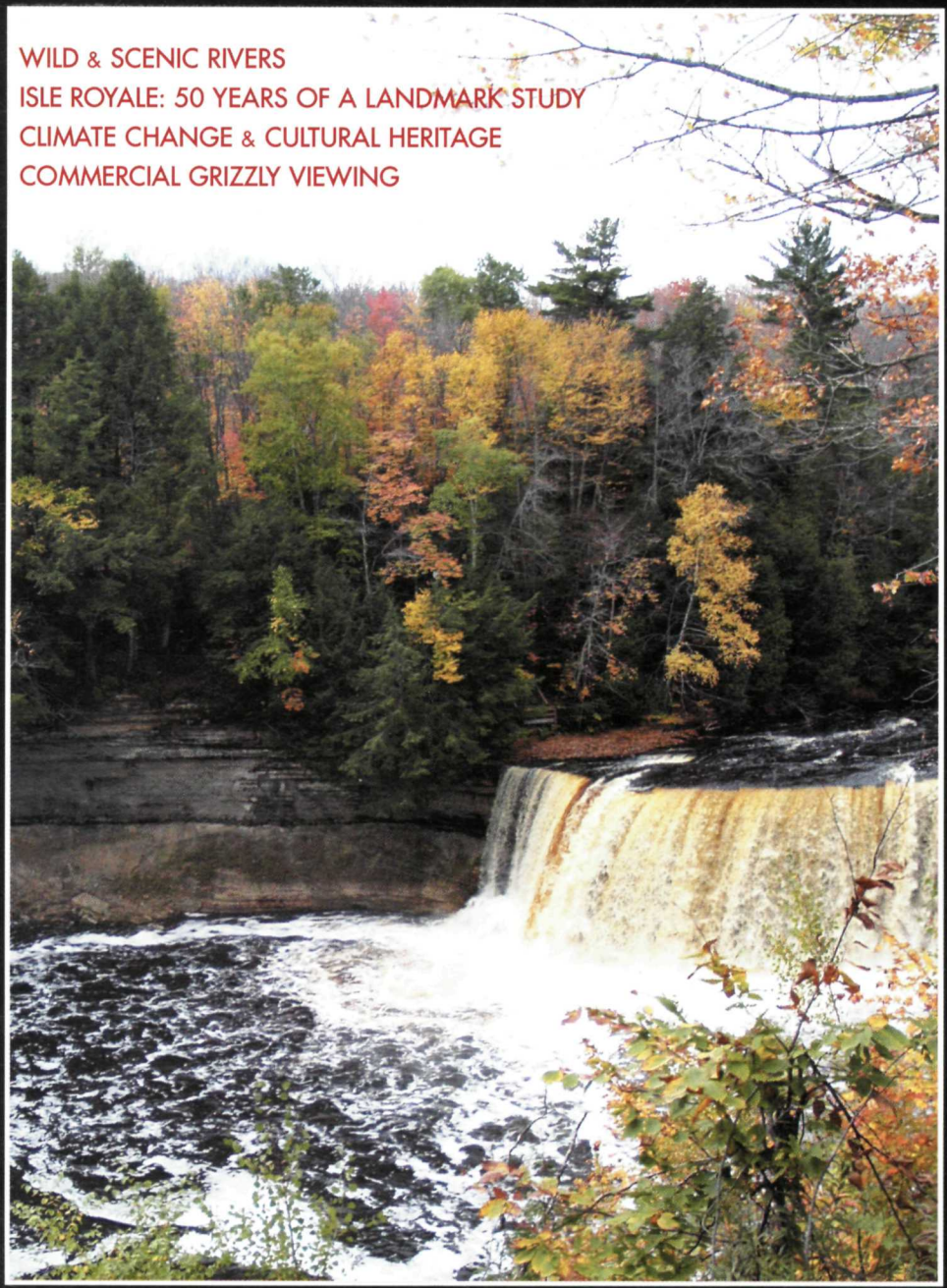
WILD & SCENIC RIVERS
ISLE ROYALE: 50 YEARS OF A LANDMARK STUDY
CLIMATE CHANGE & CULTURAL HERITAGE
COMMERCIAL GRIZZLY VIEWING



The George Wright Forum

The GWS Journal of Parks, Protected Areas & Cultural Sites

volume 25 number 2 • 2008

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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The George Wright Society is a member of US/ICOMOS (International Council on Monuments and Sites—U.S. Committee) and IUCN (International Union for Conservation of Nature).

