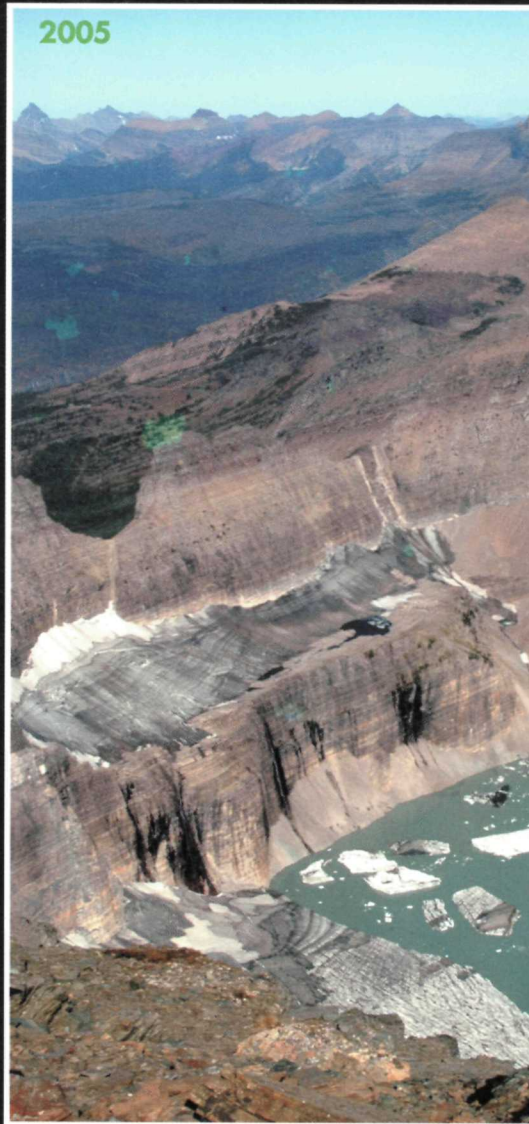


CLIMATE CHANGE

what will it do to America's national parks?

2005



1938



The George Wright Forum

The GWS Journal of Parks, Protected Areas & Cultural Sites

volume 24 number 1 • 2007



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 encourages 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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On the cover:

Glacial retreat due to a warming climate has emerged as a major concern for Glacier National Park in Montana. These repeat photos show the changes in Grinnell Glacier between 1938 and 2005. The 1938 photo is by T. J. Hileman and is courtesy of the Glacier National Park archives. The 2005 photo is by B. Reardon and is courtesy of the U.S. Geological Survey. For more, see the article "Losing Ground: Western National Parks Endangered by Climate Disruption."

SOCIETY NEWS, NOTES & MAIL

New Forum format debuts

With this issue we are bringing a new look, and a new publishing schedule, to *The George Wright Forum*. From now on the Forum will come out three times a year instead of four, but with more content in each issue. That's because we will be expanding each issue to run 100–124 pages; previously, each issue ran 60–96 pages. The new, longer format will enable us to continue to offer themed issues, but with more room to offer additional articles unaffiliated with the theme. Our aim is to make sure each issue contains material that will appeal to a wide range of interests. As always, we welcome proposals for articles or themes; see the guidelines at www.georgewright.org/forum.html.

Kimball joins GWS Board

Suzette M. Kimball, the U.S. Geological Survey's regional director for the Eastern Region, has been named to the Society's Board of Directors. She will fill the remaining two years of the term of Jerry Emory, who resigned from the Board last autumn. Before assuming her current duties, Kimball was USGS's regional executive for biology. She came to the USGS from the National Park Service, where she served as the associate regional director of science and natural resources stewardship in the Southeast Region.

2007 GWS Board election: Call for nominations

Nominations are now being accepted for the 2007 election for the Society's Board of Directors. Board member Abby Miller is reaching the end of her second and final term, while Suzanne Lewis is eligible to run for a second term. We are now accepting nominations from GWS members who would like to be candidates in this year's election. The term of office runs from January 1, 2008, through December 31, 2010. Nominations are open through July 1, 2007. To be eligible, both the nominator and the potential candidate must be GWS members in good standing (it is permissible to nominate one's self). The potential candidates must be willing to travel to in-person Board meetings, which usually occur once a year; take part in Board conference calls, which occur several times per year; help prepare for and carry out the biennial conferences; and serve on Board committees and do other work associated with the Society. Travel costs and per diem for Board meetings are paid for by the Society; otherwise there is no remuneration. Federal government employees who wish to serve on the Board must be prepared to comply with all applicable ethics requirements and laws; this may include, for example, obtaining permission from one's supervisor, receiving ethics-related training, and/or obtaining a conflict of interest waiver.

The nomination procedure is as follows: members nominate candidates for possible inclusion on the ballot by sending the candidate's name to the Board's nominating committee. The committee then, in its discretion, determines the composition of the ballot from the field of potential candidates. Among the criteria the nominating committee considers when determining which potential candidates to include on the ballot are his/her skills and experience (and how those might complement the skills and experience of current Board mem-

bers), the goal of adding and/or maintaining diverse viewpoints on the Board, and the goal of maintaining a balance between natural- and cultural-resource perspectives on the Board. (It also is possible for members to place candidates directly on the ballot through petition; for details, contact the GWS office.) To propose someone for possible candidacy, send his or her name and complete contact details to: Nominating Committee, George Wright Society, P.O. Box 65, Hancock, MI 49930-0065 USA, or via email to info@georgewright.org. All potential candidates will be contacted by the nominating committee to get background information before the final ballot is determined. Again, the deadline for nominations is July 1, 2007.

The Preserve America Summit

First Lady Laura Bush led 500 participants from all over the nation and other countries in convening the *Preserve America Summit* in New Orleans, October 18–20, 2006. The Advisory Council on Historic Preservation and other federal and non-federal partners—including the Departments of Agriculture, Commerce, Defense, Education, Homeland Security, Housing and Urban Development, Interior, and Transportation, the National Endowment for the Arts, and the National Endowment for the Humanities, the National Trust for Historic Preservation, and the Marriott Corporation—co-sponsored the conference to mark the 40th anniversary of the passage of the National Historic Preservation Act. The summit was preceded by meetings held around the country by 11 panels, each composed of a mix of public and private expertise, that focused on critical issues facing the national preservation program. Summit participants participated in sessions to review and provide comments on the panels’ draft recommendations; in addition, an opportunity was provided for comment outside of the conference through a sponsored website through January 16, 2007.

The issues and recommendations of the panels covered a wide range of issues and can be found at www.preserveamericasummit.org/pa/hay_reg_index.asp. Cross-cutting topics included a call for an accelerated and enhanced effort to compile a national inventory of culturally significant properties that would facilitate information-sharing among agencies, organizations, and other stakeholders, and expansion of the U.S. government’s involvement in international preservation efforts. The New Orleans setting gave heightened urgency to proposals to enhance our ability to respond to security and disasters threats, including the need for additional guidance and training at all levels of government. Many of the concerns expressed by the panels and participants regarding the need for greater civic engagement, support for the teaching of history, and the incorporation of heritage sites into a range of education issues echoed the issues identified by the National Park Service in its 2006 Education Summit. Finally, the panel on “Improving the Historic Preservation Infrastructure” provided recommendations for further enhancing partnerships with Indian tribes and Native Hawaiians; fostering greater collaboration with local governments, non-profits and private organizations; and funding “to support a sustainable preservation program to accomplish the vision, mission, and mandates of the National Historic Preservation Act.”

Overall, the summit succeeded in bringing the critical issues affecting the national preservation program to a much higher level of attention than the program has received in recent years. The 50th anniversary of the National Historic Preservation Act—2016—coincides

with the centennial of the establishment of the National Park Service. The partnerships created by the NHPA have touched every state and many communities throughout the nation, preserving cultural resources of local, state, and national significance. It would be timely if the discussions initiated by the summit led to a new commitment and a major initiative to address the unfunded and under-funded mandates of the National Historic Preservation Act for the 21st century.

Errata

After the last issue of *The George Wright Forum* (volume 23, number 4) went to press, we learned that Michael A. Schuett of Texas A&M University should have been credited as co-editor, along with Gillian Bowser, of the theme articles on environmental justice. In addition, all the photos in that issue were credited to Bowser when in fact several of them were taken by Duane Holmes. All of the photos are courtesy of the National Park Service.

The National Park Service Centennial Essay Series: An Introduction

AMERICAN CULTURE, SO THE PUNDITS TELL US, IS ALL ABOUT THE HERE AND NOW. In this view, most Americans—especially most young Americans—are not very interested in, or adept at, looking either backward or forward. What lies behind us in time are the murky landscapes of history, a realm of half-remembered facts all too often tainted with myth. The past, in the memorable phrase of David Lowenthal, is a foreign country—and we all know how bad Americans are at geography. As for the future, Americans are notorious for not planning for it. We don't save enough money for retirement, we don't have the willpower to fix Social Security, we go about our daily lives as if there were no such things as global warming or peak oil.

There are good reasons to doubt all these snap generalizations, but for the sake of argument let's entertain the possibility that they contain more than a kernel of truth. What, then, are we to make of the fact that in just under ten years' time, on August 25, 2016, the National Park Service will celebrate its one hundredth anniversary? For this is an agency that rather awkwardly straddles the present. One of NPS's main goals is to provide for visitation—the enjoyment of the parks in the here and now. But it is also an agency uniquely constrained by the past and the future, for it must promote only those kinds of present-day enjoyments that respect the past while not compromising the interests of future generations.

Balancing the often-conflicting interests of the past, present, and future has been the Park Service's core administrative and legal challenge since its founding in 1916. That task also carries over to the commemoration of the agency's centennial. Somehow, NPS must approach 2016 with a judicious mixture of celebrating past achievements and planning for future changes and as-yet-unforeseen problems, while at the same time garnering political and financial support for meeting today's needs.

One thing we already know about the NPS centennial is that present-day needs will be attended by a great deal of public money, coupled with aggressive fundraising from the private and philanthropic sectors. The day this was being written, it was announced that the Bush administration's proposed 2008 budget includes requests for increases in the NPS base operations budget that would be the largest in the agency's history. This is the leading edge of the National Parks Centennial Initiative, the NPS's official program running up to 2016. When all the proposed increases are rolled together, as much as \$3 billion could be invested in the national park system between now and the big anniversary.

Even if these requests are not fully enacted by Congress, they evidence the serious intent of politicians from both sides of the political aisle to make much-needed investments in the national park system. Yet, as several commentators have already pointed out, the National

Parks Centennial Initiative has to be something more than Mission 66 Redux. It can't just be about fixing all the busted toilets and filling in all the potholes on the scenic drives. It can't just be about new or buffed-up visitor centers, or additional parklands. It can't just be about permanent increases in the NPS base operations budget, or fully funding employee salaries, or bringing on thousands of new seasonals, or ramping up the funds available to conserve historic objects or eradicate invasive species.

All of these concerns are important, of course—vitaly important. But there has to be something else at the core of all this activity. As it approaches its hundredth year, the National Park Service must commit itself to a “creed of discovery,” to the willingness to question all assumptions, right down to the very mission of the agency itself. What needs to be at the heart of the NPS centennial is not celebration, but *cerebration*: a rigorous and deeply penetrating process of reflection on every aspect of the national park idea.

The Park Service cannot, and should not, do this alone. The agency's leaders, to their credit, understand this full well. Many outside groups—the National Parks Conservation Association, the Coalition of National Parks Retirees, and others—are contemplating plans for being involved in the centennial run-up.

The George Wright Society is no exception. We see our role as a continuation of what we've always done: encouraging serious reflection on critical park-related issues across the entire spectrum of cultural and natural resource disciplines. In the context of the NPS centennial, this means challenging the agency to enact the creed of discovery described above, specifically by bringing voices into the centennial conversation that represent a broad range of viewpoints, including those not traditionally part of the discourse on America's national parks.

How will we do that? One way will be through the National Park Service Centennial Essay Series, to be launched in the next issue of *The George Wright Forum*. The series will run over the next 28 issues, one essay per issue, all the way up to August 2016. The GWS Board will commission essays from well-known writers who have a demonstrated interest in national parks, but just as importantly we will also seek out analysts who are addressing important issues that are relevant to parks but who have not yet applied their thinking in that way. We will certainly give room to established voices within the National Park Service, but will also be looking far beyond the usual fields we have come to associate with the administration of parks, protected areas, and cultural sites.

We welcome the participation of George Wright Society members and other readers of *The George Wright Forum* in this ambitious journey of discovery. Who are the people who have inspired you in your work? Is there a philosopher, an essayist, a novelist whose work has influenced your approach to issues affecting your park or its resources? Are there scientists, anthropologists, or historians whose thinking should be brought to the attention of the parks community? Which poets have gone straight to your heart with their words? Or maybe you weren't touched by words at all. What is the power of music, of painting, of the lively arts to inform the national park experience? Who should we talk to, and ask to talk with all of us?

Or maybe *you've* got something you'd like to share, either in your own voice or simply by passing along an idea that you think one of the Centennial Essays should address. We welcome that, too. Please see the accompanying box for guidelines.

If you had to boil all this down to a single question, that question would be: How is the National Park Service to remain relevant in a fast-changing 21st century? But even this is not straightforward. Several commentators have pointed out that the word “relevance” is in danger of being debased, of being turned into a wedge word by (for example) motorized recreation interests who want access to the parks and who complain that by keeping them out the Park Service is in danger of making itself “irrelevant” to the current preferences of the public. Still, such cynical uses are no reason for NPS to abandon the search for relevance so long as it adopts an expansive conception of the word: one which implies continuity with America’s past while maintaining the flexibility to meet the challenges of the future. It’s the only way the Park Service can escape the tyranny of the present that the pundits are so fond of talking about.

So look for the first of the National Park Service Centennial Essays in the next issue of *The George Wright Forum*—and feel free to join the conversation.

Guidelines for the National Park Centennial Essay Series

As noted in the text, we are glad to have your suggestions for topics that should be included in the Centennial Essay Series. It would be most helpful if they were accompanied by the name and contact information of one or more people whom you think would do a good job developing the ideas into an essay.

The GWS publications committee also welcomes specific proposals for essays from authors themselves. Again, proposals can come from any field of endeavor so long as they consider important issues related to the National Park Service as an agency or the resources of the national park system. Authors may send fully developed essays if they wish, but because of the competitive nature of the selection process it is suggested that initial proposals consist of a short summary (no more than 500 words) of the proposed essay, accompanied by a brief description of the author(s). Proposals will be reviewed by the publications committee; for those deemed of interest, authors will be invited to submit a complete essay for further consideration. These full essays will be reviewed by the committee (and, on occasion, by outside peer reviewers) to determine whether they should be included in the Essay Series. It is our hope that a selection of the essays will eventually be published as a book.

In general, essays should run 3,000–5,000 words, though longer or shorter ones are possible with prior permission from the publications committee. Style guidelines are the same as for regular submissions to *The George Wright Forum*. They can found on our website at www.georgewright.org/forum.html. All submissions—whether suggested topics, proposals for essays, or complete essays—should go to: The George Wright Society, P.O. Box 65, Hancock, MI 49930-0065 USA, or by email to

The National Park System and the Historic American Past: A Brief Overview and Reflection

Richard West Sellars

Editor's note: What follows is the opening chapter in Richard West Sellars' history of cultural resource management in the national park system, in progress. It is intended as an introduction for readers who are not fully familiar with the breadth and depth of National Park Service involvement with historic preservation.

Then he told me—really ordered me—to ‘get busy.... Suppose you do something tomorrow about this.’

— *Former National Park Service Director Horace M. Albright, recalling a discussion with President Franklin D. Roosevelt*

The trip to Shenandoah

ON AN EARLY APRIL MORNING IN 1933, a heavily guarded motorcade carrying President Franklin D. Roosevelt made its way through the pastoral beauty of the Virginia Piedmont to the rugged mountains of Shenandoah National Park, about 90 miles west of Washington, D.C. Its destination was a rustic camp in the woods along the upper Rapidan River that Roosevelt wanted to inspect for use as a retreat from the constant pressure and stifling summer heat he would have to contend with in the nation's capital. His predecessor, Herbert Hoover, an avid trout fisherman, had built the rustic fishing camp beginning in the late 1920s. However, upon visiting the camp the newly inaugurated president, crippled by polio and dependent on leg braces and a wheelchair, found the terrain around the buildings too rough and decided against using the place. Nevertheless, Roosevelt, who loved automobile touring, thoroughly enjoyed the drive through the Virginia landscape on a beautiful spring day and the chance to relax and visit with friends, including several officials of his new administration. Eleanor Roosevelt had ridden up with her husband, and the new First Lady hosted a picnic at the Hoover camp. In the afternoon the motorcade headed back to Washington—a trip that would mark a decisive turning point in the historic preservation activities of the federal government, especially the National Park Service.

Interested also in inspecting Shenandoah National Park's high-mountain roadway, then under construction, Roosevelt invited the director of the National Park Service, Horace M. Albright, to join him in the presidential limousine for the return trip. Roosevelt was fascinat-



The President's Cabin at Rapidan Camp, ca. early 1930s. National Park Service photo, courtesy of Shenandoah National Park collections.

ed with the roadway (soon officially designated Skyline Drive)—a winding drive edged in places with low, picturesque guard walls made of rough-cut native stone. Scenic pull-outs provided spectacular views of wooded slopes and rolling farm country in the distance below. During the return to Washington, the president, pleased with the day and in a characteristically ebullient mood, talked at length with Albright about American history and about historic sites, especially those in Virginia and the District of Columbia, topics of great interest to both men.

The visit with Roosevelt was a rare opportunity for the Park Service director, but one he had prepared for. Even before the National Park Service was established as a bureau of the Department of the Interior in 1916, Albright and key members of Congress had envisioned the Park Service taking control of all federal lands set aside for their historical associations. They planned that the Park Service would be in charge of not only ancient southwestern Indian sites managed by the U.S. Forest Service, but also historic areas under the War Department, which oversaw Civil War battlefield parks and other historic sites, including those in the nation's capital. Sites that Albright had *especially* wanted included battlefield parks such as Shiloh, Gettysburg, and Vicksburg; plus the Forest Service's archeological areas in the Southwest. But the 1916 act did not turn these places over to the Park Service. And by 1933, Albright was increasingly certain that such places were not being managed satisfactorily enough to fulfill the American public's desire to see them and gain a better understanding of their history and significance. The Park Service itself was convinced that, given the experience it had gained in historic site management by 1933, it could oversee these

Stone guardrail under construction on Skyline Drive, early 1930s. National Park Service photo, courtesy of Shenandoah National Park collections.



places better than the existing caretakers. As Albright later put it, the National Park Service “coveted” these sites—it wanted them in the national park system.

It soon got them. During the return trip to Washington, Director Albright seized the chance to explain to the president the benefits of turning the supervision of these sites over to the Park Service. Roosevelt gave a surprisingly quick response. Deeply interested in American history and approving of the Park Service’s work at Shenandoah, he suddenly instructed Albright to draft a presidential executive order transferring the coveted areas to National Park Service control. In early June—almost two months to the day after the trip to the Hoover camp in Shenandoah—the president signed the executive order. In July, following further negotiations, he signed a second executive order providing a final list of those sites that were to be transferred, including more than forty historic and archeological sites in addition to a dozen predominantly natural areas. Roosevelt’s orders, which became effective August 10, 1933, decisively placed primary responsibility for federal historic preservation activities in the hands of the National Park Service.¹

By August 1933, the National Park Service had built its public status not on historic preservation, but primarily on its management of a number of large, spectacular national parks mostly in the West. Yellowstone, established in 1872, was the first, followed much later by such majestic parks as Sequoia, Yosemite, and Mount Rainier. These parks gained great renown, becoming geographical symbols of national identity and destination sites for thousands of tourists. The Park Service—much more than its management predecessors in the Department of the Interior—had worked diligently to

attract people to the parks and to educate visitors about the areas’ natural history and special scenic features. To enable the public to see and enjoy the parks, the Park Service’s first director, Stephen T. Mather (Albright’s immediate predecessor) aggressively sought to develop roads, trails, camping areas, tour-bus systems, and many other facilities. Under Mather’s guidance, the parks continued to enjoy enthusiastic support from railroad companies, and then from automobile associations, all interested in promoting tourism to these extraordinarily scenic places.²



President Franklin D. Roosevelt visiting a CCC camp at Shenandoah, August 1933—about four months after his visit to the park with Horace Albright, described in the text. National Park Service photo, courtesy of Shenandoah National Park collections.

Still, the National Park Service's historic preservation responsibilities had become rather extensive even before President Roosevelt signed his executive orders in 1933. By that time, the Park Service was already managing about 20 archeological and historic areas, including Aztec Ruins and Bandelier in New Mexico, Scotts Bluff on the Oregon Trail in western Nebraska, and sites in the town of Sitka in Alaska Territory. Most of these parks had been established as "national monuments," not by Congress, but by presidential proclamation under authority of the 1906 Antiquities Act. Many of them were relatively small, encompassing far less acreage than any of the big scenic parks. With the chief exception of Mesa Verde National Park, the Park Service had paid little attention to these historic and archeological sites, given that many were not overwhelmingly scenic and had remained little-known to the American public. Yet archeological and historical investigations had begun, along with stabilization and restoration work on structures. But these parks had to compete for limited operating and development funds coming from Congress, and the bulk of the funding went to the increasingly popular large national parks that the Park Service had been striving to develop for the public. Building a park system required strong public support, so that parks with greater potential to attract and please visitors tended to receive higher funding. Still, Director Albright believed in the ultimate potential of the smaller national monuments to attract and inform the public. The Park Service would develop those areas when funding became more available.

Among the archeological and historic sites already managed by the Park Service in the West, only one was well on its way to becoming a national attraction. With its awe-inspiring cliff dwellings, Mesa Verde National Park, created by act of Congress in 1906 and located in southwestern Colorado, had gained wide recognition; and the Park Service increased the funding and attention that the park had received since shortly after its establishment. With the development of roads, a campground, museum, and other facilities, plus stabilization of some of the major cliff dwellings, this remote park proved it could draw substantial numbers of visitors.³

Also, the Park Service had become especially interested in acquiring historical parks in the more populous eastern United States. Between 1930 and early 1933, it gained three new parks representing the Colonial era and Revolutionary War: the George Washington Birth-

George Washington Birthplace National Monument, Virginia. National Park Service photo.



place in Virginia, near the Potomac River downstream from Mount Vernon; Colonial National Monument, also in Virginia, which included portions of the 1607 English settlement of Jamestown, as well as Yorktown Battlefield, site of the last major engagement of the Revolutionary War and surrender of the British forces; and Morristown in New Jersey, the Continental Army's wintering quarters in early 1777 and 1779–1780. Already, organizations such as the Association for the Preservation of Virginia Antiquities and the Society for the Preservation of New England Antiquities (established in 1889 and 1910, respectively), had helped nurture a strong interest in places related to the Colonial era and the war against the British. With much of the American public long steeped in Colonial and Revolutionary War lore, the new historical parks provided the Park Service an opportunity to reinforce its preservation efforts by connecting to public patriotism through building greater pride in the nation's past and the founding fathers. The parks would soon become significant tourist destinations. Realizing these possibilities—and wanting to increase political support in the East for the national park system—the Park Service pushed for congressional funding to develop these parks to accommodate the public.⁴

This, then, was the general state of affairs by the spring of 1933, when Director Albright made the return trip from Shenandoah with the president. With an assortment of historical and archeological parks already in the national park system, Roosevelt's 1933 executive orders nearly tripled the number of these kinds of parks under the Park Service's care, bringing the total to more than sixty. Out of the broad sweep of American history, the greatest concentration of new sites in the system was related to the Civil War, including the battlefields that Albright wanted most of all. This gave Civil War history and sites a prominent role in Park Service preservation and interpretation of the American past. In 1933, seventeen years after Congress established the National Park Service primarily to manage large scenic parks, it achieved a goal that Albright in particular had sought since even before the bureau's creation: to gain dominance in federal historic preservation.

Getting very busy

Moreover, the potential for continued growth in the field of historic preservation became evident during the return trip from Shenandoah. Immediately following his instructions to Albright to prepare an executive order, the president switched the conversation to Saratoga Battlefield. Located in his home state of New York and scene of one of the pivotal conflicts of the Revolutionary War, the battlefield had long been of special concern to Roosevelt. Albright, who already had an interest in Saratoga and recognized its potential to become a federally preserved park (some of the lands were already owned by the state of New York), responded by commenting on the battle's importance and previous efforts to establish the area as a historical park. Likely influenced by what he had seen that day and by Albright's encouraging comments, Roosevelt determined that the battlefield should be under National Park Service supervision. The president flashed his famous smile and told Albright to "get busy" on the Saratoga idea, adding, as Albright later recalled, "Suppose you do something tomorrow about this."⁵

Through the decades, many more opportunities would arise for the Park Service to "get busy" and add other historic and archeological areas to the national park system. But prob-

Saratoga National Historical Park, New York. National Park Service photo.



