural resource legislation. The ongoing controversy and debate about how stewardship of cultural resources fits in wilderness seems to stem mainly from personal values and selective interpretation of parts of the Wilderness Act, the National Historic Preservation Act, and National Park Service policies.

The Wilderness Act and all of the historic preservation laws are part of the National Park Service's stewardship mandate and we must put our efforts into making them work in concert with one another, even when they appear to be in conflict. Director's Order 41 contains a requirement that needs to be emphasized and followed more closely. In Section B4, Cultural Resource Management in Wilderness, it states that "cultural resource specialists shall fully participate in the development of a park's wilderness management plan" (National Park Service 1999a). Failure to include cultural resource specialists as full participants in the development of wilderness management plans has contributed to the present level of controversy and debate. An example of this is the development of the Wilderness Stewardship Plan Handbook, also known as the Generic Wilderness Management Plan, by a sub-committee of the National Wilderness Steering Committee. Cultural resource specialists were not full par-

ticipants in the early stages of the development of the handbook and the quality of how it dealt with cultural resources in wilderness suffered accordingly. Once cultural resource specialists became engaged in the process, the treatment of cultural resources in the document improved significantly and it is now close to being finalized.

The flip side of this situation also needs to be improved. Cultural resource specialists prepare many different kinds of plans for conducting research, inventory, monitoring, and treatment studies and actions in park areas throughout the National Park Service. When the resources and areas in question are in wilderness, it is incumbent upon the cultural resource specialists to engage the wilderness managers so they can participate in the preparation of those plans. Neither "side" can expect the other to support any final plan if they did not have the opportunity to participate in its development.

Simply putting wilderness managers and cultural resource managers in the same room and telling them to work together is not going to solve the problem, however. Each will continue to have his or her strongly held values and beliefs and will tend to view one another with suspicion and distrust. It is a common human trait to fear or distrust what you don't understand or appreciate. It is clear that that not all wilderness managers understand or appreciate cultural resource laws, policies, and values, and not all cultural resource managers understand or appreciate the Wilderness Act and wilderness polices and values. Since all wilderness areas contain cultural resources, all wilderness managers should receive training in cultural resource values and management. In addition, all cultural resource managers in parks that contain wilderness areas should receive training in wilderness values and management. This may not change anyone's personal values, but hopefully it will increase the understanding and appreciation of the differing sets of values and enable the various wilderness and cultural resource managers to more effectively work together to accomplish the stewardship mission of the National Park Service.

Representatives from the National Park Service National Wilderness Steering Committee and the Arthur Carhart National Wilderness Training Center are working together to develop a cultural resource training module that can be inserted into existing wilderness training classes and a wilderness training module that can be inserted into existing cultural resource training classes. These modules should be ready for use within the next year. As they become implemented and increased cross-pollenization between cultural resource and wilderness managers occurs, working relationships should improve. Hopefully, this will enable us to move from conflict to cooperation so we can spend more of our efforts working to achieve our daunting resource stewardship mandates and less time working to push a one-sided (pick your side) agenda.

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Securing an Enduring Wilderness in the National Park System: The Role of the National Wilderness Steering Committee

The National Park Service (NPS) can take great pride in the fact that it is responsible for the stewardship of more designated wilderness than any other federal land management agency. Since the passage of the Wilderness Act in 1964, 46 separate units have been established in national park areas. These 44 million acres of designated wilderness comprise nearly 53% of the total NPS-managed acreage. Most of the legislation establishing NPS wilderness was passed during the 1970s and 1980s. The Alaska National Interest Lands Conservation Act in 1980 set aside an astounding 33 million acres in eight large park units. In addition, past presidents have recommended an additional 19 wilderness areas to Congress for inclusion in the National Wilderness Preservation System, and the NPS has formally proposed wilderness for another 20 parks. By NPS policy no actions that would diminish the wilderness suitability of these proposed or recommended areas will be taken until after the president and Congress have made their decisions on wilderness designation.