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On the cover:
The Upper Falls of the Tahquamenon River, Michigan, a unit of the national wild and scenic rivers system. Photo courtesy of Sue Jennings. A series of articles marking the 40th anniversary of the National Wild and Scenic Rivers Act begins on p. 15.

SOCIETY NEWS, NOTES & MAIL

GWS Board sets near-term strategic directions

In March the Society's Board endorsed an updated Strategic Statement for the period 2008–2012. The Board produces these statements every five years. They are, in effect, concise strategic plans: a pithy outline of where we want to go and how we want to get there over the near term. The new Strategic Statement sets six directions for the Society, each elaborated with a small number of actions matched to benchmarks of success:

1. Enhance fiscal solvency while actively seeking to expand our financial, governance, and administrative capacities so that we are in a position to seize new opportunities when they arise.
2. Build membership so that membership in the GWS is widely considered a "must" for park and protected area professionals.
3. Increase the visibility and connectedness of the organization so that GWS is better known to the audiences we wish to reach — make GWS "the NPR of protected areas."
4. Continue to develop the GWS's role as a leading convener and facilitator of conferences on parks, protected areas, and cultural sites.
5. Enhance the quality and expand the influence of the GWS's publications so that they are seen as a principal clearinghouse for information about protected area research and management.
6. Establish the GWS as a leader in promoting diversity within professions dealing with research in and management of parks, protected areas, and cultural sites.

To read the entire Strategic Statement (5 pages), go to www.georgewright.org/strategic.html. We welcome any comments you might have; send them to the Executive Director Dave Harmon at dharmon@georgewright.org.

GWS member survey coming your way

As just noted, one of our strategic directions is to build up the GWS membership. The first step is finding out what current members think are the strengths and weaknesses of the organization, and what specific tasks they'd like to see the Society take on. We have never done a member survey before, but that deficiency is about to be remedied. Sometime in the next few months, all GWS members will receive an invitation to fill out (anonymously) a short web-based survey. Like you, those of us on the Board and in the executive office are frequently asked to fill out web surveys, and we know such requests can be tiresome. However, we hope all members will be receptive to our invitation—your input really will help us strengthen the organization we all share. So watch your inbox, and when you get your invitation, please take five minutes to fill out the survey.

Call for nominations, 2009 GWS awards

Nominations are now open for the 2009 round of Imagine Excellence, the Society's awards program. Imagine Excellence recognizes outstanding accomplishments in fields

associated with research in, administration and management of, and communication about parks, other kinds of protected areas, cultural sites, and related supporting activities. The GWS awards are handed out every two years at a banquet on the closing evening of our conference. The 2009 banquet, to be held March 5 at the conference in Portland, is a joint affair at which the National Park Service's top natural resources awards will be bestowed. GWS members are invited to submit nominations for the following awards:

- The **George Melendez Wright Award for Excellence**, given in recognition of lifetime contributions on behalf of the Society or in furtherance of its purposes. This is the Society's highest award, and it is reserved for exceptional achievements in any of the areas with which the GWS is concerned. It is a top-of-career award.
- The **GWS Cultural Resource Achievement Award,** given in recognition of excellence in research, management, or education related to the cultural resources of parks, cultural and historic sites, reserves, and other protected areas. This award is generally aimed at mid-career to senior-level accomplishments.
- The **GWS Natural Resource Achievement Award,** given in recognition of excellence in research, management, or education related to the natural resources of parks, reserves, and other protected areas. This award is generally aimed at mid-career to senior-level accomplishments.
- The **GWS Communication Award,** given in recognition of excellence in communication, interpretation, or related areas pertaining to the purposes of the Society. This award is given specifically to recognize outstanding efforts in communicating highly technical or controversial park-related subjects to the public in a clear and understandable manner.

Please note: Nominations must be made by a current GWS member, but the person being nominated does not have to be one. All nominations must be made via the online application form; you can find more information about Imagine Excellence, and a link to the form, at www.georgewright.org/awards.html. The deadline is October 31, 2008.