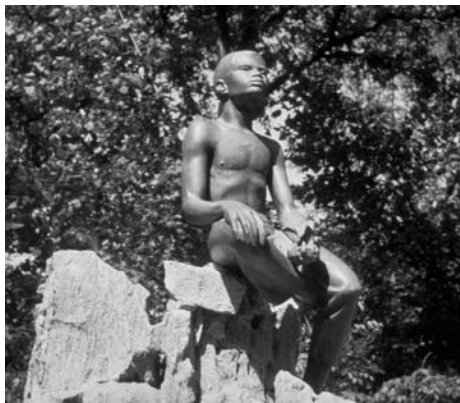
ably few, if any, such opportunities came about as a result of the kind of enthusiastic spontaneity displayed by Roosevelt on the return from Shenandoah. The Park Service would resist many proposals for new historical parks, declaring them unsuitable; still, it steadily and selectively sought expansion of its historic preservation responsibilities, which would grow significantly over the years.

Prominent among the kinds of sites added to the national park system in the decades *after* 1933 were presidential homes, such as Theodore Roosevelt's Sagamore Hill estate on Long Island; the Abraham Lincoln home in Springfield, Illinois; and the Dwight D. Eisenhower farm, adjacent to Gettysburg Battlefield. Also, Franklin Roosevelt himself donated his home near Hyde Park, New York, to the American public, to be cared for by the National Park Service. More parks associated with the Revolutionary War and early nation-building came into the system, including Independence Hall in Philadelphia, where, among other events, the Declaration of Independence and, later, the Constitution were debated and drawn up; and Valley Forge near Philadelphia, the revered site of the 1777–1778 winter encampment of Washington's Continental Army. Civil War sites that came into the system after 1933 included Fort Sumter in the Charleston Harbor, where the war began in 1861; Manassas Battlefield in Virginia, scene of major Confederate victories in 1861 and 1862; and Andersonville, the infamous military prison in Georgia. And as more memorials were built on the National Mall in Washington, D.C.—for instance, the Thomas Jefferson, Vietnam Veterans, and World War II memorials—they also came under National Park Service management.

Many parks relating to ancient American history were added. These included Cape Krusenstern, an area of about 650,000 acres on the northwest Alaskan coast, containing thousands of archeological sites, mainly Inuit and representing 4,000 years of occupation; the Ocmulgee mounds in Georgia; and Pipestone in southwestern Minnesota, the site of early (and still active) Indian quarries for stone used for pipe-making. Congress has also established sites relating to controversial aspects of American history, such as Washita Battlefield in western Oklahoma, where in 1868 the Seventh U.S. Cavalry led by Lieutenant Colonel George Armstrong Custer attacked and overwhelmed a Cheyenne village under Chief Black Kettle. European American expansion and settlement—and encroachment onto

Indian lands—has been represented in the national park system by less controversial places such as Cumberland Gap in the Southern Appalachians, long-distance emigration and trade routes like the Oregon Trail and Santa Fe Trail, and sites reflecting early Spanish activities, including several early missions in San Antonio, Texas, and a site on Florida's west coast commemorating the explorer Hernando De Soto.⁶

Only in 1943 did the first site specifically representing African American history come into the system: George Washington Carver National Monument in southwestern Missouri, honoring the distinguished scientist and teacher and including his birthplace, childhood home, and family cemetery. In the mid-1950s, the Virginia farm on which the great educator and orator Booker T. Washington was born into slavery and spent his boyhood was added to the system. By the late 20th century, Congress was open to establishing deeply controversial African American historic sites involving recent and, at times, violent conflicts over Civil Rights issues, such as Central High School in Little Rock, Arkansas, where, in 1957, nine black children aided by the United States Army finally integrated the school; and a historic trail to commemorate the march from Selma to Montgomery, Alabama, which helped bring about the Voting Rights Act of 1965. The national park system includes other places involving Civil Rights history, such as Manzanar in southeastern California and Minidoka in southern Idaho, where during World War II American citizens of Japanese descent were incarcerated.



George Washington Carver National Monument, Missouri. National Park Service photo.

The expansion of the park system in Alaska in 1978 and 1980 brought in a number of huge national parks and preserves such as Wrangell–St. Elias and Yukon–Charley Rivers, most of which are frequently thought of as scenic natural areas in the traditional sense. Yet Bering Land Bridge National Preserve helps commemorate where humans first immigrated from Asia, and Cape Krusenstern was included in this expansion because of its vast array of archeological sites. Most important, however, with these Alaskan additions the National Park

Service has practiced not only the more typical kinds of historic preservation, but also the protection of living cultures on a scale unmatched in any other areas within the national park system. This especially includes subsistence practices, such as the regular harvesting of native animals and plants of value to Alaskan cultures. These practices, which are in accord with the views of Native Alaskans and in line with congressional legislation, greatly contributed to the expansion of the concept and meaning of cultural resource preservation. As well, they contributed to a growing awareness of the interrelationships of nature and culture in park management.⁷

Especially in the latter decades of the 20th century, the American history profession moved away from concentrating on great men and great events toward social and cultural his-

tory that no longer ignored the lives of salt-of-the-earth Americans—a trend that in turn influenced the types of sites that came into the national park system, such as Selma to Montgomery and Minidoka. In seeking to broaden the context for interpreting the American past, the Park Service also became involved with diverse kinds of historical themes, such as the industrial mills in Lowell, Massachusetts, with their labor forces of women; the World War II home front as represented by Rosie the Riveter national historical park in the San Francisco Bay area; and the history and culture of the Nez Perce Indians in the northern Rocky Mountains and nearby lands to the east and west.

Similarly, the Park Service has served as a catalyst for the cooperative establishment of national heritage areas—extensive and generally privately owned landscapes where the natural and built environments together reflect traditional American lifeways, and where present-day communities set direction for their own conservation and tourism efforts. For instance,

the Cane River National Heritage Area features Creole and other southern cultures in a rural Louisiana setting, while the Lackawanna Valley area in northeastern Pennsylvania reveals the history and culture of a coal mining and industrial region. Such new kinds of areas involving cultural and social history have helped advance another Park Service trend that has affected most areas of the nation-



Lowell National Historical Park, Massachusetts. National Park Service photo.

al park system: the complex array of creative “partnerships” that connect the bureau with supportive organizations and interested individuals to further park preservation, protection, and interpretation.

In the approximately seven decades between 1933 and today, the number of predominantly historic areas in the national park system increased to about 230—a total, and a diversity, of places surely far beyond what Roosevelt or Albright envisioned. Furthermore, Congress, especially through laws passed in 1935 and 1966, greatly strengthened America’s historic preservation endeavors inside and outside the national park system. Through the National Register of Historic Places and its allied programs, these laws precipitated a multitude of working relationships on behalf of preservation within the private sector and among local, state, tribal, national, and territorial governments. This extensive nationwide effort to enhance historic preservation came to involve millions of private citizens.

The varied National Register programs brought about greater Park Service awareness of sites situated *within* parks and monuments but not previously designated officially as being

historically significant and worthy of preservation. The historic Shiloh National Military Park, for instance, includes many ancient Indian mounds, some very large. Also, large numbers of historic and archeological sites have been identified for preservation in such big natural parks as Grand Canyon, Everglades, Shenandoah, and Gates of the Arctic. And 20th-century historic structures have been preserved, including the Old Faithful Inn in Yellowstone, a number of architecturally significant buildings along Grand Canyon's South Rim (such as El Tovar Hotel), plus dozens of Civilian Conservation Corps (CCC) structures from the New Deal era that grace parks and monuments across the country.⁸

Reflections

One way to think about historic preservation at a national level is to compare it with preservation at a personal level. For example, the rationale used in selecting historic sites to be included in the national park system may be thought of as somewhat like overseeing the disposition of a very large family estate; that is, sorting through a massive array of belongings and deciding what meanings they have and what to do with them. A family may consider the house, the furnishings, the personal items, the outbuildings, and the surrounding landscape—the gardens, farmlands, and woodlots—and determine what has special ties to family history and ancestors and what does not, what has artistic or architectural value and what does not, what evokes familial sentiment and pride and what does not, and so forth.

Ultimately this results in decisions on what to part with and what to keep and care for—what will be preserved for the family, and what will be sold or given away. But this becomes quite complex. The grandmother's writing desk will be kept, as well as the great-great-grandfather's military sword. But, if the lands are sold, what would happen to the ancient burial mounds on the ridge above the creek, or to the familiar landscapes—the gardens, farmlands, and woodlots—or to the dwellings, tools, and personal items used by house servants and those who (whether free or slave) worked the family fields? For the National Park Service, the great diversity of the American "family" and its material culture has resulted in the heritage of many different social and ethnic groups becoming increasingly important to a federal entity that only gradually awakened to the concept of preserving places reflecting stories of all the people.

Under such changing perceptions, the large number of historic and archeological sites brought into the national park system reflect decisions made through the decades by Congress and/or the president that these places have exceptional value for the nation as a whole. They have thus been given special protection: shielded from the vagaries and fluctuations of the open market by being officially set aside to be preserved and to enhance public appreciation and understanding of their significance.

Generally speaking, historic preservation begins when the perception of historical significance starts to influence the treatment of a place. The past may even become the central point of reference, as an earlier time and an earlier use or activity assume importance in determining present-day treatment of a site deemed to be historic. Those in charge may merely think twice before bulldozing the site; or, past events may be perceived as being so deeply meaningful that the places where they occurred cannot be ignored. In effect, they *compel* some form of commemorative affirmation. People may invoke elaborate commemorative rit-

uals, including preservation and interpretation, to affirm the importance of an era or a moment of the past.

A historic event or activity is itself of primary importance. Yet the place where it happened assumes significance through association, by having been the stage upon which important events, activities, or trends took place. People involved in a historic activity may move on, but the site remains, its importance sooner or later elevated above the ordinary. The site may have been there for years or many centuries in a stable or changing condition, yet what may also change is how it is perceived and regarded. Whether suddenly or gradually, a historic site emerges from the commonplace, assuming values beyond ordinary landscapes or real estate. A transition occurs—historical qualities are now perceived.

Once a site is formally set aside to be preserved, it may be assumed that alterations to the site are made in an informed and cautious way, with particular concern for the special historical values present and recognized. Perhaps a large majority of site, structural, and object alterations are intended to enhance the public's ability to get to, enjoy, and understand a park. Such changes to historic places almost always bring into greater focus the ever-present tension between preservation and use. Here, questions of historical authenticity and integrity become critical issues. Further complicating matters, perceptions of a site's historical values can change over time. But in the best of worlds, historic and archeological sites are treated not only as compelling landmarks of the past, but also as reservoirs of evidence regarding questions that the present generation may not be asking.

The perception of history is like the view through a broken camera lens: images of the past are blurred and can never be brought into perfect focus. No matter who is in charge of a site, objectivity remains elusive. Whether a site is perceived as merely historic or as truly hallowed ground, the perception is likely to be influenced by factors such as nationalism, localism, ethnocentricity, racism, social class, and reverential ancestral pride. Hallowedness is in the eye of the beholder—and in most cases so is historical significance.

The multitude of activities and programs that have been undertaken within the national park system to commemorate the American past reflect such complex cross-currents of perceptions and values. Yet the historical qualities of those places selected to be set aside for preservation are validated with, in effect, an official stamp of approval. In preserving significant places throughout the country and explaining their meanings, the National Park Service has been an "official voice" for American history, ancient and modern. Through its management of historic and archeological areas, the Park Service calls attention to, commemorates, and perpetuates public remembrance of selected aspects of American history as represented by specific sites. Preservation of such places comes about through political processes, and sometimes within a context of sharply divergent, conflicting perceptions, many very strongly held, and, at times, angrily voiced.

Commemoration and tourism are closely linked at publicly preserved historic sites, as the public supports these places of remembrance not only through preservation, but also by *going there* to see and understand. Once historic places are set aside, serious controversies can arise over how to care for them and present, or interpret, them to the public. Such matters have been debated and hammered out many, many times by groups or individuals of one persuasion or another within the National Park Service's bureaucratic structure. And the

Park Service is very frequently pressured by external voices, both local and national, themselves often at odds. The preservation world within which the Park Service operates is rarely, if ever, monolithic. As well, neither the establishment nor the management of historic sites always results from fully rational processes. The national park system reflects, by and large, the perceptions and proclivities of those who have held influence and authority through the decades, both inside and outside the Park Service—but who typically keep a close watch on the shifting interests and perceptions of the American public, to whom many owe their influence and authority.

Generally shadowing the primary narratives of the American story, the history of historic preservation many times begins, in a sense, “after history”: an after-the-fact looking back at significant events and people that is focused on specific associated places designated to be preserved and interpreted. (Places connected to living cultures and lifeways represent, in some respects, an exception to this.) Collectively within the national park system, this looking back forms a great national retrospective; and public fascination with the scenes of exceptional events—the places where they happened—can endure remarkably well. Many National Park Service sites associated with personalities, events, or activities of surpassing interest or significance (the “iconic” sites) have themselves become celebrated—launched into the legendary and mythological realms of the great American historical narrative. There many of them remain today, alive and well.⁹

Hallowed ground and conflicting perceptions

As an example, the Little Bighorn Battlefield—where in late June 1876 the Lakota Sioux and Northern Cheyenne overwhelmingly defeated Lieutenant Colonel Custer’s Seventh U.S. Cavalry—became a celebrated shrine to the defeated commander and his troops. There, on the high and lonesome plains of southeastern Montana Territory, a wooden memorial to the fallen soldiers was erected in 1879, then replaced in 1881 by a granite obelisk, sculpted in Massachusetts and shipped across country. At first, a square mile of the battlefield was designated a national cemetery (an official military burial ground), but later a much smaller national cemetery was established not far from the obelisk, and the overall site became commonly known as Custer Battlefield. It was cared for by the War Department until transferred to the National Park Service in 1940. Under the Park Service, interpretation at the battlefield continued to enshrine Custer and his men, helping to perpetuate an almost religious reverence not only for Custer, but also for the place—the battlefield itself, the sacred ground.

Historic sites at times project messages and values that trigger deeply passionate feelings, and bring about sharp conflict among those holding different perceptions of the past. In the last decades of the 20th century, determined American Indian groups sparked a move to shift the focus at Custer Battlefield National Monument toward full inclusion of the Indian story—the story of all those who fought and died there. This effort reflected the more expansive and inclusive perspectives on American history that emerged in the late 20th century. The situation at the battlefield turned belligerent on occasion, with angry confrontations between opposing factions. Indeed, threats were made to park staff who supported plans to abandon the long-time park name that honored Custer and to erect a memorial to all Indians who participated in the battle. The proposal to change the name to Little Bighorn Battlefield



Little Bighorn Battlefield National Monument, Montana.

became the most contested issue of all, but ultimately proponents for both the name change and the Indian memorial prevailed. Surely these high-publicity events and their resolution helped intensify and perpetuate the controversy and celebrity of the battlefield.

The Little Bighorn's enduring fame and celebrity stem in large part from the fact that it has offered something for everyone—Indians and non-Indians, scholars and non-scholars, adults and children. As drama and as theater, the battle provides endless fascination; as historic incident, it provokes endless inquiry, speculation, and controversy. The battle's symbolic aspects remain powerful even today. For many, the battle rages on. Each generation has found itself part of this historic pageant, this great retrospective. And now our own generation has its participants, its actors in the play—in the enduring drama of remembrance.

The battlefield has served, in effect, as a public stage for an exceptionally rich and varied pageant of commemorative history—an extended, ongoing response to the brief, furious conflict that occurred there. Preserving the battlefield—the sacred ground—allowed the site to fulfill its role as a shrine, rather than being just another tract of high-plains grasslands. From around the world, pilgrims and the curious continue to trek to this celebrated focal point of the Little Bighorn legend—the place where it happened, the one spot on the planet where this historic encounter can be recalled most vividly.¹⁰

The Little Bighorn Battlefield, where commemoration began shortly after the 1876 battle and has been overseen by the National Park Service since 1940, is only one of many historic and archeological places across the country where the bureau has faced controversial issues. Those who, in effect, “pick up the pieces” in the aftermath of history—who preserve the places where history occurred; examine and re-examine historic events, personalities and trends; and infuse them into the public mind—themselves become a part of history. So it has been with the Park Service in its preservation and interpretation of historic and archeological sites. By perpetuating memory of the historic past, the National Park Service has nur-

tured, sustained—and become part of—an ongoing commemorative history that reaches far back in time and extends throughout the United States and its territories.

Notes on terminology

Because of its early and long-standing usage, the term “historic preservation” is most frequently used in this essay. As well, the terms “history” and “historic” are often used in a generic sense, referring to ancient and/or more recent times. Only by about the early 1970s did the term “cultural resources management” come into general use. As increasingly diverse new areas were brought into the national park system owing to their importance in American history, archeology, ethnography, and related fields, these areas (and the older historic and archeological sites as well) would come to be generally referred to as “cultural” parks—an appropriately broad designation, inclusive of the varied aspects of the American story by then being addressed by the National Park Service. Significant structures, objects, landscapes, gardens, archeological remains, etc., within each park would become known as “cultural resources.” Also, the word “park” is often used here in a generic way, whether or not the official designation of the site being discussed is “national park,” “national monument,” “national historical park,” “national historic site,” or any other of the more than two dozen such designations now used in the national park system.

Acknowledgments

The author is grateful to the many individuals who supported this work during its preparation.

Endnotes

1. The epigraph is from Horace M. Albright, *Origins of National Park Service Administration of Historic Sites* (Philadelphia: Eastern National Park and Monument Association, 1971), 21.

Land purchasing in Shenandoah National Park was still underway in 1933. In the late 1920s, President Hoover had bought the 164-acre fishing camp site, which, along with the buildings, he donated to the park after leaving office. Aware of increasing interest in a scenic mountain roadway in Shenandoah, and responding to the national financial stress of the early Depression years, Hoover had authorized the roadway along the mountainous “spine” of the newly created Shenandoah National Park and insisted that it be built using unemployed local workers. He had not, however, been able to persuade Congress to grant him full presidential authority (that is, without having to get further congressional approval) to reorganize the Executive Branch of the government for purposes of greater efficiency. Only in March 1933, at the close of his administration, did Hoover get a chance to sign legislation providing presidential authority for reorganization—which Roosevelt soon used to transfer the archeological and historic areas to the National Park Service.

Roosevelt and Albright had met several times, including at private parties in Washington when Roosevelt was Assistant Secretary of the Navy. The president eventually chose a site in the Catoctin Mountains of northern Maryland for his retreat, which he named Shangri-la, and which President Dwight D. Eisenhower would rename Camp David.

Discussions of Albright's goals, his trip with President Roosevelt, and the follow-up to Roosevelt's decision are found in Albright, *Origins of National Park Service Administration of Historic Sites*, 1–24, see especially 17–22; Horace M. Albright as told to Robert Cahn, *The Birth of the National Park Service: The Founding Years, 1913–33* (Salt Lake City: Howe Brothers, 1985), 238–239, 265–268, 285–297; Darwin Lambert, “Shenandoah National Park, Administrative History, 1924–1976” (Philadelphia: National Park Service, 1979, typescript), 83–84, 99–100; John Ise, *Our National Park Policy: A Critical History* (Baltimore: The Johns Hopkins Press, 1961), 352–353; Horace M. Albright and Marian Albright Schenck, *Creating the National Park Service: The Missing Years* (Norman: University of Oklahoma Press, 1999), 23. For pertinent text from Roosevelt's executive orders (nos. 6166 of June 10, 1933, and 6228 of July 28, 1933), see Lary M. Dilsaver, *America's National Park System: The Critical Documents* (Lanham, Maryland: Rowman and Littlefield, 1994), 116–121.

2. Richard West Sellars, *Preserving Nature in the National Parks: A History* (New Haven: Yale University Press, 1997), 7–90; Alfred Runte, *Trains of Discovery: Western Railroads and the National Parks* (1984; rev. ed., Niwot Colorado: Roberts Rinehart, 1990), 1–82 (a beautifully illustrated book); Alfred Runte, *National Parks: The American Experience* (1979; rev. ed., Lincoln: University of Nebraska Press, 1987), 65–105; see also Runte's discussion of national parks and America's “cultural nationalism,” 11–32.

3. National Park Service, *The National Parks: Shaping the System* (Washington, D.C.: National Park Service, rev. ed., 2005), 12–43; Hal Rothman, *America's National Monuments: The Politics of Preservation* (Lawrence: University Press of Kansas: 2000; originally published as *Preserving Different Pasts: The American National Monuments*, Urbana and Chicago: University of Illinois Press, 1989), 127–131, 197; Ricardo Torres-Reyes, *Mesa Verde National Park: An Administrative History* (Washington, D.C.: National Park Service, 1970), 125–149, 196. Even earlier than at Mesa Verde, development and stabilization work (overseen by the Department of the Interior's General Land Office) began at Casa Grande Ruin Reservation (now Casa Grande Ruins National Monument), in south-central Arizona Territory. Rothman, *America's National Monuments*, 12, 109.

4. Barry Mackintosh, “The National Park Service and Cultural Resources,” *CRM* (vol. 22, no. 4, 1999), 41–42; National Park Service, *Shaping the System* 21; Albright, *Origins of National Park Service Administration of Historic Sites*, 14–17; Albright and Cahn, *Birth of the National Park Service*, 249, 252.

5. Albright, *Origins of National Park Service Administration of Historic Sites*, 21; Albright and Cahn, *Birth of the National Park Service*, 296–297.

6. National Park Service, *Shaping the System*, 44–61; and Mackintosh, “The National Park Service and Cultural Resources,” 42–44. The Hyde Park estate came under National Park Service administration not long after Roosevelt's death in 1945. Charles B. Hosmer, Jr., *Preservation Comes of Age: From Williamsburg to the National Trust, 1926–1949* (Charlottesville: University Press of Virginia, 1981), vol. II, 758–767.

7. G. Frank Willis, *The National Park Service and the Alaska National Interest Lands Conservation Act of 1980* (1985; rev. ed., Anchorage: National Park Service, 2005), 50–57, 130–138.

8. See: Laura Soullière Harrison, *Architecture in the Parks: National Historic Landmark Theme Study* (Washington, D.C., National Park Service, 1986), 1–19; William C. Tweed, Laura Soullière, and Henry G. Law, “National Park Service Rustic Architecture” (San Francisco: National Park Service Western Regional Office, 1977, typescript).

9. Richard West Sellars, “Why Take a Trip to Bountiful—Won’t Anaheim Do?,” *Landscape*, (vol. 30, no. 3, 1990), 14–18; Richard West Sellars, “Custer at the Little Bighorn: The Great Retrospective,” *History News* (vol. 44, no. 5, September–October 1989), 11–12.

10. Jerome A. Greene, “Stricken Field: Little Bighorn, 1876–2003” (unpublished manuscript, January 2005, copy courtesy of the author), 162–163, 267–269, 274–293; Edward Tabor Linenthal, *Sacred Ground: Americans and Their Battlefields* (Urbana and Chicago: University of Illinois Press, 1991), 127–171; Robert M. Utley, *Custer and Me: A Historian’s Memoir* (Norman: University of Oklahoma Press, 2004), 203–205, 210–213; Robert M. Utley, “Whose Shrine Is It?: The Ideological Struggle for Custer Battlefield,” *Montana: The Magazine of Western History* (vol. 42, no. 1, winter 1992), 70–74; Don Rickey, Jr., “Myth to Monument: The Establishment of Custer Battlefield National Monument,” *Journal of the West* (vol. 7, April 1968), 209–216; Sellars, “Custer at the Little Bighorn,” 11–12, 33; Sellars, “Why Take a Trip to Bountiful—Won’t Anaheim Do?,” 14–18.

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Glacier National Park and Its Neighbors: A Twenty-Year Assessment of Regional Resource Management

Joseph L. Sax and Robert B. Keiter

Introduction

THIS ARTICLE IS A SUMMARY UPDATE of our mid-1980s study of external threats to Glacier National Park (Sax and Keiter 1987). In 1980, the National Park Service's *State of the Parks Report* identified Glacier as the most threatened major park unit, detailing an assortment of energy exploration, timber harvesting, road construction, and other development activities emanating from adjacent federal and private lands that potentially imperiled the park's ecological integrity (National Park Service 1980). With the passage of twenty years and the emergence of new ecological management concepts, we returned to Glacier to assess how the park has fared over the intervening years and the progress it has achieved in integrating the park into a larger regional management agenda.