Although the modern era of wilderness stewardship began with the legislative establishment of designated NPS wilderness following the passage of the 1964 Wilderness Act, the administrative commitment to wilderness as a supplemental responsibility for managers lagged, and the agency was frequently criticized for its shortcomings. Similar criticism continued well into the 1990s (Sellars 2000). In response, the National Park Service convened several national task forces beginning in the mid-1980s in an attempt to identify its major wilderness stewardship issues and to recommend solutions.

Central to implementing most of the recommended solutions for the issues identified by these task forces is the challenge of providing leadership for wilderness stewardship across the

National Park System. It is a challenge because National Park Service wilderness is fundamentally different, especially when compared with wilderness managed by agencies such as the U.S. Forest Service and the Bureau of Land Management (BLM).

In other agencies, wilderness is the outcome of an allocation decision among largely consumptive uses, whereas wilderness in the National Park System is more about an allocation among largely non-consumptive uses. Moreover, where there is wilderness in a national park, most of the park becomes designated wilderness, which is not correspondingly true of wilderness in a national forest or BLM district. The result of this is that most national park staff members are involved in some manner in wilderness stewardship, in contrast to the other agencies where more limited and specialized staff are involved. And although it is possible in the other agencies to do programmatic budgeting for wilderness management, it is more realistic for the National Park Service to budget its resources by park rather than by program.

All of these factors point toward the likelihood and need for different approaches to providing leadership for wilderness stewardship in these agencies. Centralized program management and budgeting fit wilderness stewardship in the Forest Service and BLM, but are not functional in the National Park Service, where a different approach has evolved.

After the passage of the Wilderness Act in 1964, the National Park Service response was to establish a centralized program within the Planning Office to conduct the mandated 10-year study of national parks for the purpose of making recommendations on their suitability for designation as wilder-

ness. The National Park Service had largely completed this planning effort by 1978, when recommended wilderness in over thirty parks was designated, and on-ground assessments and studies were complete in more than 40 other parks where wilderness proposals and recommendations were developed.

As this wilderness study program wound down, many of its staff and resources were channeled into the special studies in Alaska that helped to influence wilderness decisions that were made in the Alaska National Interests Land Conservation Act (ANILCA) of 1980. But there is no evidence that the agency had yet begun to think systematically about wilderness management in the national parks.

And wilderness studies did not entirely disappear even after ANILCA because many pieces of park legislation in the 1980s created new parks with "wilderness study" provisions. Furthermore, some members of Congress supported wilderness studies because they viewed wilderness as the best means of ensuring that national parks in their states or districts would be kept in their current natural state without further development (e.g., Cumberland Island National Seashore, Guadalupe Mountains National Park, Sleeping Bear Dunes National Lakeshore, etc.)

But wilderness studies do not address the problems associated with managing wilderness, and this was becoming apparent within and without the agency. In 1986, the NPS director developed a 12-Point Plan for the National Park Service that, among other things, called in general terms for several activities relating to management of legislated wilderness areas. The action plan for implementing the 12-Point Plan called specifically for ensuring that designated, potential, and proposed wilderness areas in the National Park System were managed according to the principles of the Wilderness Act and, for Alaska, of the Alaska National Interest Lands Conservation Act. It also called for specific steps to improve coordination and consistency in management of all wilderness areas; to monitor human use, air quality, and noise trends in wilderness areas; to develop an initiative on interpretation and public information regarding wilderness areas; and to develop a systematic resource management strategy for such areas.

To implement these action steps, the National Park Service convened a task force of wilderness specialists from eight regions, key headquarters staff, representatives from the other wilderness management agencies, and wilderness constituent groups. In the process of developing recommendations, the task force systematically reviewed management policies, major wilderness management issues, and the intent of the Wilderness Act as applied to the overall National Park Service mission. The task force developed six major recommendations together with implementation steps to be completed over five years. These were related to (1) designation of national and regional wilderness coordinators; (2) management techniques appropriate for wilderness; (3) wilderness uses and capacity determination; (4) education and training of wilder-

ness management personnel; (5) educating the public; and (6) interagency coordination and consistency. The primary recommendation for addressing wilderness management leadership in the agency was the establishment of wilderness coordinator positions at headquarters and the regional offices.