New guidelines out on sacred natural sites in protected areas

A new set of guidelines, co-published by IUCN and UNESCO, finds that thousands of sacred natural sites are in jeopardy around the world despite the fact that many lie within formal protected areas. These sacred sites are endangered because indigenous peoples are sometimes excluded or forcibly removed from their traditional territories and thus can no longer care for the sites. There is growing interest in, and recognition of the importance of, sacred natural sites as critical elements to both biological and cultural preservation, especially in light of the accelerating loss of biocultural diversity as an unintended by-product of globalization. *Sacred Natural Sites—Guidelines for Protected Area Managers*, the latest in IUCN's Best Practice Guidelines series, summarizes experience in recognizing, planning, and managing sacred natural sites in a variety of protected areas. The guidelines will be used to share experience with protected area managers and their colleagues around the world who are concerned about and interested in protecting sacred natural sites. For more information,

visit http://cms.iucn.org/about/union/commissions/wcpa/ and click on "Best Practice Guidelines."

GWS co-publishes U.S. Tentative List portfolio

For the past several years, the GWS has worked with the National Park Service Office of International Affairs to revise the U.S. Tentative List of properties deemed worthy of World Heritage nomination. Early this year a new Tentative List was approved by the secretary of the interior. Now, GWS and NPS have co-produced a 48-page, full-color, richly illustrated portfolio booklet describing the 14 sites on the new Tentative List and providing background information on the Tentative List's revision and the World Heritage nomination process. You can download a PDF of *World Heritage in the United States of America: The U.S. Tentative List 2008* at www.georgewright.org/us_tentative_list.pdf.

Duly noted

Sellars receives Hartzog Award. In May, former GWS President Richard West Sellars was presented with the George B. Hartzog, Jr., Award by the Coalition of National Park Service Retirees (CNPSR). Sellars, who retired from a long NPS career in February, is well known for his 1997 pathbreaking history, *Preserving Nature in the National Parks,* which helped lay the groundwork for the agency's successful natural resources research and management program, the Natural Resource Challenge. Sellars is now working on a parallel history of NPS cultural resource management. CNPSR's Hartzog Award, named after the influential NPS director, cites Sellars for "his unparalleled past contributions to understanding and advancing the cause of natural resource management in the National Park Service, for his continued professionalism and positive contributions to cultural resource management, and for his determination to carry the project forward to completion even after retirement." **(Editor's note: As we were about to go to press, we learned of the death on June 27 of former NPS Director Hartzog. The next issue of *The George Wright Forum* will have an obituary and appreciation of Hartzog, who was a GWS Life Member.)**

Addendum to Cane River interpretation article. The co-authors of "Economics and Authenticity: A Collision of Interpretations in Cane River Creole National Heritage Area, Louisiana," published in volume 23, number 1 (2006), have asked that an addendum be added to the online edition of the article. The addendum updates some of the key conclusions of the article based on information that has recently come to light. You can read the article, and the addendum, at www.georgewright.org/231morgan.pdf.

Report assesses Revolutionary War & War of 1812 sites. A recent National Park Service study, titled *Report to Congress on the Historic Preservation of Revolutionary War and War of 1812 Sites in the United States,* is now available online. The 137-page report gauges the historic preservation status of 243 battlefields and 434 associated historic properties, and concludes that up to 170 of them are in immediate jeopardy of being damaged or destroyed by development. The report is the most comprehensive federal review of sites associated with the two wars that achieved, and then consolidated, American independence. It is available online at www.nps.gov/history/hps/abpp/Rev1812Study.htm.

Reassessing the National Park Service and the National Park System

Janet A. McDonnell

> We are all agreed that park lands are more than physical resources; they are indeed the delicate strands of nature and culture that bind together the generations of men. They are moreover the bench marks by which we may chart a new course of human behavior.
>
> — *George B. Hartzog, Jr.,*
> *Centennial Celebration of Yellowstone and the Second World Conference on National Parks*

In recent decades, the National Park Service (NPS) and its partners conducted a series of studies, reports, and conferences to assess the current state and future of the national park system. Each study to some extent reflected its political, social, cultural, and economic environment. A critical review of these studies can tell us much about the significant challenges the National Park Service and the parks have faced—and continue to face. Though varied in scope and form, the reports all struggled with questions about the importance of the national parks and what the drafters and participants believed were the enduring core values that the parks represented. Their major findings and recommendations were remarkably similar. Although the reports yielded some positive results, none resulted in fundamental, enduring change. As the NPS Centennial approaches and discussion focuses on the future of the NPS and the park system, there is much that can be learned from a look back at the strengths and weaknesses of these earlier studies and assessments.