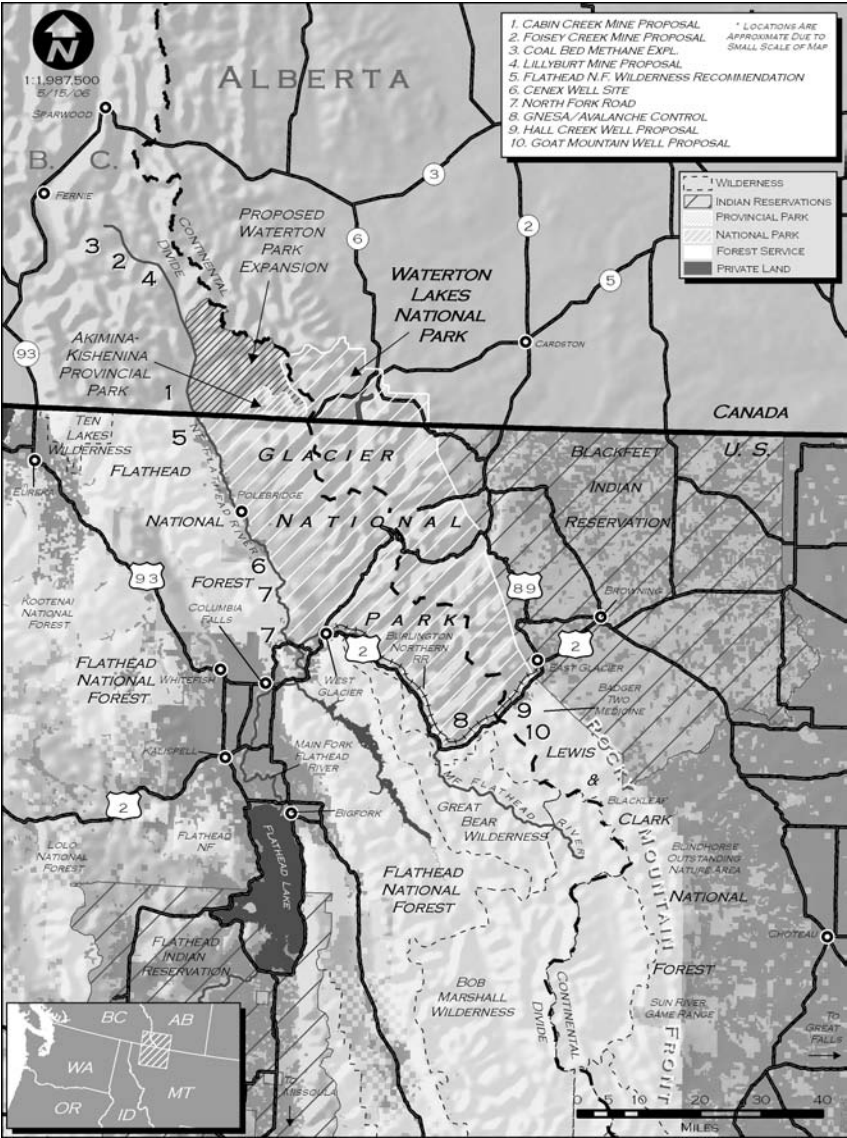
External threats have been a persistent problem for the National Park Service (Sax 1976; Keiter 1985; U.S. General Accounting Office 1987, 1994; Freemuth 1991; National Parks and Conservation Association 1992). Once viewed as isolated enclaves, even the most remote national parks must now regularly contend with recurrent development proposals and related environmental pressures on their borders. We discovered in our earlier study that the Park Service rarely availed itself of legal remedies that it might invoke to protect park resources, and that Glacier officials were also reluctant to speak out forcefully against development proposals. They often relied on others, in particular environmental advocates, to do much of the heavy lifting for them in protecting park resources, while depending on the park's status as a "sacred cow" to ward off the most serious threats. Very little has changed in that regard.

Glacier provides an ideal setting to study the external threats problem. Like many parks, it was established primarily for its spectacular scenery and abundant wildlife in a pre-ecological era with little regard for such natural features as watersheds or wildlife habitat. As reflected in the following figure, the park is bordered by an assortment of neighbors: two national forests, the Blackfeet Indian Reservation, two Canadian provinces, a sister national park in Canada (Waterton Lakes), and various private landholdings. The region also features two designated wild and scenic rivers, a major east-west highway and railroad line, several wilderness areas, and various federally protected threatened and endangered species, most notably the grizzly bear. This leaves Glacier as an island amid a vastly larger ecological region

that encompasses the North Fork watershed, the Rocky Mountain Front, and internationally significant wildlife habitat extending outward from its borders in every direction.

Glacier still confronts several of the same problems it faced twenty years ago. Our earlier study focused on four potential threats: timber harvesting and energy exploration in the Flathead National Forest; a road paving proposal that would facilitate access into the park's remote northwestern corner; a highly contentious Canadian coal mine proposal in the North Fork watershed; and energy development proposals pending in the Lewis and Clark Na-

Figure 1. The Glacier National Park Region. © University of Utah Department of Geography DIGIT Lab.



tional Forest on the park's southeastern flank in an area known as the Badger-Two Medicine, where the Blackfeet claim treaty access rights. This study revisited these issues and examined several new ones as well, including new energy development proposals in the Canadian Flathead, escalating private land development in the Flathead Valley, and motorized recreation in the national forests (Jamison 2005a).

Our central concern was to determine whether ecologically rational management—embracing actual wildlife habitat and watersheds rather than formal territorial boundary lines—has become a reality in the extraordinarily resource-rich Glacier region. We begin by noting changes over the past two decades in federal agency management policies and personnel, as well as in the demographics and economy of the region. We then use case studies to examine in detail the key external issues confronting the park—namely, timber harvesting in the Flathead National Forest, private land development in the Flathead Valley, energy exploration in the Lewis and Clark National Forest, and energy development proposals in the Canadian Flathead—and observe how these issues have fostered a new, though incomplete, regionalism. We conclude by noting that the past several decades have generated a good deal of progress toward environmentally driven regional land management, by explaining how this has been occurring in one place, and by offering some broader park resource protection strategic observations.

Glacier revisited

Since our prior study, Congress has not altered the basic statutory framework governing the Park Service and Forest Service. The National Park Service [Organic] Act, Multiple Use-Sustained Yield Act, National Forest Management Act (NFMA), National Environmental Policy Act (NEPA), and the Endangered Species Act (ESA) are all intact, even as controversy has swirled around several of these laws. Newer laws, like the National Parks Omnibus Management Act, the National Parks Air Tour Management Act, and the Healthy Forests Restoration Act of 2003 (HFRA) have altered but not fundamentally changed the legal landscape.

Of much greater potential import are developments emanating from the agencies themselves. Most notably, during the 1990s the Clinton administration embraced the ecosystem management concept as it sought to shift federal natural resource policy toward landscape-scale planning and biodiversity conservation (Szaro et al. 1998; Thomas and Ruggiero 1998). The Forest Service responded by making fundamental changes to its NFMA planning rules, giving priority to ecological sustainability for policy purposes (Hoberg 2004), and undertaking several landscape-scale planning initiatives (Keiter 2003). Notwithstanding the Bush administration's quite different policy priorities (Scarlett et al. 2004), the result has been a dramatic reduction in emphasis on timber production, a new commitment to ecosystem management principles, and a significant restructuring of the agency's workforce toward greater disciplinary diversity.

Although changes within the Park Service have not been as extensive, the agency has revised its basic management policies document to instruct park managers to "use all available tools to protect park resources and values from unacceptable impacts," to "encourage compatible adjacent land uses," and to work cooperatively with neighbors to mitigate potential unacceptable impacts (National Park Service 2006). These provisions legitimize, even



The Garden Wall, an arête separating Lake McDonald Valley from Many Glacier Valley, is one of the park's prominent geological features. Photo courtesy of Glacier National Park.

oblige, the involvement of national parks, like Glacier, in issues beyond their borders. But they do not give park officials any new powers that extend beyond park boundaries.

At Glacier itself, change began in the late 1980s, when Superintendent Gil Lusk—described by one employee as a “new paradigm manager”—said, “let’s get off the island.” Lusk issued a striking management strategy document that called for a proactive approach to both external and internal park threats, including “[p]articipat[ion] in other planning processes in the region that have an effect on Glacier ... and expansion of our review and comment on other agency plans” (U.S. Department of the Interior 1987). He also hired a new ecosystem coordinator, who proceeded to conceive a “Crown of the Continent” regional initiative. Moreover, Glacier has revised its general management plan and resolved “to manage most of the park for its wild character and for the integrity of Glacier’s unique natural heritage” (U.S. Department of the Interior 1999). Though focused primarily on internal park issues, the plan has a strong ecosystem flavor, highlighting Glacier’s special designations—the world’s first international peace park, a World Heritage site, and an international biosphere reserve—as well as its role “at the core of the ‘Crown of the Continent’ ecosystem, one of the most ecologically intact areas remaining in the temperate regions of the world.”

There have also been significant changes outside the park. On the neighboring national forests, timber and energy development have seemingly receded in importance while off-road vehicle (ORV) management has become more troublesome. Perhaps the most notable change, however, has been the flood of new residents and corresponding development pressures, primarily in the Flathead Valley between the park and Kalispell. And across the international border, the Canadian Flathead is again facing intense mining and energy development pressures driven by international market forces and local economic pressures.

The Flathead National Forest

Glacier's westernmost neighbor—the Flathead National Forest—provides a dramatic example of transition away from traditional conflict among adjacent federal enclaves and toward a more ecologically managed area. When we visited in 1986, the Flathead projected massive timber sales and was intent on issuing oil and gas leases to promote energy exploration, some in the North Fork area adjacent to the park. It had also supported paving the North Fork to enable access into that remote region. While the Flathead supervisor was willing to consider Glacier's concerns, managerial discretion was the forest's primary *modus operandi*.

Though developmental issues are not entirely off the table today, management of the Flathead forest has continued to evolve in a way that benefits the park. Such changes, however, are attributable more to hard-edged legal standards, third-party watchdogs, and local socioeconomic trends than to any concerted strategy pursued by park or forest officials. Regardless, park and forest officials both report that their mutual relations are cordial today, though they each are still quite conscious of their separate mandates. And the two agencies do not always reinforce each other, as reflected in the Forest Service's non-involvement in cross-border Canadian energy development issues and local private land development issues.

The most notable change in the Flathead over the past twenty years has been a major reduction in its timber program. As a result of steady ESA litigation pressures related to the grizzly bear (see, e.g., *Resources Limited v. Robertson*, 35 F.3d 1300 (9th Cir. 1994)), the Flathead has cut its timber harvest levels from 100 million board-feet (mbf) annually to 54 mbf, reduced the forest's road density by 15% (from 1,900 to 1,600 miles), and adopted old-growth timber cutting limitations (U.S. Forest Service 1995, 1999). Despite concerns about possible ESA "delisting" of the Northern Continental Divide grizzly bear population, this appears unlikely at the present time, which means these restrictions will remain in place. Moreover, several new local species, including the Canadian lynx and bull trout, have been added to the endangered species list and will also affect future forest management decisions.

Protection of the remote North Fork region continues to be a major concern for Glacier managers. But when a troublesome North Fork road paving proposal resurfaced a few years ago, the park remained silent (unlike its active opposition twenty years earlier) as did the Forest Service (thus altering its earlier supportive stand). The proposal has died for now due to lack of funds. Since finding themselves enjoined from oil and gas leasing during the 1980s by a court order (*Conner v. Burford*, 848 F.2d 1441 (9th Cir. 1988)), Flathead officials have taken no further action to facilitate energy exploration in the North Fork or elsewhere on the forest. Although a contentious exploratory well was drilled on private North Fork lands adjacent to the park during the late 1980s, it was a dry hole, which has apparently discouraged any renewed interest in the area. Moreover, the Flathead's recent forest plan revisions recommend a new wilderness designation adjacent to the park in the North Fork region (U.S. Forest Service 2006). But this does not relieve forest officials from the need to deal with the burgeoning ORV activity in the area.

South of Glacier in the Highway 2—railroad corridor, the two agencies have joined with Burlington Northern railroad and others to form the Great Northern Environmental Stewardship Area (GNESA) partnership. In an effort to reduce accidents between trains and griz-

zly bears and thus avoid potential ESA section 9 “take” liability, GNEA is engaged in developing an ESA-based habitat conservation plan (U.S. Fish and Wildlife Service 2005). Although Burlington Northern has limited the train management options on the table, Glacier officials speak positively of this initiative. A related Park Service environmental impact statement (EIS) process to address avalanche control for the railroad tracks will be a real test of this relationship, given Burlington Northern’s support for firing artillery shells onto park mountainsides to control the avalanche danger (Jamison 2006).

Private lands in the Flathead Valley

For many decades, Glacier, like other older western national parks, was insulated from the common problems of urbanization by its isolation and by the region’s sparse population. That is no longer true. Flathead County, which lies just west of Glacier, has experienced an extraordinary rate of growth. Its population increased 26% between 1990 and 2000, and another 9% from 2000 to 2004. Although the majority of that increase has occurred farther out in the Flathead Valley, there is residential development close to the western border of the park, along the North and Middle Forks of the Flathead River, and in the corridor between West Glacier and Columbia Falls. Some of that development has impacted prime winter range just beyond the park’s border.

From the park’s perspective, the new residents and improved roadways are a mixed blessing. Overwhelmingly, those who move to the area these days do so because of the aesthetic and recreational benefits that Glacier and its surroundings provide. These newcomers generally do not depend on the traditional commodity uses of the region’s public lands, which makes them compatible neighbors for the park. At the same time, they resist having anyone tell them what they can or cannot do with their land.

The political situation in the Flathead Valley is in flux, and the local public’s willingness to accept managed growth remains uncertain. During the 1990s, the county was a cauldron of heated conflict over land use controls, triggered initially by a property rights-based revolt against a proposed county master plan that contained progressive new open space protections (Williams 1994; Ring 2003). The atmosphere, according to one pollster, was “as hostile a political environment for conservation that he [had] ever encountered.” While the situation is still uncertain, the extreme tensions of the past decade have begun to give way to a more conciliatory approach and to increased public willingness to address the problems presented by growth.

As importantly, pursuant to state law, the county was obliged to revise its master plan and adopt a growth policy by late 2006. Though still a work in progress, the guiding “vision” is to “properly manage and protect the natural and human environment” and to “preserve the rights of private property owners” (Flathead County Planning & Zoning Office 2006). But thus far, most of



New construction in a subdivision in the foothills north of Whitefish, Montana, west of the national park. The area was formerly transitional habitat for grizzly bear. Photo courtesy of Steve Thompson.

the county's growth control initiatives have been limited, involving issues like traffic congestion and drinking water quality—matters that directly affect the residents' lifestyle and convenience—as contrasted with land use controls designed to accommodate wildlife needs. Not surprisingly, Glacier officials have played little role in this ongoing debate. Even the progressive county commissioner who we interviewed displayed little interest in engaging park officials in the dialogue or in protecting the park, which he thought was big enough to absorb peripheral development.

It is still too early to say whether success will reward this moderate approach to local land use control. While there have been a number of positive developments in the last several years, the critical and unresolved question is whether the “soft” approach, without the iron fist of legal coercion in the background, can do the job.

The Lewis and Clark National Forest

Twenty years ago, oil and gas development in the Badger-Two Medicine area of the Lewis and Clark National Forest appeared as the most immediate and most potentially damaging domestic external threat that Glacier faced. Despite ongoing litigation and Blackfeet tribal ambivalence, we observed that “[p]ark officials now are reconciled ... to ... exploratory drilling ... [and] rest their hope on the chance that commercial quantities of oil and gas will not be discovered in environmentally critical areas.” Two decades later, however, things could hardly look more different. There has still been no exploratory drilling in the Badger-Two Medicine area, the major oil companies that held leases there have effectively left the area, the Blackfeet now “strongly object to any development in ... the Rocky Mountain Front (St. Goddard 2004),” and the Bush administration has suspended further leasing or exploration along the entire Front.

Unlike the situation twenty years ago, it is generally understood today that the Front area is unlikely to be richly rewarding for hydrocarbon production. Yet for over a decade, despite organized opposition and successful administrative appeals, the Forest Service three times approved an exploratory well at the Hall Creek site, largely ignoring critical comments from Glacier officials. But the Forest Service could not ignore opposition from the Blackfeet tribe, which claimed treaty-based access rights to the Badger-Two Medicine area. At about the same time, public opinion along the Front was beginning to shift in favor of maintaining wildlife and outdoor values, even at the expense of some potential energy development.

The third Hall Creek well approval in January 1993 seems to have been the last stand of the pro-development forces in the Badger-Two Medicine area. After losing another administrative appeal and in response to tribal concerns, the Forest Service undertook a comprehensive traditional cultural district (TCD) study of the area pursuant to the National Historic Preservation Act (NHPA). The question was whether to designate the entire Badger-Two Medicine area, including the Hall Creek well site, a TCD, which would then require a NHPA “adverse effect” consultation before drilling could commence. Because any such determination would be seen as harmful to traditional Blackfeet uses, and for the enrichment of an oil company, the designation would act as a powerful (though not formally coercive) deterrent against development. With a new TCD study now underway, most observers believe that eventually an expanded TCD designation will incorporate the Hall Creek site, which will in practice doom oil and gas operations there (Bradley 2002).

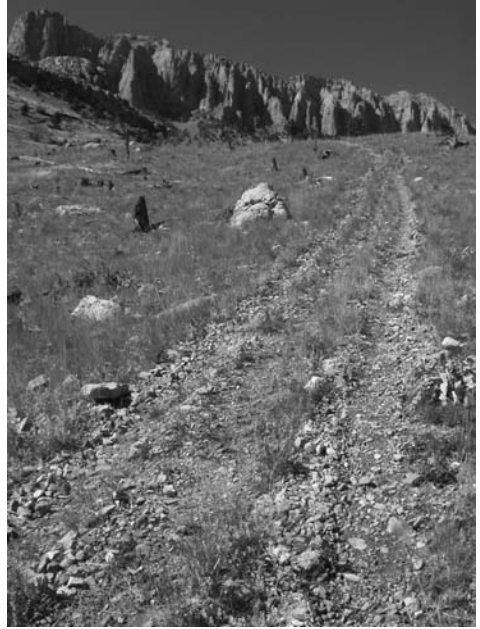
In the mid-1990s, a new forest supervisor named Gloria Flora was named to head the Lewis and Clark forest. Trained as a landscape architect, Flora was the very embodiment of the “new” Forest Service. With the Badger-Two Medicine leases suspended and the TCD study underway, Flora initiated an EIS process to address the broader question of oil and gas leasing on the Rocky Mountain Front, where an earlier federal court injunction had stopped all leasing (*Bob Marshall Alliance v. Hodel*, 852 F.2d 1223 (9th Cir. 1988)). Citing extensive public opposition and the “value of place,” Flora startlingly decided not to offer any national forest lands for lease in the Front area for the next 10–15 years (U.S. Department of Agriculture 1997). This no-leasing decision was later upheld by the courts (*Rocky Mountain Oil & Gas Ass’n v. U.S. Forest Service*, 12 Fed. App’x 498 (9th Cir. 2001)).

While Flora’s decision galvanized local public opinion, it did not create it. There has long been recognition that the Rocky Mountain Front is a special place, as reflected in the federal protection given the nearby iconic Bob Marshall Wilderness Area, the state protection given the Sun River Game Range, and other organized private land conservation efforts by the Boone and Crockett Club, The Nature Conservancy, and others.

Public concern about protecting the Front has generated action on other forest management issues as well. Timber harvesting had already been significantly reduced at the time of our previous study, and those reductions have been maintained. But over the past 15 years, ORV use has erupted along the Front, leading one knowledgeable visitor to observe: “ATVs [all-terrain vehicles] run amok in the Badger-Two Medicine area... Trails are now as wide as Central Avenue.” In response, the Forest Service initiated a revised travel plan process,

The Bob Marshall Wilderness Area, south of the park, is one of the most highly regarded units of the national wilderness preservation system. Photo courtesy of Cal Tassahari, Swan Ecosystem Center.





As ORV use along the Rocky Mountain Front east of the park increases, damage from the machines has become a major resource management concern. Photos courtesy of Cameron Naficy / Native Forest Network.

which generated 37,000 comments with 98% favoring elimination of all motorized access (Lee 2005). Most observers expect the Forest Service to adopt the protective option, which will reinforce the notion that the Rocky Mountain Front region is an area that should be generally managed for the protection of its resources.

Other important developments have further protected the Front from industrial incursion. In 2001, at the behest of the Clinton administration, the Front was withdrawn from hardrock mining activity. Three years later, faced with substantial local opposition to a controversial exploratory drilling proposal, the Bush administration announced that it was suspending further oil and gas activity in the area (Lee 2004). The suspension, though temporary, will enable the agencies to prepare a region-wide environmental assessment on the Front and to make decisions about the long term future of this special ecosystem. At the same time, the U.S. Fish & Wildlife Service announced a proposal to place conservation easement protection on about 170,000 acres along the Front, which would add an important lower-elevation buffer. And Congress has now entered the picture with legislation that permanently withdraws Forest Service and Bureau of Land Management lands along the Front from mineral leasing and mining, and offers a tax incentive to encourage the sale of existing leases to conservation organizations (P.L. 109-432 sec. 403). Thus, consistent with the prevailing public sentiment, the Front is being protected from industrial incursion, and environmental, recreational, and Indian interests are ascendant, all of which bodes well for Glacier.

The Canadian Flathead

Glacier once again faces the prospect of extensive mineral development across the international boundary in the Canadian Flathead region. Located in southeastern British Columbia, the Canadian Flathead country extends for roughly 40 miles along the North Fork of the Flathead River, which also forms Glacier's western boundary. The remote and uninhabited Canadian Flathead has unsurpassed water and air quality, and provides important habitat for the grizzly bear and other wildlife species, making it a vital part of the larger Crown of the Continent Ecosystem. During the mid-1980s, the Sage Creek Coal Company planned to open a large open-pit coal mine in the pristine Cabin Creek drainage just eight miles north of the park. Glacier, joined by the state of Montana and an array of allies, vigorously resisted and ultimately secured a favorable ruling from the International Joint Commission (IJC) that squelched the threat (International Joint Commission 1988). Now the park faces multiple mineral development threats within the same watershed, and it may no longer be possible to employ the strategies that safeguarded it in the past.

Most of the Canadian Flathead is owned by the British Columbia provincial government, which is reportedly quite interested in developing it to help finance the upcoming winter Olympics and to garner additional revenues. The expansive Crowsnest coalfield underlies the headwaters of both the Elk and Flathead rivers, and mining has a long and productive history in the Elk River drainage. Of metallurgical quality, most of the coal is destined for Asia and its ravenous steel industry. With the conservative party in control of the province, British Columbia has aggressively pursued economic development opportunities, repealed

The Canadian Flathead. Photo courtesy of Erin Sexton / Flathead Basin Commission.



already-weak environmental protection standards, and shown little interest in protecting the Canadian Flathead's environmental assets.

With two major mineral development proposals on the drawing board, the Canadian Flathead faces an uncertain future that could transform it into an industrial zone. Most imminent is the Cline Mining Company's proposal to construct a large open-pit coal mine on Foisey Creek in the upper reaches of the watershed (Jamison 2005c). A second potential project involves coalbed methane; exploratory wells have already been drilled at two sites near Foisey Creek. Three other mineral development projects lurk in the background, including a potential gold mine and two other coal mines. The environmental impacts from these projects would be significant by any measure: an expansive infrastructure of roads and pipelines that will fragment wildlife habitat and sever migration routes, as well as air and water quality impacts, including toxic pollutants and sedimentation, that will reverberate throughout the watershed.

Were these development proposals pending in the United States, several strong environmental laws would come into play, but that is not the case on the Canadian side. Indeed, under Canadian and British Columbia law, it is unclear whether these projects will undergo meaningful environmental analysis or other serious scrutiny. At the federal level, the critical question is whether the Canadian Environmental Assessment Act will apply, while at the provincial level, British Columbia's recently streamlined Environmental Assessment Act vests initial environmental analysis responsibility with the project proponent, subject to provincial review. Besides, there are no real cumulative effects analysis requirements or any law similar to the U.S.'s Endangered Species Act, and neither the Canadian courts nor provincial officials are likely to intervene in any event.

The prospect of industrial development in the Canadian Flathead is particularly troublesome given the effort that has gone into protecting the adjoining landscape on the U.S. side of the border. Besides Glacier National Park with its multiple special designations, the Bob Marshall Wilderness complex, the Flathead River's wild and scenic status, and the Forest Service's pending North Fork wilderness proposal all reflect a deep commitment to preservation. A similar but less expansive commitment is evident on the Canadian side, including Waterton Lakes National Park, the adjoining Akamina-Kishinena Provincial Park, and a Waterton expansion proposal that would extend the park's boundaries into the North Fork drainage—a move that has been resisted by the British Columbia government (Johnson 2005).

One potential solution—and the one that succeeded twenty years ago—would be a referral to the IJC. During the mid-1980s, when confronted with the Cabin Creek mine proposal, Glacier and Montana officials convinced the State Department to invoke the International Boundary Waters Treaty of 1909 (36 Stat. 2448). The treaty provides for referring U.S.–Canadian transboundary environmental disputes to the IJC for resolution, so long as both nations agree to the referral. Somewhat surprisingly, Canada agreed to the Cabin Creek referral, which set off a multi-year environmental study (Clark et al. 1988).