Despite this impressive program management plan and agency efforts to implement it, including the naming of regional wilderness coordinators, agency efforts faltered after several years and had largely dissipated by 1989. This happened essentially because critical measures were never institutionalized and staff and funding commitments were inadequate for significant progress to be made in implementing the action plan.

This lack of progress lead to the formation of a second task force in late 1993 charged with revisiting wilderness management issues across the National Park System. The recommendations of this task force dealt with wilderness leadership, conveying the wilderness message, developing partnerships, investing in NPS employees, improving wilderness planning, improving resource management and understanding, and addressing the backlog in the wilderness review process. Major leadership recommendations focused mainly on the establishment of interdisciplinary wilderness steering committees at the national and regional levels, establishment of an interagency wilderness policy council, maintenance of a strong wilderness coordinator in headquarters, and participation in the interagency Arthur Carhart National Wilderness Training Center and the Aldo Leopold Wilderness Research Institute.

As a result, the NPS established a National Wilderness Steering Committee (NWSC) in 1996, comprising four superintendents together with representatives from Alaska, natural resources, cultural resources, maintenance, interpretation/education, and rangers (Figure 1). In addition, NPS established a collateral-duty wilderness coordinator position and funded an NPS position at the Carhart Training Center. Since that time, the NWSC has evolved into an increasingly effective organizational entity for improving wilderness stewardship in the National Park System. Task Force recommendations continue to be used by the NWSC in development of their on-going work plans. The effectiveness of the NWSC is evidenced by some of the major actions it has taken:

- Development of Director's Order 41: Wilderness Preservation and Management
- Development of Reference Manual 41: Wilderness Preservation and Management
- Participation in the Carhart Training Center, including inauguration of on-site wilderness training in parks
- Establishment of the Director's Order 41 Survey Database
- Inauguration of an annual NPS wilderness report
- Development of a wilderness education plan for the National Park System
- Completion of a wilderness planning handbook
- Development of a wilderness resource book for NPS interpreters
- Development of internet and intranet NPS wilderness websites
- Inauguration of a White Paper Series on wilderness management issues for inclusion in Reference Manual 41

Figure 1. National Wilderness Steering Committee members and park staff discuss proposal for ecological restoration in wilderness to protect cultural resources at Bandelier National Monument. *Photo by Jim Walters, National Park Service.*

- Making the new wilderness management text available on-line
- Development of servicewide performance goals

The reorganization of the NPS that began in 2001 has also led to other opportunities to improve the agency's wilderness stewardship. The program now has a full-time wilderness program manager who reports directly to the new associate director for visitor and resource protection, Karen Taylor-Goodrich. Under the reorganization, this associate director now shares program leadership responsibilities with the associate directors for natural resources, science, and stewardship (Mike Soukup) and park planning, facilities, and lands (Sue Masica) for issues related to wilderness science and planning. And in a promising development, the NWSC now has committee liaisons from natural resources and science, park planning and special studies, cultural resources, and the associate regional directors for operations. Further improvements in relationships with training and interpretation programs are being explored. The evolution of the NWSC as an effective force for improving wilderness stewardship in the National Park System has been aided by the commitment of such able leaders as Maureen Finnerty, Dick Ring, Karen Wade, Doug Morris, Ernie

Quintana, and Don Neubacher.

The associate directors for visitor and resource protection and for natural resources, science, and stewardship also sit as the National Park Service representatives on the Interagency Wilderness Policy Council that was recently established to address the full suite of interagency wilderness issues.

The highest priorities for the NWSC will continue to be in ensuring that wilderness stewardship training is available to Park Service managers and staff, to make wilderness stewardship information available to park staffs, to aid in the development of educational materials for park visitors, and to be responsive to field staff on wilderness stewardship issues. The new White Paper Series may be an excellent way to address critical stewardship issues, and a number of them are now in the process of being developed. And finally, at the request of Director Fran Mainella, the NWSC is developing a wilderness action plan to strategically guide the agency's course over the next five years.

The National Wilderness Steering Committee welcomes comments on its effort to become an increasingly effective advisory body focused upon achieving consistency in NPS wilderness management objectives, techniques, and practices on both an agency and interagency basis.

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