The IJC's Cabin Creek mine decision amounted to a complete victory for Montana and Glacier National Park. Finding a violation of the Boundary Waters Treaty's pollution provision, the IJC recommended against approving the mine proposal until "potential transboundary impacts ... have been determined with reasonable certainty and would constitute



Upper photo: The ridge in the background is the proposed site for the Cline Coal Mine in the Canadian Flathead. Lower photo: An aerial shot of the nearby Elkview Mine. The impacts of the proposed Cline Mine would be comparable. Photos courtesy of Erin Sexton / Flathead Basin Commission.

a level of risk acceptable to both Governments” (International Joint Commission 1988). Noting the U.S. efforts to protect the Flathead basin, the IJC also recommended that “the Governments consider, with the appropriate jurisdictions, opportunities for defining and implementing compatible, equitable and sustainable development activities and management strategies in the upper Flathead River basin.” But this recommendation—an explicit invitation to engage in a meaningful multi-jurisdictional dialogue over the future of the Canadian Flathead and its relationship to the larger regional landscape—has unfortunately never been implemented.

Another IJC referral, however, seems quite unlikely. The State Department has already deferred such a request by Montana’s governor, explaining that it will continue to monitor the matter while Montana and British Columbia seek a local resolution (Jamison 2005b). There is little present likelihood that Canada would agree to another IJC referral. The Canadian and British Columbia governments are still unhappy over losing the earlier Cabin Creek mine referral, while Canada and the United States are at loggerheads over several high-profile issues, including the Devil’s Lake water allocation controversy, and U.S. embargoes on Canadian cattle and softwood timber. As a result, these mineral development issues are being addressed at the state–provincial level and not at the national level.

Negotiations between Montana and British Columbia officials have thus far yielded few substantive results. After an unusual September 2005 personal meeting between Montana’s governor and the British Columbia premier (no such high-level meeting had occurred during the 18 years since the IJC’s Cabin Creek decision), British Columbia officials announced that the Cline coal mine proposal would undergo an environmental assessment and include the state as a cooperating partner. Exactly what this environmental review will entail remains to be seen.

Meanwhile, opponents have continued pressing British Columbia to do a comprehensive regional environmental study before permitting any mineral development activities within the Flathead drainage. They are seeking to generate enough political pressure to force Canadian federal involvement in the matter or an IJC referral, and to forestall corporate interest in the region. But if international energy prices remain at high levels, these efforts may be for naught. In short, the Canadian Flathead portion of the regional ecosystem is not secure and faces real and immediate development pressures.

Toward regionalism and coordinated management

Glacier managers continue to embrace regionalism as the primary long-term strategy for protecting the park’s ecological integrity. The overall goal is to knit the entire Glacier region together as an entity with the park at the core of the larger ecosystem, primarily by creating transboundary management forums, institutions, or incentives consistent with the park’s conservation objectives. Twenty years ago, Glacier officials were relying heavily on the park’s international biosphere reserve designation to provide it with meaningful protection and to foster restraint from its national forest neighbors. But since then, the biosphere reserve concept has not had any measurable direct effect, and it was barely mentioned during our interviews this time.

In recent years, an array of other transboundary initiatives have surfaced in the Glacier area that offer forums where external threat issues might be addressed. These efforts include

the Flathead Basin Commission, a Yellowstone to Yukon initiative (Y2Y), the Northern Rockies Ecosystem Protection Act bill, the Crown of the Continent Managers Group, and the GNESA partnership. Each of these initiatives is designed to break down the traditional jurisdictional boundaries that impede rational management of wildlife and water systems. None has yet produced a major breakthrough, and it is doubtful that such organizational efforts will be central to the search for regional managerial integration.

To take one example, the 20-member Crown of the Continent Managers Group has endorsed collaborative ecosystem management and adopted “an ecologically healthy Crown of the Continent ecosystem” as its vision (Crown Managers Partnership 2006). But even after disavowing any intent to involve itself in management decisions or processes, the group was forced to abandon its initial project—development of a joint cumulative effects model—after the Flathead Forest supervisor opted out of the project, evidently fearing that the model could be used against the agency in domestic NEPA litigation. And it has so far largely ignored the region’s most pressing transboundary resource management problem—energy development in the Canadian Flathead.

The hard fact seems to be that regionalism does not happen merely because it is a good idea or through creation of a formal group. Indeed, the most significant progress toward regional identity and management—the conception of the Rocky Mountain Front—has come about informally and *de facto*, and it stands in stark contrast to the limited achievements of the more formal regionalism efforts. No such success is yet discernible on either side of the border on the Flathead side of the park, where the concept of a region, even one as visible as the watershed of the Flathead River, has yet to take hold.

A twenty-year assessment

Glacier has so far been spared each of the major threats we identified two decades ago. While the park is still at risk, things are not nearly as bleak as we anticipated from the perspective of the mid-1980s. This is especially true on the adjoining national forests where we have seen the emergence of what amounts to a *de facto* buffer on their lands that border the park. It also holds true for private lands on the east side, where a sense of regional identity is taking hold. Such positive developments are less evident on the private lands in the Flathead Valley and across the border in the Canadian Flathead.

What explains the striking differences in park protection and environmental sensitivity that we have observed over the past twenty years? Significantly, neither a formal realignment of boundary lines to create habitat-determined federal enclaves, nor establishment of regionally based managerial systems, account for the progress toward greater regional integration. Rather, the key is a pronounced shift in thinking and local management away from formal enclaves (such as the park and the forest) and toward the region seen as an integral ecological unit, in particular as the habitat needs of target wildlife populations.

Thus, how regionalization actually happens on the American landscape seems to be the product of a variety of interlocking and mutually reinforcing changes in the way business is really done. One important element has been a reduction in conflict between the missions of neighboring federal land managers, as reflected in the Forest Service’s transition away from its historic commodity production orientation and toward wildlife, recreation, and other amenities. A second indispensable factor is the law and its enforcement, which has played a



Lake McDonald and Iceberg Cirque: part of the spectacular landscape of Glacier National Park. The last twenty years have seen a dramatic rise in environmental concern, both among land-managing agencies and the general public. Although new concerns have come forth in that time, the park has been spared the major threats that loomed in the mid-1980s. Photos courtesy of Glacier National Park.

pivotal role in promoting management across formal boundaries. Where strong laws apply, as on the two national forests adjoining Glacier, developments have been positive and incompatible uses are being channeled into environmentally benign locations. But where the law is weak or where there is a reluctance to invoke it, the perils of environmentally harmful activity remain high, as on private lands in the Flathead Valley and in British Columbia. A third important element promoting environmental protection has been the evolution of a local public that conceives its surroundings in regional terms. That has been the case on the east side of the park, where the ecologically defined image of a Rocky Mountain Front has come to be a central reality. The absence of any such cohesive community concept undoubtedly helps explain why no analogous progress has occurred in the Flathead Valley on either side of the border. The last, but by no means least, important factor in the fate of the region is the market. Where economic pressures are high, as for energy development in the Canadian Flathead and for private lands in the Flathead Valley, it is extraordinarily difficult to advance regional environmental protection goals.

When these four elements are in harmony, the prospects for ecologically rational management are good. Neither national park nor national forest managers can control these matters, and perhaps they can only marginally influence them. Yet it would seem vital for park managers to know that these are the primary forces that will determine their park's destiny, and to work with that reality.

Some specific strategic observations for park managers also follow from our twenty-year review of the Glacier situation. First, while some issues—like private land use in the Flathead Valley—may be too sensitive for overt park involvement, there is little reason for the park not to be outspoken on other issues—like the Canadian threats—where the political calculus is quite different. Second, regular engagement with adjacent land managers can pay dividends, as it did when the progressive Lewis and Clark supervisor was convinced to stop further leasing on the Front. Park engagement with the Flathead forest over the Canadian threats and perhaps some local land use issues might pay similar dividends. Third, park officials should not disregard the role of third-party advocates, who were key to preventing drilling at Hall Creek and to bringing the Flathead's timber program under control. Finally, even when formal regionalism institutions and endeavors pay few immediate dividends, park efforts to promote a sense of regional identity and integration with the public can only help advance park protection goals over time. In sum, the challenge of park resource protection requires both a long-term vision as well as calculated short-term strategic moves and interventions.

Ed. note: A more complete and detailed account of this study was published by the authors as "The Realities of Regional Resource Management: Glacier National Park and Its Neighbors Revisited," Ecology Law Quarterly 33, 233–311 (2006).

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THE CHALLENGES OF CLIMATE CHANGE

Losing Ground: Western National Parks Endangered by Climate Disruption

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Part 1: Climate disruption poses an unprecedented risk to western national parks

THE NATIONAL PARKS IN THE AMERICAN WEST include some of the country's most treasured places: the geysers of Yellowstone, the nation's first national park; the gorges of Grand Canyon; Yosemite's dramatic rock domes; and Mesa Verde's cliff dwellings. To preserve these national treasures for all time, Congress directed the National Park Service (NPS) to manage them "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."¹

Congress believed that NPS could preserve the national parks unimpaired by managing properly the resources and uses within the parks. Now, however, the continued ability of the national parks to bring enjoyment to the American people is at risk because of an unprecedented, external threat: climate change. A climate disrupted by human activities poses such sweeping threats to the scenery, natural and cultural resources, and wildlife of the national parks and to our enjoyment of the parks that it dwarfs all previous risks to these American treasures.

Climate disruption and its causes

Although local temperatures fluctuate naturally, over the past 50 years the average global temperature has increased at the fastest rate in recorded history—primarily, scientists agree, as the result of human activities that spew heat-trapping gases into the atmosphere.² These pollutants, particularly carbon dioxide from the burning of fossil fuels, collect in the atmosphere like a thickening blanket and trap the sun's heat, causing the planet to warm up.

The consequences of climate-changing pollution are sweeping, and its full-scale impacts are hard to predict far in advance. But each year, scientists learn more about how climate

change already is affecting the planet and what consequences are likely to occur if current trends continue, including:

- Changing temperatures will reduce snowfall and snowpacks, change water supplies, and lead to more severe droughts.
- Rising sea levels will lead to coastal flooding.
- Warmer seas will fuel more intense hurricanes.
- People will face more mosquito-borne and other diseases.
- Key habitats, from coral reefs to mountain meadows, will be disrupted and many plant and animal species driven to extinction.

Climate disruption particularly affects the West

Many scientists think the American West will experience the effects of climate change sooner and more intensely than most other regions.³ To begin with, the West already is warming faster than the East.⁴ Over the past 100 years, warming west of the 100th meridian (the traditional beginning of the West) has been twice as great as east of that boundary.⁵ Warming is also greater in mountainous areas, putting the spectacular mountain ranges of the American West (home to many national parks) at more risk than lowlands.⁶ These changes are already profoundly affecting the scarce snow and water resources of the West: more winter precipitation is falling as rain rather than snow.⁷ Snowpacks have declined at most sites measured by the government.⁸ Snow is melting earlier in the spring, and peak flows of streams and rivers have moved earlier in the year, leaving summers drier.⁹ And recent widespread, severe droughts in the West are consistent with scientific projections that climate change will make the world's wet areas wetter and dry areas drier.¹⁰

Scientists predict that these changes in the West will likely continue. Projections of future warming by the end of the century range from, on the low end, 3 to 7 degrees Fahrenheit for the entire West to, on the high end, as much as a 14-degree (Fahrenheit) warming in the Southwest.¹¹ With this warming, more winter precipitation will fall as rain instead of snow, less snow will accumulate atop mountains through the winter, and the snowpacks will melt earlier in the year.¹² And a scientific workshop concluded that in areas like the American West, a combination of hotter summers and earlier snowmelt "is a recipe for increased intensity, frequency and duration of drought."¹³

In the arid and semi-arid West, changes of these magnitudes would fundamentally disrupt the region's ecosystems. The region's national parks, representing the best examples of the West's spectacular resources, will be among the places where the changes in the natural environment will be most evident. As a result, a disrupted climate is the single greatest threat to ever face western national parks.

Part 2: Climate disruption threatens natural resources and wildlife

The rising temperatures and changing precipitation patterns of a disrupted climate could drastically reshape entire ecosystems across the West, including in the region's national parks. If we allow climate change to continue unchecked, everything from the glaciers,

snowfields, and meadows to the plants and animals living in parks could be fundamentally altered. And these changes could occur in our lifetime, not in some distant future.

Glacier loss from rising temperatures

Scientists predict that a quarter of the ice in the world's mountain glaciers could melt away by 2050 as a result of climate change.¹⁴ Western national parks, home to most of the glaciers in the lower 48 states, share this vulnerability. National parks known, in part, for their spectacular glaciers are Glacier, Mount Rainier, North Cascades, Olympic, and Yosemite.

Glacier National Park in Montana, despite its name, is in great danger of losing all its glaciers. U.S. Geological Survey scientists now count only 26 ice bodies that still qualify as glaciers, down from 38 glaciers in 1968, and project that by 2030 all glaciers in the park could be gone, as shown in Table 1 and Figure 1.¹⁵

Glacier is not the only western national park losing glaciers and icefields. Washington's North Cascades National Park has 318 glaciers, representing 60% of the land covered by glaciers in the United States south of Alaska (Figure 2). But since 1958, the total mass of the park's glaciers has shrunk by 80%.¹⁶ Here, as in other national parks, the loss of glaciers affects more than just the scenery. NPS estimates that as much as 50% of the park's late summer stream flow is fed by its glaciers. In the Thunder Creek watershed, shrinking glaciers have already reduced summer flows by 31%. If all the glaciers were lost, flows in the streams would decrease by perhaps another 25%.¹⁷ Among the consequences would be additional stress on endangered and threatened salmon species that spawn in the park and downstream.¹⁸

Other national parks are feeling the heat. At Mount Rainier National Park in Washington, 25 major glaciers form the largest collection of permanent ice on a single U.S. peak south of Alaska (Figure 3). Those glaciers lost 21% of their area between 1913 and 1994, and a series of ice caves that used to draw visitors to Paradise Glacier melted away by 1991.¹⁹ In Olympic National Park in Washington, glaciers nearly one mile thick gouged out Puget Sound and other waterways, isolating the Olympic peninsula from the mainland and leading to the evolution of species found nowhere else on Earth. Studies here document that Blue Glacier and others in the park are in retreat.²⁰ In Yosemite National Park in California, six glaciers decreased between 31 and 78% during the last century, with the largest, Lyell Glacier, having lost 35% of its west lobe and 70% of its east lobe, mostly since 1944.²¹

Table 1. Projected melting of glaciers in Glacier National Park, Montana. Source: U.S. Geological Survey.

Year	Average July–August temperature	Remaining glacier area
1990	62.4°F	1.95 square miles
2000	62.7°F	1.50 square miles
2010	63.1°F	0.94 square miles
2020	63.6°F	0.24 square miles
2030	64.3°F	none

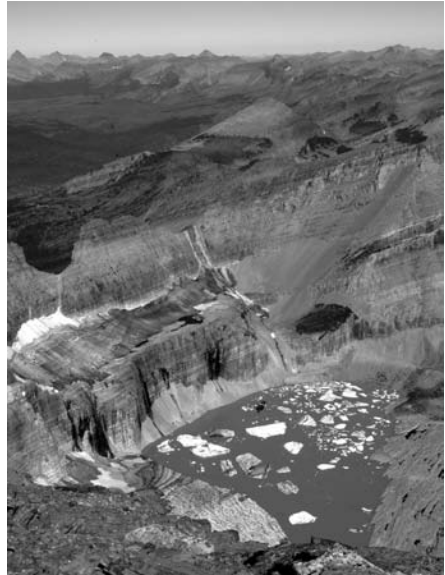


Figure 1. These photographs of Grinnell Glacier in Glacier National Park, taken from the same point over the course of nearly seven decades, demonstrate the retreat of the glacier. Upper left: 1938 (photo by T.J. Hileman, Glacier National Park). Upper right: 1981 (photo by C. Key, USGS). Lower left: 1998 (photo by D.B. Fagre, USGS). Lower right: 2005 (photo by B. Reardon, USGS). For analysis, see M.H.P. Hall and D.B. Fagre, "Modeled Climate-Induced Glacier Change in Glacier National Park, 1850-2100," *BioScience* 53 (2003), 131 - 140.



Figure 2. Washington's North Cascades National Park has 318 glaciers, representing 60% of the land covered by glaciers in the United States outside of Alaska. Since 1958, the total mass of the park's glaciers has diminished by four-fifths. Photo courtesy of National Park Service.



Figure 3. U-shaped valley looking upstream from the bridge over Nisqually Creek (draining from the toe of Nisqually Glacier on the south flank of Mount Rainier). Mount Rainier National Park could experience losses of glaciers and snowcover and changes in vegetation cover as a result of global warming. Photo courtesy of U.S. Geological Survey.

No snow-covered mountains in summer

Glaciers are in just a few western national parks; snow-covered mountains are in many, and provide some of the West's most dramatic scenery. But less snowfall, less snow build-up, and earlier snowmelt would lead to less snow coverage of the region's mountains. Most importantly for visitors who come to the parks in the summer, the mountains would not be snow-capped then, when visitation is greatest. Different teams of scientists have projected that climate change could diminish future snowpacks on April 1, the traditional day used to measure a season's snowpack before melting begins in most places, by shocking amounts: in California by 29 to 89%, in the Columbia River basin by nearly half, in the Cascade Mountains as much as 72%, and in the water-short Colorado River basin by 30%.²² After April 1, when more visitors are present and when higher temperatures have been in place longer, the reductions in snow coverage should be even greater. So summertime visitors to Glacier, Grand Teton (in Wyoming; Figure 4), Rocky Mountain (in Colorado), Mount Rainier, North Cascades, Yosemite, and other mountain parks will still see mountains, but they will be much less likely to see snow-capped mountains.

Vegetation changes from shifting temperatures

Loss of alpine tundra. Alpine tundra is found on mountaintops where it is too cold for trees to grow. This distinctive habitat supports plant and animal species uniquely adapted to the harsh high-altitude environment, include plants such as tussock grasses, dwarf trees, small-leaved shrubs, and heaths, and animals such as pikas, marmots, mountain goats, bighorn sheep, elk, and ptarmigan. Because areas of alpine tundra are especially vulnerable

Figure 4. If global warming increases as projected, summertime visitors to Grand Teton National Park will likely see fewer scenes like this—mountains whose peaks are covered in snow year-round. Photo courtesy of U.S. Geological Survey.



to warming and could shrink or disappear, the animals and plant species that are adapted to the short growing season and extreme cold and wind of these areas are particularly at risk of having shrinking populations or disappearing.

Shrinking tundra could squeeze hundreds of species. For example, more than 40% of about 300 total plant species that grow in alpine tundra in the southern Rocky Mountains occur only above the treeline.

In places where tundra plants and animals have no higher elevation to climb to, they could disappear altogether. At risk are many animals popular with park visitors, including ptarmigan, pikas, and marmots. The scenery of national parks could be much different, too. Without alpine tundra, park visitors would see more uniformly forest-covered mountains, instead of forested mountain sides and open mountaintops.

Rocky Mountain National Park would be most affected. Each summer as many as two million visitors drive up Trail Ridge Road, the highest paved through road in the country, to enjoy the largest expanse of alpine tundra in the lower 48 states. Visitors to the park, according to a 2002 survey done as part of a study of climate change effects there, would consider the loss of tundra one of the most troubling possible consequences of climate change in the park (Figure 5).²³ The study's scientific researchers projected that for every degree of warming, the treeline in the park could encroach onto the tundra by nearly 250 feet. A 5.4-degree (Fahrenheit) rise in temperature could eliminate half the park's tundra, separating what remains into small patches and making it more difficult for alpine species of plants and animals to survive and re-colonize neighboring patches. And temperature increases between 9 and 11 degrees Fahrenheit could eliminate all alpine tundra from the park.²⁴

Figure 5. Visitors to Rocky Mountain National Park consider the tundra landscapes alongside Trail Ridge Road to be among the most valuable in the park. Photo courtesy of National Park Service.



In Glacier National Park, scientists have used repeat photography near the popular Logan Pass Visitor Center to document changes at treeline. Pine trees at treeline (called “krummholz”) that have adapted to extreme cold and weather by growing branches primarily on their downwind side, out of the prevailing harsh winds, have begun to grow more upright and to fill in forest edges at treeline.²⁵

Loss of forests. Higher temperatures can eliminate an entire plant species from an area. Researchers from the U.S. Geological Survey and universities have documented substantial mortality of Joshua trees in California’s high desert and project that because of climate warm-



Figure 6. The life cycle of Joshua trees in the eponymous national park is threatened by warmer winter temperatures. Photo courtesy of National Park Service.

ing the trees “will be unable to persist much longer within Joshua Tree National Park.”²⁶ Joshua trees need the relatively cooler temperatures now found in the higher Mojave desert, compared to those of nearby Colorado or Sonoran deserts, in part because they require winter freezes to flower and set seeds (Figure 6).²⁷

Entire forests, not just individual tree species, are also at risk. Forests can be lost suddenly through climate-driven mortality of entire stands, not just gradually in response to changes in tree growth and reproduction. Sudden, widespread, climate-driven loss of forests is now occurring in the American Southwest, where semiarid conditions make even the hardy trees that can survive there susceptible to drought. National parks most at risk of losing forests are Bandelier National Monument in New Mexico, Mesa Verde National Park in Colorado, and others of the 23 parks on the Colorado Plateau, a region encompassing much of Utah, Colorado, New Mexico, and Arizona that is full of many of the country’s greatest natural and cultural wonders.

In Bandelier National Monument, five years of extreme drought in the 1950s killed off ponderosa pine forests in parts of the park, leading to the most rapid change in forest boundaries ever documented. The immediate cause of death for most trees was infestation by bark beetles, but as the beetles are more likely to be fatal to drought-stressed trees, researchers attributed the mortality to the drought. The loss of the ponderosa forests has persisted, as ponderosas have failed to re-grow in the decades since, even when precipitation levels have been normal. The loss of the ponderosas has been accompanied by a loss of other plant cover and increased soil erosion.²⁸

The ongoing multi-year drought in the Southwest has brought about a replay, although this time with piñon pines the victims instead of ponderosas, and this time with an even greater loss of forests. In just the two years of 2002 and 2003, drought led to the loss of piñon trees across more than 60,000 square miles in the Southwest—a more extensive forest loss than from the 1950s drought. The recent drought was accompanied by higher heat than the earlier one, magnifying its effect and increasing greater stresses on trees. As a result, piñon pine trees died across a wider geographic area and at higher (and normally cooler) elevations. Piñons of all ages died, with mortality reaching as high as 90% in Bandelier National Monument and parts of Mesa Verde National Park. Just as a half-century ago, the immediate cause of many tree deaths was infestation by bark beetles, which again were often fatal because of stress from drought and heat. Also as in the 1950s, the death of the dominant trees has been accompanied by rapid and substantial disruption of the ecosystem, including significant mortality of other types of trees and of shrubs, grasses, and other plants in the woodlands and a significant increase in soil erosion. And the substantial disappearance of piñon nuts means reduced populations of the piñon jays and small mammals that feed on them.²⁹ Because piñons are the dominant tree species in the piñon-juniper forests that cover much of the West, these forest losses in the Four Corners area could foretell greater losses across the entire region.

Mesa Verde National Park's forests are especially vulnerable to forest loss because the park itself is relatively small, surrounded by lands altered by human use, and atop a mesa. Tree species in the park stressed by a warmer climate have no adjacent grounds—in particular, no higher, cooler grounds—into which they can spread. Drought in the 1950s and recent years have nearly eliminated the park's Douglas firs and ponderosa pines and fragmented its piñon-juniper woodlands, creating more space for opportunistic invasive plant species that will stress the woodlands even more (see below).³⁰

Losses of mountain meadows and wildflowers. Mountain meadows exist where the combination of heavy snow cover in the winter and a short growing season in the summer make it impossible for tree seedlings to survive. Climate change is likely to both reduce snow cover and extend the growing season, so mountain meadows likely will disappear in many places.³¹ Scientists are already detecting a loss of mountain meadows. At Olympic National Park, a reduction in meadows has been measured on both the wetter west and dryer east sides of the park's mountains.³² Repeat photography over the years in Glacier National Park has documented subalpine fir forests taking over meadows.³³

At risk are some of the West's largest meadows: Paradise Valley in Mount Rainier National Park, the most visited spot in the park; Yosemite National Park's Tuolumne Meadows, which draws thousands of people every summer to view wildflowers; and the open expanse of Hayden Valley in Yellowstone National Park (Wyoming, Montana, Idaho), one of the best places to view the full range of that park's unparalleled wildlife, including grizzly bears and the world's largest remaining unfenced bison herd (Figure 7). Also vulnerable are countless small mountain meadows in every mountain national park across the West.

Scientists have also documented how higher temperatures suppress the growth of mountain wildflowers. For 14 years, researchers have used overhead heaters to warm Rocky Mountain meadows by 4 degrees Fahrenheit to mimic global warming. With the resulting



Figure 7. The Yellowstone River flows through Hayden Valley in Yellowstone National Park. The valley is one of a number of large high-elevation meadows in western parks that might see encroachment by forests in a warmer climate. J. Schmidt photo courtesy of Yellowstone National Park.

longer snow-free growing seasons and hotter and drier soil conditions, wildflowers become much less common and are replaced by sagebrush.³⁴

Shifts in plant cover. A team of scientists from The Nature Conservancy, Oregon State University, and the U.S. Forest Service have projected how climate change would shift plant cover across North America. Their findings indicate that one-third of the land area of the 11 western states could experience a change in an area's dominant type of vegetation by 2100. The greatest changes in the West, measured as a percentage of an area that will undergo a change in dominant plant cover, are projected to be in mountain areas as lower-elevation species of trees and plants move uphill and subalpine and alpine species are reduced or eliminated. Their projections for areas including western national parks include:

- Subalpine forests could be replaced by temperate evergreen forests in North Cascades National Park.
- Boreal forests could be replaced by mixtures of temperate evergreen forests, shrub steppes, and savanna woodlands in Grand Teton, Rocky Mountain, and Yellowstone national parks.
- Shrub steppes could largely be replaced by savanna woodlands and grasslands across the many national parks of the Colorado Plateau, including Arches, Bryce Canyon, Canyonlands, and Capitol Reef national parks in Utah and Grand Canyon National Park in Arizona (Figure 8).³⁵



Figure 8. Shrub steppes in Colorado Plateau parks such as Great Basin could be displaced by other vegetation types. Photo courtesy of U.S. Geological Survey.

A vivid illustration of the changes that could be in store for mountain parks is from a U.S. Geological Survey model of possible changes in one area of Glacier National Park. The USGS model projects that the loss of glaciers is just the beginning: decade by decade, forests move upslope to cover what is now bare rock, and grasslands move into lowlands to replace the forests.³⁶

More invasive plants. Invasive plants, non-native plants that cause environmental or economic harm, cause an estimated \$20 billion a year in economic damage in the United States and already infest some 2.6 million acres in the national parks. Examples are Russian olive trees, which destroy plant and animal habitat in New Mexico and Arizona national parks (Figure 9); tamarisks, which deplete water and overrun riparian corridors in national parks on the Colorado Plateau; knotweeds and knapweeds which take over stream corridors and degrade salmon spawning habitat in national parks of the Northwest; and exotic grasses that thrive in wet periods and then burn native cacti in desert national parks.

As climate changes disrupt natural ecosystems, the spread of invasive plants likely will accelerate because they are especially adaptable, reproduce quickly, and thrive in disturbed areas. They

Figure 9. Russian olive trees are invading a number of parks, including Petrified Forest. Photo courtesy Petrified Forest National Park.



can also be more successful than native plants in responding to increases in temperature, changes in precipitation patterns, or elevated atmospheric carbon dioxide levels. Once established in an area, invasive plants can displace native plants, diminishing food and shelter for animals that evolved with an area's native plants; deplete surface and ground water levels; alter runoff patterns; increase soil erosion; and change fire patterns and intensities.³⁷

Loss of plant species to increased wild-fires. Wildfire is a natural part of western ecosystems and essential to their health. But climate changes have already unnaturally increased wildfires in the West, and are likely to do so even more in the future. Particularly at risk from an unnatural increase in wildfires are plant and animal species with narrow habitat requirements, little mobility, or restricted distributions, and those in parks that are relatively small, surrounded by developed areas, or otherwise ecologically isolated. These species have little opportunity to spread into neighboring areas when their original habitat is disturbed by fire.³⁸

The saguaros of Saguaro National Park in Arizona illustrate how even the dominant plant species of a national park can be highly vulnerable to increased wildfires, particularly when fire-prone invasive plants have moved into the area (Figure 10). A symbol of the American Southwest and North America's largest cactus, the saguaro has such an imposing stature and regal presence that it has been nicknamed the "desert monarch." But these majestic cacti have a high mortality rate when there is fire in the deserts, and fires are now occurring more often because of the spread of invasive grasses and the higher temperatures and precipitation changes of a disrupted climate. The invasive grasses proliferating in the Upper Sonoran desert, where the national park is, almost always out-compete native plants for limited supplies of water and nutrients. When the invasive grasses dry out after wet spells, they become ready fuel for wildfires, which used to be rare in this ecosystem. This is creating a new, serious risk to the long-term survival of saguaros, not only in the national park but also across the entire Southwest.³⁹

Mesa Verde National Park's forests also illustrate how park resources are at risk from unnatural increases in wildfire. The national park's forests are inherently vulnerable and already suffering from climate-driven changes, as explained earlier. National Park Service



Figure 10. If the frequency and intensity of wildfires increase because of climate change, the signature species of Saguaro National Park outside of Tucson could be at risk. Photo courtesy of National Park Service.

modeling suggests that invasive weeds are likely to increase fire risks so much that future fires may irreversibly eliminate the park's woodlands.⁴⁰

Wildlife extinction and other threats from shifting temperatures

The chance to see wildlife in its native habitat is one of the main reasons people visit national parks. But a disrupted climate is likely to lead to widespread extinctions of wildlife species, in national parks as well as elsewhere. In "the largest scientific collaboration ever to apply itself to this problem," a team of 18 scientists studied the likely effects of climate change on more than 1,000 species in areas representing one-fifth of the world's land. They predicted that by 2050, 15 to 37% of the studied species are likely to be irreversibly on the road to extinction because of climate change. Extrapolating their conclusions to all species in the world, the researchers suggested that one million species could become extinct by 2050.⁴¹

The threat of wildlife extinction from climate change stems from several factors: changes in ecosystems, the spread of invasive species that out-compete native species, the spread of diseases, changes in the timing of seasons so they no longer match migration and hibernation schedules, and temperature changes that push a species out of the temperature range in which it can survive. Some species may be able to migrate to adjust to warming temperatures, but isolated wildlife populations and alpine species with no higher elevations to climb to are in particular danger of extinction.⁴²

Climate change is already affecting wildlife. More than 80% of species showing changes in their ranges are changing in directions consistent with a response to climate change.⁴³ Some mammals are ending hibernation earlier and some birds are migrating earlier in the spring.⁴⁴ There are only a few studies of the vulnerability of species in particular western national parks, but they suggest the local extinctions that could take place there.

White-tailed ptarmigan numbers in Rocky Mountain National Park have been cut in half in just two decades, and researchers predict they will be extinct in the park by mid-century if temperatures rise as predicted. Ptarmigan's primary habitat is the tundra that is itself endangered by warming, and they depend on deep snow to survive the alpine winter, using the natural insulation of snow caves to keep warm and using snowpack like a ladder to reach willow shrub branches for food.⁴⁵

Desert bighorn sheep are in danger of extinction across their range, including in California's Death Valley and Joshua Tree national parks and Mojave National Preserve, Utah's Canyonlands and Zion national parks, Arizona's Grand Canyon National Park, and Nevada's Great Basin National Park (Figure 11). Thirty of the 80 separate populations of desert bighorn sheep that once lived in California are already extinct; scientists point to climate change as a major contributor to the local extinctions. Further local extinctions are most likely for herds in lower elevations where temperatures are hotter and precipitation lower, reducing forage.⁴⁶

Pika populations in the West, especially in the lower elevation portions of the range, are in danger. As warming temperatures enable forests to move upslope and cover alpine rock-fields, the pikas' habitat could recede right off the mountaintops. Warming is also deadly to the animals, as they cannot survive even modest temperature increases. In the Great Basin, eight of 25 pika populations are already extinct. The remaining populations live at or above

Case study of climate change's effects on wildlife: Global warming, bark beetles, whitebark pines, and grizzly bears in Yellowstone

Contributed by Jesse A. Logan

WHEN I CONSIDER THE LARGE-SCALE BARK BEETLE MORTALITY occurring in lodgepole pine forests across the western United States, I think it is interesting and unusual, although I have no doubt that lodgepole forests will remain on the landscape for future generations. My response to the current mortality in whitebark pines is much different: It breaks my heart.

We are witnessing the catastrophic collapse of high-mountain ecosystems as a result of how people are changing the climate, and grizzly bears could end up paying the price. The grizzly bear is perhaps the most emblematic symbol of America's remaining wildlands. Unfortunately, in one of its last strongholds, the greater Yellowstone area, its very existence is in peril. The threats to the great bear there are multifaceted; among the most challenging is a loss of critical food resources. Grizzly diet consists of four major foods. In spring, carrion from winter-killed elk and bison are readily available. Early summer finds the bear feeding on spawning cutthroat



Grizzly bear in Yellowstone. B. Harry photo courtesy of Yellowstone National Park.

trout. As the summer progresses, bears move to the high country to eat noctuid moths feeding on the nectar of alpine flowers. In fall, the large and nutrient-rich seeds of whitebark pine provide the majority of the diet. Of all these, the availability of whitebark pine seeds is most critical; that is what they depend on in the time before hibernation. Nutritionally stressed bears have a lowered overwinter survival rate, and, more importantly, embryos will be reabsorbed if pregnant females lack sufficient fat resources entering hibernation. Without enough whitebark pine nuts, grizzly bears are also more likely to become involved in human conflicts as they search for other foods.

In recent years, a new threat has erupted to this critical element in the grizzly diet: the expansion into high-elevation forests of a small, native bark beetle in response to a warming climate. The mountain pine beetle is a native insect that has co-evolved with some pine forests. Without disturbances like mountain pine beetles and fire that

open up the forests, some types of trees, like lodgepole pine, would be replaced by shade-tolerant spruce and fir. But whitebark pines are different from lodgepoles. Whitebarks live for centuries, not decades, and are adapted to life at high elevations (with one of their adaptations being the large, highly nutritious seeds that are so important to grizzly bears). Whitebark pines do not depend on catastrophic forest disturbance to survive; instead, they are threatened by it. One of the hypothesized reasons for the restriction of whitebark pines to high elevations is that they are poorly defended against the insect pests and pathogens prevalent in more benign lower-elevation forests. Mountain pine beetles have not been a major threat to whitebark pine survival; the high-elevation climate has been their defense, as it historically has been too cold for long-term survival of outbreak beetle populations.

Unfortunately, things have dramatically changed in response to climate warming that began in the mid 1970s. Computer simulations had predicted mountain pine beetle outbreaks in high-elevation systems in response to this warming, but even the modelers were surprised by how quickly and how far beetles have now spread into whitebark pines. Significant mortality is occurring across the entire American distribution of whitebark pine, with no sign of it diminishing. When added to another stress—from an introduced pathogen, white pine blister rust—the spread of bark beetles into higher elevations makes the continued existence of these ecosystems an open question. Mountain pine beetle mortality in whitebark pines has occurred in the past, in relatively short-lived warm periods. In contrast, the current warming is a trend that began in the western United States over 30 years ago.

Given the likelihood of continued warming, what, if anything can be done to protect whitebark pines and the grizzlies that depend on them? First, we need to better understand the basic ecology of mountain pine beetle in whitebark pine. Most of our knowledge regarding host-insect interactions comes from lodgepole or other pine species. By understanding the unique aspects of mountain pine beetle in whitebark pines, we may come to better understand how we might tip the scale to favor the host. Second, we need better tools to evaluate the extent of mortality. Whitebark pine habitats are in the most remote and wild places (often designated wilderness areas) in the Rocky Mountains. Mortality there goes almost completely unrecorded. Without knowing the extent of the problem it is not possible to formulate effective responses. Advanced technology, such as satellite imagery combined with traditional aerial photography and ground surveying, is needed. Third, management tools (e.g., pheromone strategies) need to be fine-tuned for high-elevation environments and whitebark pine ecosystems. All of these approaches need to be integrated across large, remote, and inhospitable landscapes.

Logan retired in June 2006 from the U.S. Forest Service. He is a world authority on the relationship between climate and bark beetles.



Figure 11. Local populations of desert bighorn sheep are in danger of extinction throughout the West because their forage is being reduced by hotter temperatures. This male was photographed by a remote camera set up at a spring in Mojave National Preserve. Photo courtesy of Mojave National Preserve.

8,310 feet, while the extinct populations used to occur as low as 5,750 feet.⁴⁷ In Yosemite National Park, where pikas were recorded living as low as 7,500 feet in the early twentieth century, researchers now cannot find pikas below 9,500 feet.⁴⁸ These studies indicate that pika populations across the West, including in Great Basin and Yosemite national parks and Craters of the Moon (Idaho) and Lava Beds (California) national monuments, are at risk.

Worldwide, amphibians appear to be the first large-scale wildlife victims of climate change. Since 1980, more than 120 species have become extinct, with researchers certain that climate change was the key factor, as it made possible the rapid spread of a fungal disease to which the amphibians had no defense.⁴⁹ Evidence of amphibian decline is now showing up in western national parks. Mountain yellow-legged frog populations in lakes and streams of the Sierra Nevada, including in Yosemite and Sequoia/Kings Canyon (in California) national parks declined 10%. Most lakes in the parks now host only one to five individual frogs and about 85% of them are infected with the same fungal disease responsible for amphibian extinctions elsewhere. Researchers also link shrinking snowpacks to the decline because smaller snowpacks dry up smaller ponds, limiting the frogs to larger permanent ponds where introduced non-native trout can prey on them.⁵⁰

More invasive animal species. Climate change accelerates the spread of non-native invasive animal species that pose threats to native wildlife. Of a sample of 10% of harmful non-indigenous species in the United States, 48% are considered likely to expand their ranges as a result of climate change, while only 4% will contract their ranges.⁵¹ A study on how climate change would affect wildlife in several national parks, including Glacier, Yellowstone, Yosemite, and Zion, concluded that there would be an influx of non-native species, increasing by 70% the number of species in the parks and creating competitive stresses on the native wildlife of the parks.⁵²

Stresses on wildlife from changes in seasonal timing. Changes in the timing of sea-

sons can cause wildlife's needs and actions to no longer align with the conditions in which they evolved. These mismatches may lead to declines of certain species or enable other, potentially destructive species to expand their ranges or their populations. In Rocky Mountain National Park, presumably as a result of earlier spring thaws, young white-tailed ptarmigans now hatch significantly earlier than they did in 1975. Researchers have suggested that this change in timing may have contributed to the sharp decline in the ptarmigan population, as the timing of plant growth has not changed in the same way and chicks now hatch when there is less food available for them.⁵³

Part 3: Climate disruption threatens cultural resources

By preserving some of the best of our cultural resources—buildings, landscapes, archaeological sites, and artifacts—America's national parks provide information about the past and provide important links to the present. Many of the cultural resources of western national parks are at risk from the possible effects of a climate disrupted by human activities.

Resources at risk from increased flooding and erosion

With a changed climate, severe storms are likely to become more frequent and powerful.⁵⁴ Earlier and more sudden springtime melting of mountain snowpacks may increase peak flows of rivers and streams in the West.⁵⁵ As a result, western national parks are likely to experience an increase in flooding and erosion, which even at normal historical levels pose one of the largest threats to the cultural resources in the West. In the arid West, although there is not much precipitation, a relatively high percentage comes in downpours that flood the dry land, leading to significant erosion. Also, as explained earlier, a climate-driven loss of forest cover in the Southwest has already led to increased erosion. Further, an increase in wildfire, projected to occur with climate change, is likely to increase erosion even more.⁵⁶

At particular risk are the irreplaceable pueblos, cliff dwellings, churches, and forts already identified in the National Park Service's "Vanishing Treasures" program as "rapidly disappearing from the arid West," often because they are "in immediate, imminent danger from natural erosive factors," with inadequate NPS funding to protect them.⁵⁷ The national parks containing the inventoried Vanishing Treasures include:

- Sixteen national parks in Arizona, with the largest inventoried risks at Canyon de Chelly National Monument.
- Nine in New Mexico, including Bandelier and Fort Union national monuments and Chaco Culture National Historical Park (Figure 12).
- Nine in Utah, including Canyonlands and Zion national parks and Glen Canyon National Recreation Area.
- Four in Colorado, including Colorado, Dinosaur, and Hovenweep national monuments; three in California, including Mojave National Preserve; Fort Laramie National Historic Site in Wyoming, and five in Texas, including Big Bend National Park.⁵⁸

Resources endangered by increased wildfire

Global warming is already leading to more frequent and more severe wildfires in the

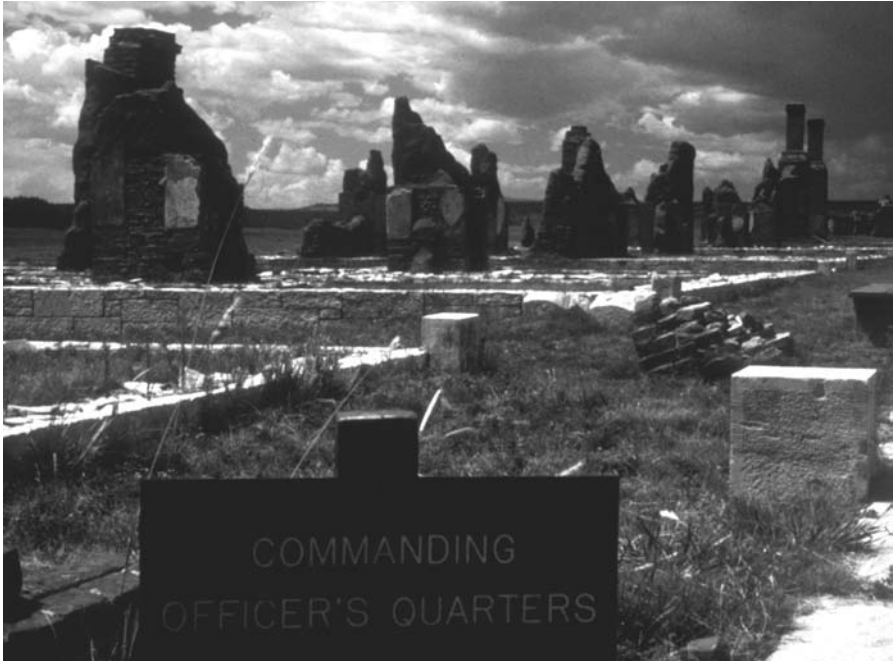


Figure 12. Many archeological and historic sites in western national parks are already naturally vulnerable to erosion damage. The ruins of Fort Union in New Mexico are no exception, and their vulnerability will be greater as the severity of storms increases. Photo courtesy of Fort Union National Monument.

West, with even greater increases likely in the future. This increase in wildfires threatens cultural resources in western national parks, as fires can burn historic structures, destroy archeological sites and artifacts, and alter cultural landscapes. Efforts to fight fires can also be destructive to cultural resources, since such fire suppression efforts as fire line construction, establishment of firefighting bases and camps, and the use of firefighting chemicals also may damage cultural resources.⁵⁹

Studies in Bandelier National Monument illustrate the vulnerability of cultural resources to fire. The first obvious effect is that flammable structures or artifacts can be lost to fire. For example, an extensive fire in the park in 2000 burned nearly all homestead archeological sites on the Pajarito Plateau in the park, since most were constructed of wood.⁶⁰ Second, fire can damage the stone used in buildings in archeological sites and stone, ceramic, and bone artifacts.⁶¹ Third, and potentially most significantly, wildfires may increase the erosion that, as in much of the Southwest, is already causing impacts to cultural sites by removing artifacts from their original location and destroying architectural features including buildings, houses, hearths, storage bins, and other constructed items (Figure 13). In the Bandelier area, surveys have already identified that approximately 80% of the archeological sites have been impacted by erosion.⁶² The park's archeologist has expressed concern that greater erosion from increased wildfires and from possible climate-driven loss of vegetation may have great adverse impacts on the integrity of the park's archeological sites.⁶³

Figure 13. Erosion is probably the biggest climate-change-induced threat to archeological resources in Bandelier National Monument. Photo courtesy of National Park Service.

In the large fires of 1988 in Yellowstone National Park, the historic building of Old Faithful Lodge narrowly escaped the flames, some undiscovered remnants of native American tribal sites may well have been destroyed, and a wickiup—the framework for a native American dwelling—was damaged. In Mesa Verde National Park, the heat of a 1996 fire irreparably damaged a 1,000-year-old Native American petroglyph (or rock art).

Particularly vulnerable are those western national parks that contain cultural resources in woodlands or rangelands subject to wildfires. These include Bandelier National Monument, with several thousand ancestral Pueblo dwellings; Little Bighorn Battlefield National Monument in Montana; Mesa Verde National Park, with its world-famous cliff dwellings and other notable and well-preserved sites (Figure 14); and Yellowstone National Park. All these parks have in recent years experienced significant fires that have endangered archeological resources. Other parks, including Nez Perce National Historical Park in Idaho, Montana, and Washington, Santa Monica Mountains National Recreation Area in California, and Zion National Park in Utah also have archeological and other cultural resources in environments at risk from wildfire.

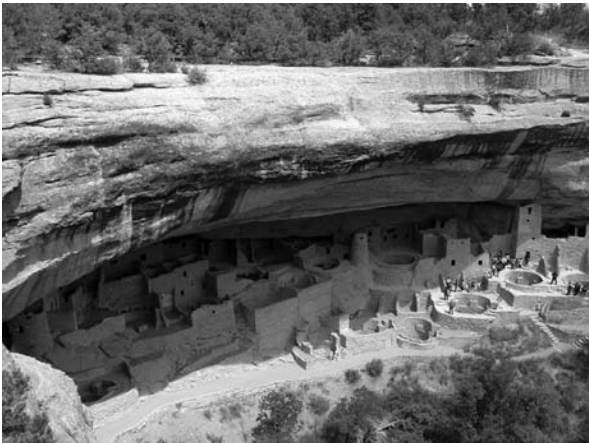
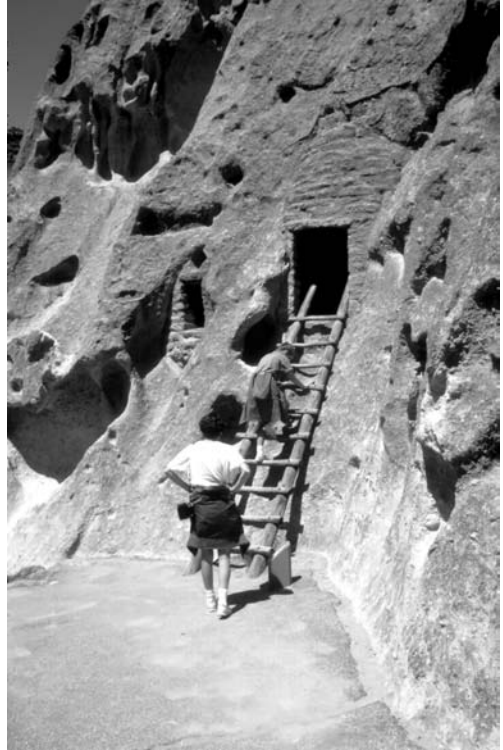


Figure 14. The wooded areas in close proximity to Cliff Palace at Mesa Verde National Park make it especially vulnerable to wildfires. Photo courtesy of U.S. Geological Survey.

Resources threatened by rising seas

With the level of the world's oceans predicted to rise as a result from climate change, cultural resources of the national parks along the Pacific coast could be at risk. Santa Rosa Island in Channel Islands National Park in California is renowned for its abundant archaeological treasures dating back 11,000 years. Olympic National Park's petroglyphs carved into shoreline rocks and shell middens left behind by tribal occupants could be inundated by floodwaters. And in that park the National Park Service is already making plans to move Kalaloch Lodge and nearby historic cabins back from a bluff overlooking the ocean because of the threat of erosion and possible collapse of the bluff, a threat that is increased by the sea-level rise and increased wave action resulting from climate change.

Point Reyes National Seashore in California has more than 120 known sites that are evidence of the Coast Miwok Indians settlements going back 5,000 years. In Golden Gate National Recreation Area in California, historic Fort Mason and portions of the grounds of the Presidio of San Francisco, the oldest continuously used military post in the nation, are low enough to be vulnerable to rising waters.

Part 4: Climate disruption threatens public enjoyment

The western national parks provide millions of Americans with irreplaceable opportunities for enjoyment. These great parks enchant us with their beauty, and restore us with their peace. They are the destinations for generations of families who pack up the car in summer to see bison and wolves in Yellowstone National Park, marvel at the sunset over Grand Canyon, and hike through the cool woods of Yosemite. Just as climate change will disrupt the natural landscape of the West, so too will it interfere with the enjoyment we can derive from the national parks.

Closed parks from more wildfires

Climate disruption is likely to significantly and unnaturally increase wildfires in the West. Scientists have concluded that high temperatures are the climate factor most connected to severe wildfires.⁶⁴ With a hotter climate and greater summer dryness, summer fire seasons are likely to last longer, with more severe fires.⁶⁵

And climate change is likely to increase the frequency and severity of storms and lightning, leading to more lightning ignitions of fires.⁶⁶ In Rocky Mountain National Park, for instance, scientists have predicted that the proportion of fires started by lightning could increase by 50% to 92%.⁶⁷ According to one study looking at the entire West, a modest 2.9-degree (Fahrenheit) increase in average temperatures could double the number of wildfires in western states by century's end and increase the amount of land burned by as much as 140%. According to this study, the western states most at risk for more wildfires are Montana, Wyoming, and New Mexico. In Montana, home of Glacier National Park, the researchers projected that wildfires could increase by as much as 500%.⁶⁸

A more recent study even more emphatically linked the warming already underway in the West with an increase in wildfires. A team of scientists concluded that western wildfires have increased in recent years and that a changing climate, not previous fire-suppression efforts that let fuels accumulate or land-use changes, are the major cause. Comparing the

most recent 17 years with the previous 17, they found that from 1987 on, spring and summer temperatures across the West have increased by 1.5 degrees Fahrenheit, leading to a two-month increase in the length of the wildfire season, a four-fold increase in the number of fires, a five-fold increase in the time needed to put out the average wildfire, and 6.5 times as much area being burned. The scientists found a very strong linkage between high spring and summer temperatures and early snowmelt in an area with severe wildfires there. With temperatures likely to continue getting hotter and snowmelt likely to continue getting earlier, the scientists predict further increases in wildfire frequency and severity. Consistent with the previous study that identified Montana and Wyoming as among the states most vulnerable to increased wildfires, this new study identified the northern Rocky Mountain region as having seen the largest increase in climate wildfires.⁶⁹

Together, these two studies suggest that Glacier National Park, Yellowstone National Park, and Grand Teton National Park, all in the northern Rockies, are the national parks most at risk from increased wildfires (Figure 15). Other national parks in the West are also vulnerable. In Rocky Mountain National Park, researchers projected that changes in conditions resulting from climate change could increase the probability of any one fire spreading beyond 10 acres by 30 to 100%.⁷⁰

Wildfires can disrupt summer vacations for park visitors. In the summer of 2002, when drought conditions and high temperatures combined to produce Colorado's worst fire season in memory, the number of July visitors to Rocky Mountain National Park dropped by

Figure 15. Among the many impacts of the 1988 Yellowstone fires was the disruption of tourism to the park. Here, a plume of smoke rises close to the gateway community of Silvergate, Montana. Jim Peaco photo courtesy of Yellowstone National Park.



nearly 100,000 from the previous year, even without any fires in the park itself.⁷¹ Statewide, reservations at state campgrounds dropped 30% and the number of visitors to some areas declined by as much as 40%.⁷²

In Mesa Verde National Park, in 2000, during the hottest, driest decade on record so far for the park, fires burned more than half of the park and led to closures to all visitors for nearly three weeks in July and August, cutting visitation in those months by almost half.⁷³ The projected increases in wildfire are also likely to reduce visibility in western national parks, one of their most valued qualities. The NPS underscores in its publications that “visitors to national parks expect clean, clear air.”⁷⁴ Yet, according to the National Park Service, smoke from wildfires is a major contributor to the worst visibility days in many western parks.⁷⁵ So if climate change leads to more wildfire in the West, it also would lead to the scenery of the western national parks being obscured more often.

Beach loss because of rising sea levels

Global sea level has risen about seven inches during the past century, and five years ago the United Nations’ Intergovernmental Panel on Climate Change, projected another three to 35 inches of increase by 2100.⁷⁶ More recent studies, including two this year, suggest that a similar or even greater sea-level rise is possible. The first, done for the state of California, gave a range of projections from a low of 4 inches to a high of 31 inches of sea-level rise.⁷⁷ The second found that future warming could be enough to melt polar ice caps, potentially leading to three feet of sea-level rise this century and as much as 20 feet over the next four or five centuries.⁷⁸

The U.S. Geological Survey is working with the National Park Service to identify the possible effects of sea-level rise in several national parks, including in the West. Impacts could include coastal erosion, saltwater intrusion into groundwater aquifers, inundation of wetlands and estuaries, and threats to cultural and historic resources and park infrastructure, with low-lying beaches and estuaries at greatest risk. The USGS assessments identify these western national parks as particularly at risk.⁷⁹

- **Golden Gate National Recreation Area.** All 59 miles of beaches in this national recreation area are judged high to very high in vulnerability because of their coastal slope, wave heights, and the range of local tides. The vulnerable beaches include heavily visited Ocean Beach, China Beach, and Baker Beach, all near San Francisco, and Muir Beach and Stinson Beach, along coastal bluffs north of San Francisco Bay. A sea-level rise of three feet or more would likely inundate most, if not all, of the sandy beaches. The beaches closest to San Francisco are among the most heavily used areas in the entire National Park System, attracting much of the 16 million visitor-days of use in Golden Gate National Recreation Area.
- **Point Reyes National Seashore.** All of the beaches on the west side of Point Reyes, where wave heights are highest and coastal slopes low, are rated high to very high in vulnerability (Figure 16). The estuaries of Abbotts Lagoon and Drakes Estero, adjacent to the coastline, are also at risk from sea-level rise. The seashore’s beaches, including both the 10-mile-long natural and undeveloped Point Reyes Beach and Drakes Beach, right

below the visitor center, along with the estuaries, which are prime wildlife viewing areas, are central features of this park, just an hour's drive from the San Francisco Bay area.

- **Channel Islands National Park.** About one-half of the 250 miles of shoreline around the southern California islands making up this national park is rated high or very high in vulnerability to sea-level rise, based on coastal slopes and tidal ranges. The largest stretches of very high vulnerability are on the two westernmost islands, San Miguel and Santa Rosa. About a half million people a year visit this park, many to observe the 50,000 seals and sea lions, of six different species, that live and breed on the shore of San Miguel Island.
- **Olympic National Park.** More than half of the 65 miles of coastline in the park is rated high or very high in vulnerability, based on wave heights (especially during El Niño-driven storms) and a low coastal slope near the park's beaches. Especially vulnerable are Shi Shi Beach at the north end of the park, Rialto Beach in the middle section, and Ruby Beach at the south end (Figure 17). The park's intermittent sand or gravel pocket beaches against the coast's rocky cliffs are favorite destinations of many park visitors.

National parks intolerably hot

Some national parks may simply become too hot to be enjoyable for long stretches of the year. Death Valley National Park in California is one of the hottest places on Earth, already typically hotter than 100 degrees Fahrenheit from late May through September and with an average daily high of 115 in July (Figure 18). Not surprisingly, visitation here is lower in the summer than in the peak months in spring and fall. Other national parks in the California desert and

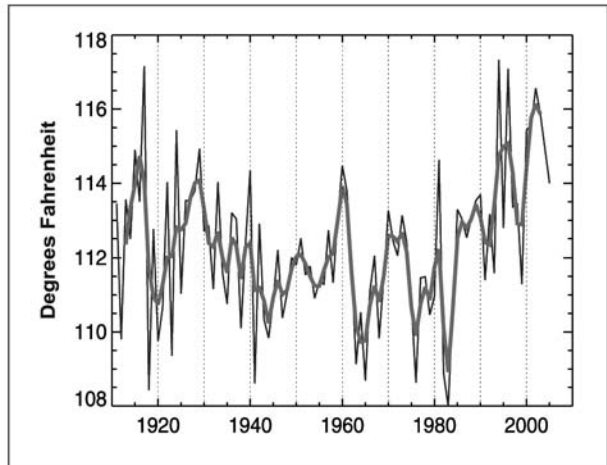


Figure 16 (top). Beaches on the west side of Point Reyes National Seashore have little relief, and so are particularly susceptible to sea-level rise. Photo courtesy of Point Reyes National Seashore.

Figure 17 (bottom). Sea stacks at Ruby Beach—one of Olympic National Park's most vulnerable. Photo courtesy of U.S. Geological Survey.



Figure 18. Average summer maximum temperatures in Death Valley National Park, 1905–2005. Average daily maximum temperatures are shown for the months of June, July, and August. Each year's average is shown by the black line, the running five-year average by the grey line. Data are from a Historical Climate Network weather station in the park. Analysis by J. A. Hicke, Department of Geography, University of Idaho.



many of the 23 parks on the Colorado Plateau are only slightly less hot. In Joshua Tree National Park, for example, average summer highs already are over 100, and in Zion National Park they typically range from 95 to 107.

According to some climate models, the Southwest may experience more warming than most parts of the country. One projection said average temperatures in the Southwest could increase by as much as 14 degrees Fahrenheit, or even more, by the late 21st century.⁸⁰ Another study of how global warming could increase heat waves also concluded that the western United States is likely to experience a greater increase in heat waves than the East.⁸¹ All in all, it seems unfortunately likely that southwestern national parks that are already hot are at particular risk of becoming too hot to be tolerable for much of the year.

Overcrowded national parks

On the other hand, climate change may make relatively cooler mountain national parks and national seashores, increasingly attractive as places to escape the heat as well as enjoy the outdoors. In Rocky Mountain National Park, a survey of park visitors suggests that under the climate conditions projected by 2020 enough visitors would come more often and stay longer to increase the number of visitor-days each year by more than one million—nearly a one-third increase.⁸² Similar results were obtained by researchers in a comprehensive study of Canadian national parks.⁸³

Increased use of the western national parks is also likely as a result of growing population in the West; the region's total population is expected to grow from 48 million in 1999 to between 60 and 74 million in 2025, with California likely to experience the greatest increase in absolute terms (with about 10 million new people) and Arizona and Nevada the greatest in percentage terms. The greatest increases in visitation seem likeliest for national parks that both offer escapes from heat and are near the most rapidly growing populations. Yosemite National Park is the foremost example (Figure 19).

More congestion can make trips to national parks less enjoyable for visitors. Increased visitor numbers would also aggravate one of the most serious problems in the national park



Figure 19. Under a warmer climate regime, it is possible that more people than ever will go to high-elevation parks in the summer to beat the heat. Yosemite is a likely destination. Photo courtesy of National Park Service.

system: a shortage of funds to meet the needs of the parks and the visitors. Already, funding for park operations has not kept up with inflation and about one-third of park operating needs go unfunded each year.⁸⁴ As a result, park managers have to cut back important services: The numbers of commissioned park rangers dropped 16% from 1980 to 2001 and of seasonal rangers dropped 24%.⁸⁵ And the backlog of unmet maintenance needs is about \$5 billion for the national park system, more than twice the National Park Service's annual operating budget.⁸⁶

Boating and fishing loss because of less and warmer waters in summer

More winter precipitation falling as rain, rather than snow, in the West and earlier melting of mountain snowpacks have moved peak rivers flows sooner in the year, which also is before summer vacation schedules.⁸⁷ The seasonal shifts not only affect the timing of river flow, but also the amount of water in the rivers. On April 1, 2006, the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture forecast that the South Platte River would have 118% of its normal flow. A month and a half later, NRCS cut its projection in half, to 65% of the normal flow, because the month of April was so hot that much of the basin's snowpack simply evaporated instead of becoming runoff.⁸⁸

With less runoff, water levels decline, jeopardizing summer recreational opportunities such as boating, rafting, and kayaking for many visitors to western national parks (Figure 20). Nearly 300,000 visitors each year go whitewater rafting and kayaking through some of the West's most dramatic landscapes in Black Canyon of the Gunnison (in Colorado), Grand

Figure 20. Summertime water levels could decline throughout the West, affecting popular river-based recreational activities, such as rafting in Dinosaur National Monument. Photo courtesy of National Park Service.

Canyon, and Grand Teton national parks, and in Dinosaur National Monument (in Colorado and Utah). Almost 10 million visitors a year go to Lake Mead National Recreation Area in Arizona and Nevada and to Glen Canyon National Recreation Area in Utah, which contains the Lake Powell reservoir created by Glen Canyon Dam, many to enjoy boating on the reservoirs.

Opinions on Glen Canyon Dam, in particular, remain sharply divided five decades after the dam was authorized. Environmentalists have long lamented how Glen Canyon Dam inundates natural and cultural resources, alters the natural cyclical flows of the Colorado River through the Grand Canyon, and threatens several fish species and the ecosystem as a whole. When drought dropped the water levels in Lake Powell from full in 1999 to 33% full in 2005—a larger and quicker decline than most river observers thought possible—many celebrated the natural and cultural resources that were revealed. But the lower water levels also affected boating. The number of visitors to Lake Powell also fell, by 800,000 or 30%, between 1999 and 2005. At Lake Mead the number of visitors fell by 1.2 million, or 13%. The National Park Service spent \$20 million to extend boat ramps to the new, lower edge of the reservoir, a concessionaire spent \$2 million to move a marina 12 miles, and at Boulder Beach people had to walk a half-mile to reach restrooms left behind by the receding waterline.

Climate studies suggest that the recent sharp drop in Lake Powell may not be an aberration. A recent study of possible climate change effects on the Colorado River project a 36% decline of water storage in Lake Powell and Lake Mead as early as 2010 to 2039, compared to historical conditions, and a 40% decline during the next 30 years.⁸⁹ Changes of this magnitude would have effects not just on the river's ecosystem and recreational boating, but also on the 30 million Americans from Denver to San Diego who now use Colorado River water.

Fishing is also popular in many western parks, with Black Canyon of the Gunnison, Glacier, North Cascades, Olympic, Rocky Mountain, and Yellowstone national parks particularly prized by many fly fishermen (Figure 21). But western trout and other coldwater fish species such as salmon are acutely vulnerable to increases in water temperature likely to result from climate change. In fact, in the Fraser River, downstream of Jasper National Park in Canada, salmon have suffered 50% mortality in several runs during years with warmer than normal water temperatures.⁹⁰

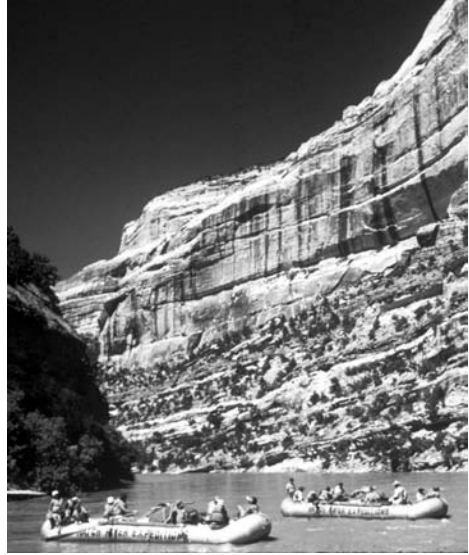




Figure 21. Fly-fishing waters in several western parks could experience declines in prized species of trout and other colwater fish. Photo courtesy of Yellowstone National Park.

Studies show that most adult salmon, steelhead, and trout species can survive only where average highs on summer days are below 70 degrees Fahrenheit and that a 5.4-degree (Fahrenheit) increase in summer temperatures would make more than half of the trout streams in the Rocky Mountain region too hot for trout.⁹¹

Another study, by Defenders of Wildlife and the Natural Resources Defense Council, predicts that overall habitat for some fish species could shrink as much as 17% by 2030, 34% by 2060, and 42% by 2090.⁹²

Winter recreation loss caused by warmer winters

Climate scientists predict that as climate change continues, winter will start even later and end even sooner, with less wintertime snow on the ground, decreasing opportunities for snow-dependent outdoor winter recreation in western national parks and elsewhere.

Yellowstone is the most popular national park for snow-dependent recreation, with about 100,000 visitors during the winter season when roads are snow-covered and closed to conventional motor vehicles. The National Park Service has been engaged for several recent years in a controversial winter-use planning process to determine what types of uses to allow in the park. Whatever the outcome of that process, all sides to the controversy support a continuation of the longstanding policy of not plowing the park's interior roads after enough snow accumulates to allow over-snow recreation. But global warming is likely to continue making winters shorter and milder and diminish opportunities to enjoy a snow-covered Yellowstone. Already, the National Park Service has had to delay the opening day of Yellowstone's winter season, from mid-November 20 years ago to mid-December in most recent years, and all the way to January 1 in the winter of 2004–05. Figure 22 illustrates why. In the Yellowstone area, the temperature record since the beginning of the twentieth century shows that in the December-to-March winter-use season, while average daily maximum temperatures (top figure) have remained within the historical range, average daily minimum temperatures (middle figure) have shown a warming trend. Daily minimum temperatures can be more important for building up and maintaining sufficient snow to allow oversnow vehicles to operate. The bottom figure shows that over the past 10 years in the Yellowstone area, the months in the December-to-March winter-use season have experienced more warming than

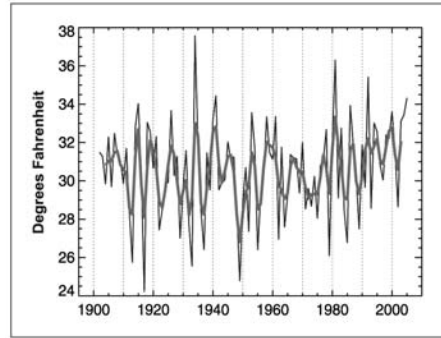
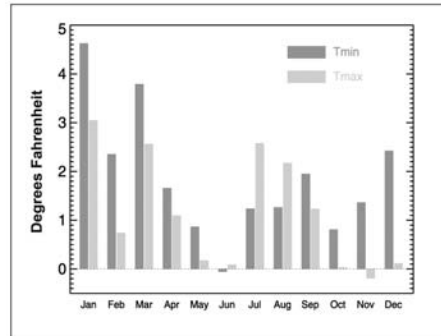
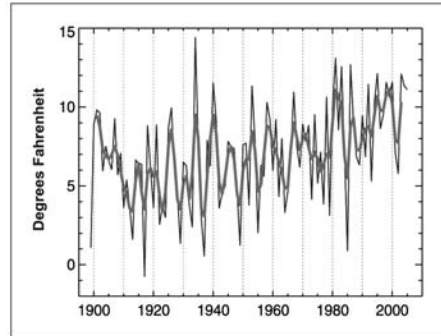


Figure 22. The top figure shows the average daily high temperatures and the middle figure the average daily low temperatures for the Yellowstone area in winter (December through March) for each year, from the beginnings of the temperature record through 2005. Each year's seasonal average is shown by the black line, a running 5-year average by the grey line. The bottom figure compares the average monthly low temperatures ("Tmin") and high temperatures ("Tmax") in the Yellowstone area for 1996–2005 to the historical monthly averages prior to 1991. Data are from four Historical Climate Network stations in and around Yellowstone National Park. Analysis by J. A. Hicke, Geography Department, University of Idaho.



other months of the year (with, again, a greater increase for average daily minimum temperatures than for daily maximum temperatures).

Opportunities for snow-dependent recreation will shrink not just in Yellowstone and nearby Grand Teton, but also in other mountain national parks. Rocky Mountain National Park, as one example, is a popular wintertime destination for thousands of cross-country skiers and snowshoers from among the 2.5 million people in Denver and other nearby Front Range cities. Researchers have projected that in the national park's Loch Vale basin, near popular ski and snowshoe trails, a 7-degree (Fahrenheit) increase in temperature could lead

to a 50% reduction in the basin's snowpack.⁹³ The projected decreases in snowfall and snow accumulation everywhere in the West would similarly hurt cross-country skiing, snowshoeing, and other forms of winter recreation in national parks across the region.

National parks more polluted

Climate change may also increase levels of ozone, a form of smog. The pollutants that combine to form ozone can travel long distances, and national parks across the West are experiencing increasing levels of ozone (Figure 23). Joshua Tree, Sequoia/Kings Canyon, and Yosemite national parks all have ozone levels in violation of the Environmental Protection Agency's health-based standards, meaning that pollution levels in those parks can cause health problems for visitors. Many other western parks showed significant increases in ozone from 1990 to 1999.⁹⁴ Since high temperatures increase ozone production, climate change is likely to lead to higher ozone levels, in national parks and elsewhere.⁹⁵

Part 5: Recommendations for reducing climate disruption

Protecting our treasured western national parks from climate disruption will take action to both reduce global warming pollutants and to prepare for the changes that may still occur.

Figure 23. Clear skies, such as those pictured below at Grand Canyon, are critical for the enjoyment of western parks. Rising ozone levels impair air quality, both in terms of human health and by damaging viewsheds. Photo courtesy of Grand Canyon National Park.



Fortunately, there are many commonsense actions that can be taken to change the odds. Encouragingly, more Americans are becoming aware of what is at stake, taking action themselves, and expecting action from their leaders.

Public officials in the West are particularly beginning to demonstrate leadership on this issue, perhaps motivated by a growing awareness of how the region's resources, quality of life, and economy are at risk. Senator John McCain of Arizona has long championed national legislation to reduce greenhouse gases. Senators Pete V. Domenici and Jeff Bingaman of New Mexico are working together to craft other strategies. At the state and local levels, too, some of the most significant steps to counteract climate change are being taken by public officials in the West. In the western United States and elsewhere, comprehensive action is needed—at all levels of government, by the private sector, and on the part of individuals—to secure the better future that is possible.

National Park Service climate action

When it comes to protection of the resources and values of our national parks, the National Park Service (NPS) has the first obligation. The Clean Air Act provides that NPS has “an affirmative responsibility to protect the air-quality related values” of national parks.⁹⁶ Park resources and values that are adversely affected by climate change certainly fall within this mandate, as climate change is caused by pollution of the atmosphere, which is defined as “the entire mass of air surrounding the earth.”⁹⁷ The National Park Service's *Management Policies* also boldly declare that “the Service will use all available authorities to protect park resources and values from potentially harmful activities.... NPS managers must always seek ways to avoid, or minimize to the greatest degree possible, adverse impacts on park resources and values.”⁹⁸ It is time for the National Park Service to exercise its authorities to address climate change, the greatest threat ever to national park resources and values. NPS should take the following actions.

Identify vulnerabilities in the national park system and determine the resources and values of individual parks most at risk from climate change. Much is already known about how climate change puts parks at risk, but a great deal is not yet known. The Park Service should greatly expand and accelerate the research, inventories, and analysis it has already conducted and permitted to better identify climate change's threat to the entire national park system and to individual parks.

Identify how NPS can take action to protect parks from climate change. Possible actions include revising management plans and taking measures to protect individual park resources and values. In some cases, park boundary changes and cooperative management with other landowners could be appropriate when current boundaries may no longer be adequate to protect a park in the face of the changed conditions accompanying climate disruption. Key plant and animal species may need to be able to use migration corridors and other habitat outside of a park to be able to maintain current populations within the park.

Cooperate with partners to mitigate climate change damage to parks. NPS should partner with other federal agencies; state, tribal, and local governments; other landowners; non-governmental organizations; and others to identify and promote actions to reduce both the extent of climate change and its impacts on park resources and values.

Speak out about the risks to parks. In communicating with individual NPS officials and employees in the preparation of this report, the authors were impressed by the extent of the knowledge and concern that many individuals in the Park Service have about climate change. The NPS leadership should gather and augment that information and disseminate it to the public at large and key decision-makers in Congress, other executive offices, and elsewhere. Such an approach is supported by the NPS *Management Policies*, which state that when park resources and values are at risk from external threats, “it is appropriate for superintendents to engage constructively with the broader community in the same way that any good neighbor would.... When engaged in these activities, superintendents should promote better understanding and communication by documenting the park’s concerns and by sharing them with all who are interested.”⁹⁹ In this case, when the external risk to parks comes not from other local or regional activities, but from human activities worldwide, the responsibility to speak out belongs not just to an individual superintendent addressing a local audience but also to the entire leadership of the National Park Service addressing a large audience.

National climate action¹⁰⁰

The scientific community agrees that climate change is happening and that it is largely caused by consumption of fossil fuels, mainly in power plants and vehicles. Understanding of these truths among the general public has also increased greatly in the last two years. Unfortunately, policies to slow, stop, and reverse emissions of global warming have not yet been enacted where they are most needed—at the federal level.

The U.S. Senate did, however, take the important step in June 2005 of officially recognizing the problem, humankind’s role in it, and the need for action. The majority of Senators (53) voted in favor of a nonbinding resolution stating: “It is the sense of the Senate that Congress should enact a comprehensive and effective national program of mandatory, market-based limits and incentives on emissions of greenhouse gases that slow, stop, and reverse the growth of such emissions....”

A recommended framework for action

The United States government must begin to significantly reduce our emissions within 10 years if we are to limit climate change to 3.6 degrees Fahrenheit and avoid the most dangerous impacts caused by rising temperatures. The window of opportunity is closing, and the time for action is now. The Senate and the House of Representatives have proposed legislation to address climate change. But to date, few if any of these proposals contain the policies necessary to cut back on emissions in time to stave off dangerous impacts.

The good news is that we can meet the emissions challenge through a combination of four approaches:

- **Energy efficiency.** By far the cheapest and fastest way to reduce emissions from power plants is to improve the efficiency of products and buildings that use electricity. This means developing technologies that allow us to get more power while using less energy—and releasing fewer emissions. We already know how to do it: we’ve achieved dra-

matic results by reducing the energy use of refrigerators, air conditioners, lighting systems, and buildings. It's time to set our sights on meeting our growing demand for energy with energy efficiency.

- **Cleaner power plants.** We have the technology to build power plants in a way that won't wreck the climate, and without turning to nuclear power. Through a combination of existing technologies—each in commercial operation today—we can convert coal into a cleaner-burning gas and siphon off the climate change pollutants before the gas-burning process. These pollutants, mainly carbon dioxide, can then be safely disposed deep underground. However, if we don't invest in this technology now, neither will China, India, or other countries with large coal supplies. It's up to the United States to lead the global response to climate change.
- **Cleaner vehicles.** Auto manufacturers know how to do it, and they already have the technology. Hybrid cars show us that dramatic improvements in emission reductions and fuel efficiency are possible. It's time to deploy hybrid and other fuel-efficient technologies throughout our vehicle fleets.
- **Clean, renewable power.** Biofuels and other renewable-energy technologies such as wind power are economically competitive today. Our cars are already equipped to run on ethanol that is blended with gasoline. And there are new methods for making ethanol from farm wastes and highly efficient crops that could compete with oil on a very large scale, generating more than 10 times the current ethanol production. This homegrown ethanol puts farmers in the business of growing fuel in addition to growing food.

Regional climate action

In the face of inaction to reduce climate change pollution at the federal level, states and cities are forming partnerships and moving forward on their own.

East Coast. In a historic agreement, eight states (Connecticut, Delaware, Maryland, Maine, New Hampshire, New Jersey, New York, and Vermont) have banded together to form the Regional Greenhouse Gas Initiative (RGGI), a market trading system covering carbon dioxide emissions from power plants. The RGGI agreement calls for states to stabilize emissions at roughly the current levels from 2009 through 2015, and for reductions to reach 10% by 2019.

West Coast. California, Oregon, and Washington are cooperating on a strategy to reduce emissions, known as the West Coast Governors' Climate Change Initiative. These states collaborated to produce a set of recommendations for cutting back on emissions that the states can pursue cooperatively and individually.

Southwest. In February 2006, Governors Janet Napolitano (Arizona) and Bill Richardson (New Mexico) signed the Southwest Climate Change Initiative, which establishes a framework for the two states to collaborate to reduce climate change pollution. Plans include developing measures for forecasting and reporting emissions; offering credits for emissions-reduction actions; promoting emissions mitigation, energy efficiency, and renewable energy sources that enhance economic growth; and advocating for regional and national climate policies.

Midwest. In early 2006, a bipartisan group of state legislators from Illinois, Iowa, Michigan, Minnesota, Ohio, and Wisconsin introduced legislation to limit carbon emissions, fund and/or mandate renewable energy development, and create standards and incentives for energy efficiency and efficient appliance purchases. Policy-makers are also working to encourage coal gasification and carbon sequestration, key issues for states that rely heavily on coal-fired generation.

State and local climate action

As of January 2006, 39 states had completed greenhouse gas emission inventories, 28 states had completed state climate action plans, and nine states had emission reduction targets. To date, 10 states have adopted California's landmark 2004 law requiring automakers for the first time to limit heat-trapping carbon dioxide emissions. The law calls for 30% reductions by 2016, beginning with the 2009 model year; Connecticut, Maine, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, Oregon, Vermont, and Washington have adopted the standards. These 11 states account for about 5.7 million new vehicles, or about a third of the new U.S. passenger market.

Around the country, other states are making strides toward limiting their emissions:

- **Arizona.** In February 2005, Governor Janet Napolitano signed an executive order creating a Climate Change Advisory Group charged with recommending ways to reduce Arizona's greenhouse gas emissions. The group is expected to submit its report to the governor this summer.
- **California.** In June 2005, Governor Arnold Schwarzenegger called for a multiphase reduction of state greenhouse gas emissions that would bring emissions down to 2000 levels by 2010; 1990 levels by 2020; and 80% below 1990 levels by 2050. Also in 2005, the state established a greenhouse gas performance standard which requires that any new long-term power purchase contracts meet strict climate change pollution standards. This comes on the heels of a December 2004 requirement from the California Public Utilities Commission (CPUC) that power companies consider the financial risk associated with carbon emissions from power plants when comparing prices of fossil fuel and renewable generation, as well as demand-side management investments.
- **New Mexico.** In June 2005 Governor Bill Richardson established a climate change stakeholder panel charged with finding ways to reduce the state's emission to 2000 levels by 2012, 10% below 2000 levels by 2020, and 75% below 2000 emission levels by 2050.
- **North Carolina.** Governor Mike Easley signed a bill in September 2005 that established the Legislative Commission on Global Climate Change. The commission is charged with addressing the threats posed by climate change and determining the costs and benefits of the various mitigation strategies adopted by state and national governments. Findings and recommendations are due in November 2006.
- **Washington and Oregon.** These Northwest states have each created statutes requiring new power plants to offset anticipated carbon dioxide emissions by approximately 17 and 20%, respectively.

At the local level, the U.S. Conference of Mayors adopted a Climate Protection Agreement in June 2005 that replicates the Kyoto Protocol's goal of reducing greenhouse gas emissions to 7% below 1990 levels by 2012. In addition, 152 local governments in the United States participate in an ICLEI Cities for Climate Protection Campaign under which they inventory their greenhouse gas emissions, set targets for future reductions, develop local action plans to achieve those targets, and monitor their progress. Portland, Oregon, recently documented that it has reduced citywide emissions of greenhouse gases below 1990 levels—the first American city to do so.

As important and encouraging as these actions are, they are just first steps. Much more will be needed to preserve not just the national parks of the American West, but the quality of life worldwide. It is only prudent and responsible to move forward and meet this challenge.

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An Inarticulate Truth: Communicating the Science of Global Climate Change

Jonathan B. Jarvis

Ed. note: The following remarks were delivered as the keynote address to the 2006 MTNLCIM Conference, convened by CIRMOUNT, the Consortium for Integrated Climate Research in Western Mountains (www.fs.fed.us/psw/cirmount/).

I HEARD RECENTLY THAT ON A SCIENTIFIC SURVEY OF WHAT PEOPLE FEAR MOST, they put public speaking first ... and death second. That means, statistically, that the person delivering a eulogy at a funeral would rather be in the coffin than standing up in front of the group. But I am honored to be speaking to you. Thank you for the invitation to join you here tonight. I want to open with two short passages about essentially the same thing, but written by two very different authors. Author 1:

Boreal habitats in Alaska support 130 species of breeding landbirds, including 68 species that migrate to Neotropical wintering areas. Significant population declines have been documented for many of these species in temperate regions over the past 30 years. Little information exists on the status of Alaskan populations in relation to those of temperate regions, habitat requirements in the north, or methods that can be used to monitor landbird populations in arctic and subarctic biomes. Designing a monitoring program for Alaska requires special considerations: the effects of long daylength, the constricted breeding season, diversity of landbird habitats, restricted road access to vast areas, expensive logistics, and high turnover of observers. This research project has three major goals: (1) to design and test methodology for a cooperative, regional program to monitor population trends of landbirds breeding in northern ecoregions; (2) to investigate relationships between the distribution of breeding landbirds and terrestrial habitats at the landscape level; and (3) to examine population dynamics governing population trends in boreal regions.

Author 2:

I marveled at this intense and concentrated beauty on the vast table of the plain. I walked on to find Lapland longspurs as still on their nests as stones, their dark eyes gleaming. At the nest of two snowy owls I stopped. These are more formidable animals than plovers. I stood motionless. The wild glare in their eyes receded. One owl settled back slowly over its three eggs, with an aura of primitive alertness. The other watched me and immediately sought a

bond with my eyes if I started to move. I took to bowing on these evening walks, I would bow slightly with my hands in my pockets, toward the birds and the evidence of life in their nests, because of their fecundity, unexpected in this remote region, and because of the serene arctic light that came down over the land like breath, like breathing.

The first passage was from the U.S. Geological Survey's Alaska Science Center website. The second passage was from Barry Lopez, in his book *Arctic Dreams*.

Both of these writers were seeing the same thing and communicating about it differently. One scientifically, one poetically. One clinically, one emotionally. One connects to the right brain, the other to the left brain. One may spur us to think, the other to act.

Tonight, I want to talk about the convergence of those two voices and why we need both.

So there will be no doubt about where I stand, I am going to just state right up front that I am an advocate for mountains and their ecology. I am going to assume that you too are advocates. You are like a medical doctor who has been presiding over the care of a particularly attractive patient, suffering from a chronic disease, but you have fallen in love with the patient. It's personal for you now. It's personal for me. The challenge we have is to make it personal for everyone.

I cannot sit back and watch these magnificent resources decline.

At least in this room, I hope we all agree that the climate is changing and at least some of the causes can be directly linked back to the activities of humans. Anyone who really doubts that flunked fifth-grade science and should be a card-carrying member of the Flat Earth Society.

As with any complex scientific issue, there are many unanswered questions. There are many who will publicly offer their doubts. But for this crowd here tonight, the debate is over.

I know firsthand the results of your research on receding glaciers because I have hiked the melting glaciers in Alaska and climbed the slopes of Mount Rainier across rocky fields that were once under ice.

I can personally verify the declining density of the snow pack of the Cascades because I ran the snow surveys in Crater Lake for a number of years and for awhile carried the satellite downlink from the snow-tell site on Mount Rainier on my palm pilot.

I can attest that this has been the largest year of wildfire since the mid-1960s—over 8 million acres burned—just by looking into the eyes of my fire staff, who are worn to a frazzle.

I get it, you get it, but there are several million people out there, in Portland, in Seattle, in Omaha, who need to hear the results of your research and begin to understand how it is going to affect them, personally.

The other day, I was on a plane back to Oakland from Denver, and working on a pile of papers. A stylish, professional woman, perhaps in her mid-fifties, was sitting next to me. She noticed the National Park Service logo on my stacks and asked about my work. Our conversation led her to comment that she had lived in Tacoma, Washington, for 25 years.

When I responded that I had been the superintendent of Mount Rainier National Park, she said, "That extinct volcano?" I said, "You mean the most dangerous volcano in North America?" She looked astonished. I went on to describe, in detail, the volcanic history and

the probably future of Mount Rainier. As I droned on and on about hydrothermally altered rock and pyroclastic debris flows, I noticed that she seemed to be eyeing her copy of *Vogue* magazine, perhaps sorry that she started this conversation.

So I changed my tactics.

I asked if she had ever been bicycling along the Foothills Trail in Orting. She said yes, and then I said, “Did you know that developers building homes in the Orting valley have been finding the stumps of a forest, buried under 15 feet of concrete-like mud from Mount Rainier?”

I said, “Did you know that 6,000 years ago the Ocoela mudflow from Mount Rainier roared down the White River valley towards Orting at 60 miles an hour at the height of the Space Needle, and that the mud shaped the bottom of the Puget Sound?”

Now it was getting personal. The message the same ... the delivery different. The first was about the mountain, the second was about her.

In the last ten years the National Park Service and the U.S. Geological Survey have been working with the local counties and the media to change the people’s understanding of Mount Rainier from an extinct volcano to a serious potential hazard, not to be taken for granted.

Over last two weeks, I have been to one place that reminds me that by the application of excellent research and a concerted effort of education, we together can affect public opinion. I was in Sequoia and Kings Canyon National Parks for a series of meetings that involved several presentations by the fire education staff. A young woman and her assistants held up maps of the park and detailed the fire history as a whiff of smoke drifted down from the several thousand acres on fire in the park. She detailed how a few years ago a wildland fire-use fire burned right above an occupied campground throughout most of the summer as visitors went about their recreational pursuits. Interpreters roved the campground with reassuring messages about safety and the fire.

I had to take a moment to remind myself how far we have come from the highly effective days when Smoky Bear had the American citizen convinced that all fire was bad—hey, it almost killed Bambi! In the very early days of prescribed burns in Crater Lake National Park, the rangers had to scrape the burned bark off of the ponderosa pines on the entrance road side of the trees so as to not upset the public. Today, we station interpreters in the parking lot over natural fires to talk of their benefits to the ecosystem. This is an extraordinary sea change in public opinion.

About five years ago the National Park Service launched what is known as the Natural Resource Challenge. The Challenge was designed as a multiyear, \$100 million effort to institutionalize a long-term inventory and monitoring program for natural resources in the all of our natural resources units of the system. Now some of you might think that for a 90-year-old agency like the NPS to just now be getting around to developing such a program seems odd. I could tell you why, but that would take another long talk. For those of you who really want to know the sordid details of our historical failings, I suggest you read *Preserving Nature in the National Parks*, a great historical account of the dominance of the agency by landscape architects, written by Richard West Sellars.

Many of us combat biologists had been arguing for such an initiative for decades. When then-NPS Deputy Director Deny Galvin finally signed on to our great push for the Natural Resources Challenge, I accused him of having a “deathbed conversion.” When I looked him in the eye and said, “Deny, a bunch of us young whippersnappers have been telling you this for years,” he responded with: “Yes, but you were so inarticulate.”

Perhaps we were inarticulate. But we make up for it with passion and a strong dose of whining.

Someday, I will write my management excellence book to stand beside Steven Covey’s *Seven Habits* or the *One Minute Manager*. I will call my book *Winning through Whining*.

As a result of the Challenge, the NPS divided up the parks into inventory and monitoring networks whose boundaries basically coincide with Robert Bailey’s ecoregional classification of the United States. The networks in the NPS’s Pacific West Region, with a few example parks, are:

- North Coast and Cascades: Olympic, North Cascades, and Mount Rainier
- Klamath: Redwood, Crater Lake, Lassen
- Columbia: Lake Roosevelt, Hagerman Fossil Beds, and Craters of the Moon
- Sierra: Yosemite and Sequoia and Kings Canyon
- San Francisco Bay: Point Reyes and Pinnacles
- Mojave: Joshua Tree, Death Valley, and Lake Mead
- Mediterranean Coast: Channel Islands and Santa Monica Mountains
- Pacific Islands: Hawaii Volcano and Haleakala

For the NPS, the Challenge has been one of the more successful programs in decades, pumping nearly 80 million new dollars into the inventory and monitoring program, establishing a network of Cooperative Ecosystem Study Units at various universities, and implementing a series of Research Learning Centers.

I could drone on and on about the long-term benefits of the Challenge, but I want mostly to speak to two aspects: (1) the approach we are using here in the Pacific, and (2) the communication aspect.

As director of the NPS’s Pacific West Region, it has been always my goal to figure out how to institutionalize a program such as this—to ensure that it does not just disappear like the Park Service’s science program did after its dynamic first scientist, George Wright, died at a young age in a car accident over 70 years ago. To accomplish that, I needed to structure everything we do in the Pacific around these ecological networks. They become the core of our organization and therefore we begin to function as a network, thinking like a network and acting accordingly. I can tell you tonight we have accomplished just that. Our superintendents are now operating as boards of directors over these networks, sharing resources, funding, and information and addressing a wide range of issues, not just those related to natural resources. Co-dependencies are forming and so then do the institutional requirements that keep the daily monitoring of park resources so integral to their thinking that they would no more stop the sampling of the air than close the visitor center.

I mentioned earlier the advent of Research Learning Centers as part of the Challenge. These are designed as an interface between research, researchers, and our communication professionals. We already are able to say many things about the status of the resources in our stewardship, and soon will be able to say much more.

In the hands of our professional communicators we can reach the public: through art, poetry, podcasts, web pages, music, education programs, school curricula, and so on. The opportunities are really exciting.

Two more quotes:

In general, whitebark pine trees in Waterton Lakes National Park, Alberta, and Glacier National Park and Blackfoot Reservation, Montana, have suffered serious declines, while further south, whitebark pine mortality was low and blister rust infection rates were moderate to low.... In the northern portion of the sample area, approximately 30% of the whitebark pine trees were dead, and of the remaining live trees, about 70% were infected with rust and had an average of 25% crown kill. In the Greater Yellowstone Ecosystem, whitebark mortality averaged 7%.

— *USGS Northern Rocky Mountain Science Center*

You know the path, but wander, thrilled, over the bare and pathless rock, as if it were solidified air and cloud. That rocky, misty summit, secreted in the clouds, was far more thrillingly awful and sublime than the crater of a volcano spouting fire.

— *Henry David Thoreau*

I recently asked the Pacific West Region's Science Council and our Natural Resource Advisory Committee to forward to me the top science and conservation issues facing the parks in the west. These are to become our major focus over the next year. Our goals are to better understand their scientific status and also how to communicate effectively with the public what we know and what we don't know. From that we will develop a strategic vision and action plan for the future of the parks of the Pacific West Region. You will note a lot of overlap with CIRMOUNT's "Mapping New Terrain."

Key conservation science issues

Habitat loss and landscape fragmentation. Dramatic changes in land use from human developments have resulted in landscape fragmentation and habitat loss in much of the United States. The effects on national parks of large-scale conversion of open space will place increasing stress on the integrity of park ecosystems. Some indicators of this stress are: loss of species, increasing numbers of threatened and endangered species, fragmentation of landscapes, pressure on mobile species, and increases in invasive species. The National Park Service will greatly benefit from improved understanding of fragmentation impacts on park ecosystems, identification of species at risk from fragmentation, and landscape-level techniques to monitor habitat loss and fragmentation changes in parks and surrounding lands. The important roles that parks play in regional conservation efforts—and, conversely, how surrounding activities affect park protection goals—are also critical conservation concerns.

Fragmentation effects also interact with other system stressors, such as invasive species, changing fire regimes, and global climate change, further complicating efforts by parks to conserve and protect resources in increasingly fragmented landscapes.

Invasive species. Human activities in and around parks have resulted in multiple introductions of non-native species into park ecosystems. In many cases, these species become major invasive pests, displacing native plants and animals through competitive exclusion, habitat alteration, and predation. Impacts can be severe both spatially and temporally, and have the potential to irreparably alter entire parks and ecosystems. The National Park Service would greatly benefit from better techniques to identify potential invasive exotics, control or eliminate invasive species, and prioritize eradication and control methods to concentrate on those species that pose the greatest risks yet are amenable to control. On a broader scale, techniques to evaluate the long-term dynamics of invasives across park networks and landscapes will help park managers focus control efforts and possibly prevent future invasions. Understanding the characteristics that make non-native species invasive will also benefit parks by providing possible early warning systems and allowing park managers to employ techniques that prevent invasive exotics from becoming established.

Global change. Although the degree to which global processes are affected by human activities remains elusive, there is scientific consensus that anthropogenic activities are affecting global climate and atmospheric chemistry, pollutant amounts and distribution, and biotoxin accumulations in ecosystems. These global changes will have far-reaching consequences on National Park Service resource stewardship efforts. If park managers are to formulate strategies to mitigate or adapt to global change effects they must understand the relationship between global change and resource impacts.

Changing fire regimes. In many national parks, alteration of historic fire regimes significantly affects ecosystem structure and function, and habitat characteristics. In some instances, past fire prevention has created the need for on-the-ground resource management activities (e.g., prescribed fire) to preserve and protect park resources. In other cases, ongoing human activities in and around parks continue to alter fire regimes, often by creating shorter fire return intervals, with dramatic effects on ecosystems, native vegetation, and exotic species invasions. Effective resource stewardship now requires closer communication and coordination between fire management practitioners, resource managers, and fire ecologists and scientists.

Unsustainable use of park resources. As human populations expand and natural areas decrease, national parks are increasingly pressured to provide ecological, economic, and social amenities for the American public. Increasing demands for water, marine resources, energy development, indigenous collection of natural resources, and recreational opportunities within and adjacent to national parks may threaten the function and structure of park ecosystems. National park managers must scientifically define and embrace sustainable park uses and develop strategies to repair damage caused by current and past unsustainable uses (e.g., marine reserves and fishing).

National parks and the emerging publics of the 21st century. The social, ethnic, and demographic composition of the United States population is projected to continue changing significantly over the next few decades. With this shift, overall public perception of parks and

park resources may also change, affecting demand for park-related services and perhaps core political support. National Park Service managers need to understand the evolving American social structure and its implications for proactive park management from both local and national perspectives, and use this knowledge to reach out to the public and connect them to parks deeply and emotionally.

Past and contemporary human interactions with park environments. Currently, we have limited knowledge of past and even contemporary human interactions with park environments. Recognition and understanding of past uses is necessary for an accurate portrayal of park environments and for the development of policies for sustainable use of parks.

Park visitor capacity. Demand for significantly increased and diverse recreational opportunities in many Pacific West national parks can be expected as human populations grow. Managers cannot arbitrarily close park gates to protect park resources; rather, they will increasingly adopt transparent planning and management models such as Visitor Experience and Resource Protection (VERP) or Limits of Acceptable Change (LAC), in which science is applied to understand the effects of variation in visitor use on both park resources and experience quality. NPS managers and planners would receive considerable benefit from better guidance concerning the effective use of scientific information in choosing social or biological indicators and standards, and in making other decisions related to visitor capacity.

Psychological value of nature. Research on the effects of urbanization and the loss of wildlands has been dominated by inquiries into changes in biodiversity, air quality, water quality, and similar natural resource measures. Recent research is quantifying the connection between people and nature by measuring its psychological and physical benefits. Natural landscapes provide a barometer for measuring change in social perceptions with the environment. Researchers have detected a social trend called “environmental generational amnesia” that is manifested in children having little experience with nature and natural landscapes. Consequently, they have a modified baseline of experience against which to compare degradation of water, air and the quality of life. Parallel research in psychology has discovered that hospital patients exposed to natural landscapes recover more quickly and that the well-being of people is improved when they are exposed to natural landscapes. This human–natural landscape linkage is fundamental to understanding the psychological significance of the value of parks. If people’s perception of landscapes is shifting because of environmental generational amnesia, then the perceived value of parks may also shift.

Over the next year, my Pacific West networks will be engaging in detailed workshops on these issues with a particular focus on Global climate change. How we deal with them, how we manage our parks in light of these issues and how we communicate the research results and the consequences to the public will be the center of our discussions.

New quote:

A child is a person who is going to carry on what you have started. He is going to sit where you are sitting, and when you are gone, attend to those things which you think are important. You may adopt all the policies you please, but how they are carried out depends on him. He will assume control of your cities, states and nations. He is going to move in and take over your churches, schools, universities, and corporations. All your books are going to be judged,

praised or condemned by him. The fate of humanity is in his hands. So it might be well to pay him some attention.

— *Abraham Lincoln*

Dan Ritchie, chair of the education committee of the National Park System Advisory Board and chancellor emeritus at the University of Denver, was our keynote speaker at the Pacific West Region's Managers Conference in 2005. Ritchie there stated that:

The Board believes there is a distinct and critical national purpose embedded in this mission (of the NPS). It is to promote understanding and respect for the values, principles and practice of our democracy. National Parks are places where people experience and learn about their country first hand—its history, cultures, geography and ecology—and what it means to be a responsible steward and citizen of this republic.

He went on to suggest the following core outcomes of the education mission of the NPS:

1. That people have a powerful understanding and connection to the American land, its biodiversity and its stories;
2. That people broadly share an ethic of stewardship for the earth's natural and cultural heritage and are willing to work collaboratively and respectfully for conservation;
3. That they are empowered with a sense of optimism, resourcefulness, and a commitment to one another, inspired by all we have accomplished throughout our history, often in the face of adversity and conflict; and
4. That people practice civic engagement in many different aspects of their lives with a commitment to responsible citizenship empowered and encouraged by their educational experiences in parks.

The core of his message was that the NPS should think of itself not just as the passive keeper of places where the actions of citizens changed the world, such as Independence Hall where Jefferson and others penned the Declaration, but as an active agent of change, by using its position in the American psyche and its inventory of America's most treasured places to inspire the public to become more civically engaged.

Last year, the NPS hosted 278 million visitors to our parks. To paraphrase President Theodore Roosevelt, the parks are a bully pulpit.

In Yosemite National Park, there was a recent resurvey of the work pioneered by the biologist Joseph Grinnell and his colleagues in 1915. The work is featured at this conference. This time, armed with live traps instead of snap traps, the team resurveyed the small mammals of Lyell Canyon. They found significant changes in the populations of ground squirrels, pikas, piñon mice, and alpine chipmunks. Some of them had moved up in elevation by 2,000 feet since being surveyed by Grinnell 100 years ago. These are indicators of global climate change. We all know too that these little creatures can only go so far up, until they are popped right off the mountaintop into extinction.

You are the Joseph Grinnells of this generation, laying down the foundation of an understanding of parks that will be a platform for management action and public awareness. You are also the candles noted in Carl Sagan's last book, *The Demon-Haunted World: Science as*

a Candle in the Dark. Your work illuminates a changing world and compels us to act accordingly.

Within this message, I think there is optimism—and it is found within our parks and in the work you do here this week. For the parents in this room, we must offer hope for the future of the environment. This week, as you sit through yet one more depressing PowerPoint on the latest global climate research results, I ask you to be thinking of how to communicate what you are learning, through your own avenues and through the bully pulpits of the parks.

Two more quotes:

The larger glaciers are now approximately one-third their size in 1850 (range, 23–38%) and numerous smaller glaciers have disappeared. There has been a 73% reduction in the area of Glacier National Park covered by glaciers from 1850–1993. Only 27 km² of glaciers remain from the 99 km² which previously existed. Out of 84 watersheds, only 18 have 1% glacier cover, 8 have 2%, and 4 have 3%. Average glacier area in the accumulation zone for September 1993 was 35%, indicating negative mass balances for most glaciers and continued shrinkage.

— *USGS-Biological Resources Discipline Glacier National Park Science Center*

As long as I live, I'll hear waterfalls and birds sing, I'll interpret the rocks; learn the language of the flood, storm, and avalanche. I'll acquaint myself with the glaciers and wild gardens and get as near the heart of the world as I can.

— *John Muir*

So, my friends, go out and get as close to the heart of the world as you can, listen, and let the rest of us know how she is faring.

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THE NATIONAL PARK SERVICE INTERPRETATION AND EDUCATION EVALUATION SUMMIT

Learning Together: A Summary of the National Park Service Interpretation and Education Evaluation Summit

Edited by Julia Washburn

Note: This article contains excerpts from Learning Together: Proceedings, Evaluation, and Applying Lessons Learned—National Park Service Interpretation and Education Evaluation Summit (Duffin et al., in preparation). The report was prepared by the Education Evaluation Coordination Team of the National Education Council, National Park Service, in collaboration with Michael Duffin and Catey Iacuzzi, through a cooperative agreement between the NPS Conservation Study Institute and Shelburne Farms. The complete report, along with other related evaluation resources can be found at www.nps.gov/interp/evaluation.

Introduction

THE NATIONAL PARK SERVICE (NPS) convened an Interpretation and Education Evaluation Summit at the University of Denver, Colorado, on October 25–26, 2006. This event brought together education, evaluation, and organizational development experts from across the country with members of the NPS National Leadership Council, deputy regional directors, three former NPS directors, 15 park partners (including the National Park Foundation), NPS field staff, regional chiefs of interpretation and education, and members of the National Park System Advisory Board. One of the more notable features of the summit was the diversity of the participant list in terms of role, region, and ethnicity, coupled with thorough representation from the senior leadership of NPS.

Collectively, more than 120 people worked together to better understand the role evaluation can play in shaping the future of interpretation and education in the National Park Service.

Dan Ritchie, chair of the board of the University of Denver and chair of the National Park System Advisory Board Education Committee, hosted the event. The overarching goal was to generate useful dialogue about “creating a culture of evaluation” within interpretation

and education as a way to keep America's national parks relevant in the 21st century. Such an organizational culture will be characterized by continuous learning and decision-making based on audience analysis and outcome data. In his introductory remarks [reprinted in full later in this issue], Ritchie explained why the National Park System Advisory Board is so committed to effective interpretation and education:

The survival of the national park system in the 21st century depends on how it interacts with society and how much society values it. The Interpretation and Education Program is the primary means by which the National Park Service engages diverse publics with their national parks, provides access to meanings, establishes relevance, and connects people and communities to national heritage.

Newly appointed NPS Director Mary Bomar delivered her support for this concept in the keynote address [also reprinted later in this issue], stating that “this evaluation summit is the beginning of our interpretation and education renaissance ... and an important first step in looking ahead to our centennial.” The interpretation and education renaissance is a commitment to build on existing success, and to learn, grow, and respond to our changing society. A culture of evaluation is critical to enable parks to be flexible and adapt to the needs of audiences, while staying focused on conservation and preservation.

A renowned evaluation expert, Michael Quinn Patton, facilitated the summit, helping to focus the discussions as well as share insights and advice on how to encourage evaluative thinking within an organization. Patton came to the summit both as a professional evaluator and as a long-time supporter and visitor of the national parks. He has spent his career working to make evaluation results meaningful and useful for organizational development, and focuses his research on the effective use of evaluation data for decision-making and program improvement. Patton was pleased with the seriousness of purpose and commitment of summit participants. He writes:

The dominant theme of the NPS Evaluation Summit was creating a *culture of evaluation* within the National Park Service. This theme is consistent with research on the utilization of evaluation showing that evaluation findings and processes are more likely to be useful when there is strong leadership support for evaluation, when the organizational culture supports inquiry, reality-testing, and learning, and when people throughout the organization value and demonstrate evaluative thinking. This shift in emphasis is critical, it seems to me. It means looking beyond the use of discrete evaluation findings reported at a moment in time, as significant as that can be. Rather, the conditions for evaluation use are understood to be embedded in the values, attitudes, and behavioral patterns that are manifest day-to-day as people throughout the organization interpret what is important, pay attention to what gets rewarded, and notice what priorities get attention.

Background

The evaluation summit was one link in a series of actions that NPS is taking to reinvigorate itself as it heads into its second century of service. During a historic general conference

seven years ago (Discovery 2000, held in St. Louis, Missouri), NPS reaffirmed the critical role of interpretation and education in conservation, particularly in the context of globalization and America's changing demographics. Shortly thereafter, the National Park System Advisory Board issued its watershed report *Rethinking the National Parks for the 21st Century*, urging NPS to embrace its role as a national education institution. The NPS National Leadership Council responded by holding a series of six education seminars, resulting in the publication of *Renewing Our Education Mission*. This led to the formation of the NPS National Education Council and a call to establish a comprehensive interpretation and education program business plan, the final draft of which is slated to be released in early 2007. Additionally, a Scholar's Forum on Civic Engagement was held in January 2006.

At each step along the way, the critical role of education was reinforced; standards, goals, and priorities were clarified; and evaluation became increasingly seen as an essential component of the overall effort. In October 2006 the National Leadership Council unanimously endorsed the interpretation and education renaissance action plan, which was developed by the National Education Council to realize the tactics described in the evolving business plan. This true "renaissance" has five key pillars: standards, access, technology, partnerships, and evaluation. In concert with the I&E renaissance action plan, a sub-committee of the National Education Council has drafted a servicewide interpretation and education evaluation strategy. The evaluation summit was a first step in implementing this evaluation strategy. Collectively, these steps aim to move the NPS from "good" to "great" in its ability to engage the public with their national parks in new, dynamic, and relevant ways.

A summary of the summit proceedings follows.

Panel One: Why Should We Do This?—Creating a Culture of Evaluation within NPS: Vision and Rationale

The first panel of the summit brought together experts from various fields to talk about what evaluation is, what a culture of evaluation looks like, and to provide their ideas about how to make evaluation successful.

Martha Monroe, Panel One moderator, associate professor, Natural Resources Education and Extension, University of Florida. Monroe began Panel One by highlighting the importance of allowing for risk-taking in a culture of evaluation. She provided the example of Ben and Jerry's Ice Cream, who have a "flavor graveyard" at their factory in Vermont celebrating flavors that have been unsuccessful or otherwise discontinued. Monroe encouraged NPS to engage field staff and build the capacity for evaluation, starting with the field. She pointed out that the more people are involved in the whole process of evaluation, the more engaged and excited they become.

Jon Wergin, professor, Antioch University Ph.D. Program in Leadership and Change. Wergin continued the conversation by presenting his research on evaluation within higher education. In this research, it was discovered that often people go along with evaluation without any real commitment to the process—what Wergin called a "compliance mentality." While this is common, he also offered hope that it can be overcome. Wergin noted that when both leadership and staff within departments are open, self-reflective, and communicative, evaluation is more likely to be successful.

Reginald (“Flip”) Hagood, senior vice president for strategic initiatives, Student Conservation Association (SCA). Hagood pointed out the importance of accountability and the use of evaluation for survival as an organization. In addition, he highlighted the partnership between SCA and NPS and spoke about the several types of evaluations and the value that they have added to SCA. Evaluation has helped SCA to diversify funding, move to meet the needs of the market, and continue to thrive as a business. Hagood’s central message was that evaluation helps an organization meet the goals it sets for itself.

Carol Stapp, director, Museum Education Program, George Washington University. Stapp shared her experience as an educator within the museum world and the role that evaluation has played in her work. She noted that shifting to a culture of evaluation is both valuable and challenging. Stapp provided the example of working with her students and their reactions to evaluation. As she noted, her students often take several semesters to adjust to the idea that evaluation does not have to be punitive. As she comments, it is difficult to promote positive attitudes about evaluation. In order to accomplish this, she encouraged focusing on competencies and building capacity for evaluation.

Les Baxter, deputy director for evaluation, Pew Charitable Trusts. Baxter described ways that evaluation can inform program planning and design. He noted that without evaluation, you do not know where you are going, if you are accomplishing what you set out to accomplish, or if you are making the best use of limited resources. Baxter shared two examples of the benefits of evaluation that he has witnessed at Pew. In the first example, evaluation played a central role in a major internal reorganization of Pew. The second example highlighted the fact that although an evaluation may indicate changes, the process of organizational change still takes time.

Emma Norland, Ohio State University. Norland spoke about the importance of evaluation occurring within a broader context and a more robust system. She provided the example of the PARKS Project, a large, 36-park evaluation. She described some of the learning that was garnered but emphasized that the episodic nature of the evaluation meant that many of the best learning opportunities were lost. She noted that evaluation should be part of a larger picture. Finally, she encouraged NPS to create a large database in which all evaluation data could be gathered so that over time larger questions could be answered.

Hazel Symonette, senior policy and program development specialist, University of Wisconsin–Madison. Symonette highlighted for participants the “who” of evaluation. She spoke about working in collaboration with stakeholders rather than standing in judgment of them when conducting evaluations. Symonette talked about identifying our goals, both personal and organizational, and using evaluation as a learning tool to reach these goals. In particular, she highlighted the importance of including all stakeholders—front-line staff, partners, leadership—in a collaborative process of evaluation.

Panel Two: The Role of Evaluation in Enhancing the Power of Place-Based Learning

The second panel brought together experts to discuss the use of evaluation in documenting the impact of services and improving programs. In addition, the use of evaluation in enhancing cultural competency was highlighted.

Lynn Dierking, Panel Two moderator, vice president for special initiatives, Institute for Learning Innovation. Dierking began the second panel of the day by sharing an example of an evaluation she has been involved with. In this example, the evaluation was initially imposed from leadership with limited buy-in at other levels of the organization. Dierking explained that the focus of the evaluation was shifted to include managers responsible for the day-to-day operations of the program. By engaging these individuals in the process, the attitude toward evaluation shifted. People in this organization are now excited about evaluation and are engaged in a wonderful learning experience.

Theresa Coble, assistant professor of forest recreation and interpretation, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University. Coble continued the conversation by sharing the results of an outcome evaluation called Visitor Voices that she worked on with the NPS Intermountain Region. She explained that this evaluation was an outcome-based assessment. Coble also stated that the outcomes needed to be contextualized in order to be meaningful. By placing the results in context, this evaluation was able to provide information about the factors that contributed to the outcomes found. For instance, different types of experiences (e.g., park film, interpretive exhibit, guided tours, etc.) evoked different levels and types of meaning-making connections in visitors. One finding was that “ranger-led programs far surpassed any other type of programs as the ... number one most meaningful program.”

Polly Nordstrand, curator, Native American Collection, Denver Art Museum. Nordstrand began her presentation with a story about her mother’s experience of being “invisible” as a result of her brown skin in a predominantly white society. She continued by sharing stories of her own experience of discrimination as a Native American when she was formerly an employee of NPS. Nordstrand described how it is often more difficult to collect data from non-white groups, and also emphasized that these groups have valuable information to share. She noted that most NPS sites have a Native American story, but that these (and the stories of other marginalized groups) are not always shared with visitors. Ultimately, Nordstrand urged NPS to use evaluation as a means of making those people who have been invisible, visible.

Doug Knapp, associate professor, Indiana University. Knapp shared his findings regarding the powers of the national parks to impact visitors. He offered examples from Clingman’s Dome in Great Smoky Mountains National Park, George Washington Carver National Monument, and Denali National Park and Preserve. In each of these examples, Knapp explained that the experiential components of the interpretive and education programs had long-lasting impacts on participants. At Clingman’s Dome, children in the 5th grade retained information they learned one year later. At George Washington Carver National Monument, children continued to experience empathy for George Washington Carver a year after the program. Similar information was found at Denali. In each of these cases, the data from the evaluation have been utilized to continue to improve already effective programs.

Veronica Thomas, professor, Department of Human Development and Psychoeducational Studies, Howard University. Thomas began her presentation with a discus-

sion of cultural competency relative to NPS. She shared data indicating that NPS is not representative of the United States' population, either in staffing or visitors. As such, she emphasized the importance of asking those populations that NPS hopes to reach what they want and need from their national parks. Thomas noted that place-based learning can play a very important role in educating children "placed at risk" by offering programming that relies on local culture and local geography. Thomas distinguished between co-construction of a program and its evaluation versus a less rigorous process of collecting feedback from stakeholders.

Allison Druin, director, Human-Computer Interaction Lab, University of Maryland. Building on the idea of co-construction offered by the previous panelist, Druin offered examples of her work with children and technology. She shared a range of examples highlighting the ways that children can and should be included in the design, implementation, and evaluation of education programs. By offering participants the opportunity to co-construct their education program, their experience in parks becomes highly individualized and more meaningful. Ultimately, the more involved all the stakeholders (including visitors of all ages) are in this process of program design and evaluation, the more effective it will become.

David Sobel, co-director, Center for Place-based Education, Antioch University New England. Sobel shared some of the results from an evaluation that is ongoing involving the national parks. Partly in response to a foundation's reluctance to fund environmental education programs for youth because the outcomes were not considered measurable, several organizations conducting place-based education programs decided to create an evaluation collaborative and work together to find ways to measure and describe the outcomes of their place-based educational programming. As a result of a series of evaluations over several years, the programs have each undergone a variety of changes to better meet their goals. In particular, the NPS program "A Forest for Every Classroom" was able to more effectively and deeply engage local schools and the local communities. Ultimately, the evaluation conducted by Sobel's group has demonstrated that outcomes from place-based education are measurable and that the results of evaluation can be used to improve programs and enhance their effectiveness.

Large-group discussions

Extensive dialogue between and among panelists and summit participants followed each formal panel discussion.

Presentation introducing the servicewide interpretation and education evaluation strategy

Sheri Forbes, chief of interpretation, Mount Rainier National Park, and chair of the Education Evaluation Coordination Team, introduced the draft servicewide interpretation and education evaluation strategy (also known simply as the "evaluation strategy"). By conducting evaluations and identifying the tangibles of interpretation (i.e., evaluation data), the Interpretation and Education Program can be strengthened. Forbes commented on the possible benefits of engaging in evaluation, including greater focus on outcomes and results, the

ability to answer questions about programs, identification of the longer-term impacts of programs, and justification for financial decisions. As an example, Forbes outlined the results of an informal survey of parks that found that park staff are eager for information about visitors, program outcomes, input for planning, and how to conduct and use evaluations.

Forbes then outlined the primary goals of the draft evaluation strategy: (1) foster a service-wide commitment to evaluation; and (2) support all NPS stakeholders in implementing useful evaluation.

Effective implementation of the evaluation strategy will lead to continuous improvement, relevant programs, and accomplishment of the NPS mission. All participants were invited to review the draft strategy and offer feedback. Invoking Freeman Tilden, she concluded with reflections on how the science of evaluation can validate and improve the art of interpretation.

Tactical discussions

A key step described in the evaluation strategy and the I&E renaissance action plan is to conduct a series of pilot evaluation projects. The rest of day two of the summit focused on detailed discussion in large and small groups regarding hoped-for selection criteria and process for pilot evaluations. The summit culminated in an interactive nationwide teleconference with NPS employees to share the outcomes of the discussions, as well as to engage field staff in this important effort to assess and improve interpretation and education programs across the National Park Service.

Outcomes

A participatory and collaborative method was used for evaluating the summit in order to model organizational learning and a user-focused approach. The evaluation was accomplished through a public-private partnership that combined knowledge of NPS interpretation and education programs with professional evaluation expertise. Members of the Education Evaluation Coordination Team of the NPS National Education Council worked closely with NPS cooperating partners from Shelburne Farms to guide and design the evaluation plan. The cooperating partner team played a leadership role in data collection and analysis, and included evaluators Michael Duffin and graduate research assistant Catey Iacuzzi.

Data were obtained from a summit reaction form, small-group notes, participant question cards, lunchtime “scribbles” of questions and ideas, a previous survey of NPS evaluation practices, field notes, transcripts, and observations.

Two overarching themes emerged from analysis of the data gathered. Participants seemed *enthusiastically engaged* in the concept of creating a culture of evaluation within interpretation and education, while simultaneously *voicing concern* about how such a change will be implemented on the ground. These themes were distinct yet interconnected. The enthusiasm was tempered by the concern, and the concern was interpreted as evidence that the enthusiasm was strong enough for people to take the concept of evaluation seriously. Both themes are consistent with normal, healthy organizational responses to the possibility of major impending change. Data also suggested that the current status of a culture of evaluation within the NPS is that the agency is poised at a watershed of potential but has not yet

demonstrated systemic change. Future communication plans and action steps should address a wide range of readiness among NPS and stakeholders with respect to evaluation.

Next steps

The official summit proceedings and evaluation will be published early in 2007 along with a DVD set summarizing and documenting the event. The servicewide interpretation and education evaluation strategy, currently out for peer review among NPS stakeholders, will also be completed and published sometime during spring 2007. Pending funding and authorization, proposed immediate next steps include: implementing pilot evaluation projects at the local and national levels; hiring of a NPS national evaluation coordinator for visitor experience; developing an on-line library of evaluation tools, studies, and results; creating a communication network for sharing evaluation results and how they are applied at parks; and providing training programs in user-focused evaluation for NPS staff and partners. All actions will be geared toward use of evaluation for organizational learning and ongoing program improvement.

Remarks from the Chair, Education Committee, National Park System Advisory Board

Daniel L. Ritchie

THE NATIONAL PARK SYSTEM IS MORE THAN THE PLACES AND OBJECTS central to the heritage of the United States. The national park system embodies intangible meanings—beauty, health, wonder, freedom, democracy, and struggle—that are central to our collective identity. The survival of the national park system in the 21st century depends on how it interacts with society and how much society values it. The Interpretation and Education Program is the primary means by which the National Park Service engages diverse publics with their national parks, provides access to meanings, establishes relevance, and connects people and communities to national heritage.

It is critical that the NPS Interpretation and Education Program be strong, vital, flexible, and effective. To that end, it is exciting that the NPS is in the midst of an interpretation and education renaissance—a commitment to build on existing success, and to learn, grow, and respond to our changing society. The National Park System Advisory Board Education Committee is honored to be a catalyst for this renaissance and is pleased to see the director and the National Leadership Council forming a strong partnership with regional, park level, and field leaders within interpretation and education.

This National Park Service Interpretation and Education Evaluation Summit was a historic step toward creating a culture of evaluation within NPS, which is one of the central pillars of the renaissance. It was clear to me that summit participants found the experience of this day and a half of dialogue to be fulfilling and thought-provoking. The contributions of our panelists and outside experts provided fresh and useful insights, and the responsive discussion from NPS staff and partners demonstrated the depth, creativity, and commitment that we bring to this challenge and opportunity.

The National Park Service must work to find the resources that will help to create this culture of inquiry and on-going learning. This is not something that can be accomplished overnight. This will be a long journey, but ultimately the effort will be fulfilling, worthwhile, and enjoyable. Creating a culture of evaluation will be a key piece of taking the NPS from “good” to “great.”

Remarks from the Director, National Park Service

Mary Bomar

THIS EVALUATION SUMMIT IS THE BEGINNING of our interpretation and education renaissance. The National Leadership Council endorsed the interpretation and education action plan at their August 2006 meeting, and this event is an important first step in implementing the plan; an important first step in looking ahead to our centennial. As we look ahead, I think it is important to also look back for a moment and see whence we came. So I looked through the history of education in the National Park Service, and I went back to the beginning.

In 1918, the objectives drafted by National Parks Education Committee were clear, bold, and expansive: to educate the public in respect to the nature and the quality of the national parks; to further the view of the national parks as classrooms and museums of nature; to use existing publicity and educational systems so as to produce a wide result; to combine in one interest the sympathy and activity of schools, colleges, and citizen organizations in all parts of this country; to study the history and science of each national park and collect data for future use. These objectives are among the earliest expressions of the National Park Service's founding fathers regarding the educational aspects of park management.

A resolution adopted by park superintendents in 1922 made it clear: "The mission of the National Parks is to provide not cheap amusement, but healthful recreation and to supplement the work of schools by opening the doors of nature's laboratory to awaken an interest in natural science as an adjunct to the commercial and industrial work of the world."

If there were any doubt about what Congress thought about the Park Service's education program, it was put to rest by the Historic Sites Act of 1935. While the act placed the National Park Service squarely in the middle of a maturing historic preservation movement in this country, it also charged the Park Service with developing an educational program for its newly acquired cultural parks. "The Secretary of Interior shall develop," it declared, "an educational program and service for the purpose of making available to the public facts and information pertaining to the American historic and archaeological sites, buildings and properties of national significance." The act also formalized the National Park System Advisory Board to advise the secretary of the interior on the administration of parks.

To mark the 20th anniversary of the National Park Service, the Department of Interior published *Research and Education in the National Parks*. It was divided into two parts: the educational program in the national parks, and the history of the educational movement. This publication was clearly designed to praise the accomplishments of the Park Service's

educational program. It itemized various ways the Park Service delivered educational information to the public from auto caravans, nature and historic trails, exhibits, lectures, and campfire talks, to museums, libraries, college and university field classes, and the Yosemite School of Field Natural History, all built upon a foundation of solid research.

Let us now fast forward to the future, 20 years from now. What will the historians write about us in 2026? What will they write about education in the National Park Service in the years surrounding the centennial? And if you agree with Emerson that “there is probably no history, only biography,” what will it say about us?

I am by nature an optimist, and I see the glass as already half full. There has been much work by the National Education Council and the National Interpretive Advisory Council in the past two years, including a business plan and an action plan, endorsed by the National Leadership Council. Together, with the National Park System Advisory Board, most of us here attended the Scholars Forum last January in Philadelphia. The Northeast Region has an on-going evaluation of its educational programs. So in many respects we are building on the good work of the past, good work that began in the era of Stephen Mather and of more recent vintage.

This past, it is said, is the key to the future. When we look back over the National Park Service of 15 years ago, how far have we come? In 1991, we had the Vail Agenda—looking for ways to diversify our workforce, broaden our stories, and reach new groups of visitors. And in a published version of the report, there were some interesting predictions. Everyone will belong to a minority group. Whites will no longer be a majority group in several states, such as California. Asian and Hispanic populations will dramatically increase, with Hispanics outnumbering African-Americans by 2010. Politics will be altered by 2000. Many mayors in the nation’s great cities will be people of color. Racial cross-over voting will be common. The Vail Agenda also recommended that the Park Service should revise its list of cultural themes to more accurately reflect the breadth of American culture; that individual units publicize their unique purpose to their employees and the local population of visitors; and that new studies by the Park Service include the need for cultural diversity throughout the national park system.

In 2001, the National Park Service Advisory Board developed *Rethinking the National Parks for the 21st Century*. That group was chaired by one John Hope Franklin, a great thinker and a most humble man despite his many accomplishments. And while the report was the work of many, I sometimes like to think that it was he who penned these words: “The public looks upon the National Parks almost as a metaphor for America itself. But there is another image emerging here, a picture of the National Park Service as a sleeping giant. Beloved and respected, yes. But perhaps too cautious, too resistant to change, too reluctant to engage the challenges that must be addressed in the 21st century.” Later that thread continues: “The Park Service must ensure that the American story is told faithfully, completely and accurately. The story is often noble but sometimes, as we all know, shameful and sad. In an age of growing cultural diversity, the Service must continually ask whether the way in which it tells these stories has meaning for all our citizens.”

The world is, indeed, different from the time the original National Parks Education Committee was established. The U.S. population was 110 million in 1922 and 300 million

today. It is expected to double yet again in this century, and the demographic forecast in the Vail Agenda Report was pretty much on the mark. With changing population, demographics, and technology, it is clear that our approach to interpretation and education must also change if we are to continue engaging the American public with their natural and cultural heritage. We can certainly use the newest in technology to reach our visitors in many ways, both those who physically visit a park and those who do it in the virtual realm. And we must embrace partners who can help in this effort.

We sometimes need that outside shot in the arm to help us change. We also need a culture of evaluative thinking as a way of doing business, not only in interpretation, but throughout the disciplines within the National Park Service. When people ask me for my vision of an ideal park, my mind's eye takes me to a very special day at Independence when I was the superintendent. I left the office after a very long day, and I walked through the park. As I arrived at Independence Hall, I saw my perfect vision of what a park could be. Our staff were busy keeping the grounds and buildings looking good. A group of school children were there listening to one of our rangers give an Underground Railroad tour. And all around me I heard languages from all over the world from our visitors who had traveled from far corners of the globe. Our parks are not just special places for Americans, but they are special places for the entire world, and that is my vision for our national parks, not just for one day, but every day; not just for one park, but for all our parks. That is the true challenge for our centennial—to make the best idea America ever had the best it can possibly be. With the vision outlined by President Bush, with the leadership of Secretary Kempthorne, and with your help, that perfect vision can become a reality.

I congratulate you. But we must demonstrate results if we wish to garner the resources we need to move forward. You have my support. You've had my support over the last two years with my involvement with the National Education Council. Now it's up to all of you to roll up your sleeves and make it work.



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