State of the Parks–1980

There had been several landmark studies of park natural resources in the 1960s,[1] but the more contemporary reassessment of the NPS and the park system began in 1980 when Congress directed the NPS to conduct a major review of the condition of its parks. NPS officials used results from a questionnaire that had been sent to park superintendents. The final product, *State of the Parks–1980: A Report to Congress,* reflected the growing emphasis on an ecolog-

ical and scientific approach to park management that had occurred in the 1960s and 1970s. It highlighted the damage caused by both external and internal threats, such as that caused by management failures and visitor use. NPS efforts to document the damage and manage the resources, it concluded, were inadequate. Alarmed by the national press attention that the report received, senior NPS and Interior department officials began to have reservations and attempted to minimize its findings. The study made specific proposals for improving natural resource management but contained no firm commitment that the NPS would act on these proposals. In January 1981 the NPS submitted its formal response to Congress—a second *State of the Parks* report—in which the Park Service agreed to identify the most critical threats and give them priority for funding in the coming fiscal years. It also agreed to complete a resource management plan for each park and implement a greatly expanded training program, which would promote a more professional cadre of natural resource managers.

The same month that the Park Service submitted this mitigation report to Congress, President Ronald Reagan took office calling for government austerity and conservative retrenchment. His secretary of the interior, James G. Watt, shifted emphasis from wildlife and wilderness protection and preservation to recreational development. During the Reagan administration, leadership in shaping the national park system shifted from the executive branch to Congress. With little support from the administration, by 1982 Park Service leaders lost some of their resolve and abandoned the reporting procedures recommended in the first *State of the Parks* report. *State of the Parks* did prompt the NPS to develop training courses in the 1980s to educate employees in ecological management principles and environmental laws, although this effort declined by the end of the decade. It also encouraged increases in funding and staffing for scientific research and natural resource management.

National Parks for a New Generation

Meanwhile, The Conservation Foundation undertook a comprehensive, three-year study focused primarily on land use issues. A multi-disciplinary team that included a land use and public land planner, an urban specialist, a social scientist, and attorneys visited more than sixty parks and interviewed hundreds of individuals. NPS staff assisted in the study, sharing information and insights. The final report, titled *National Parks for a New Generation: Visions, Realities, Prospects*, published in 1985, presented a critical portrait of the current state of the parks and made specific recommendations for the future. The Conservation Foundation acknowledged that the park system had grown in size and complexity, and the needs of the parks had changed. It outlined three major concerns that demanded attention if the national parks were to retain their "distinctive place in American life": improved stewardship of park resources, a new assessment of the role of the private sector in the parks, and innovative strategies for creating the park system of the future.[2]

As with the *State of the Parks* report, *National Parks for a New Generation* was very much a product of the contemporary political, social, and economic climate. The report warned that pressures on parks were mounting, and the cumulative impact of

heavy visitor use, deferred maintenance, and outside threats would "seriously damage parks unless checked." The 1980s, it explained, were "not a time of great expectations" for much-needed management innovations.[3] Officials had placed more emphasis on reducing federal expenditures than on promoting park stewardship. The wide-ranging report recommended broad initiatives to preserve park resources and respond to rising public expectations: a ten-year, $50 million comprehensive program called Preservation '95 to protect park resources; special attention to historic and cultural resources; and a campaign to combat external pressures in the parks.

National Parks for a New Generation envisioned new and expanded roles for the private sector but with greater transparency and improved oversight. It advocated a "more expansive" vision of the future in which many unprotected sites worthy of preservation would become part of the national park system or protected in some other way. The report emphasized the need to address the backlog of private lands currently located within park boundaries and highlighted the need to improve and modernize NPS management. *National Parks for a New Generation* conceded that the increased visitation and other pressures on the park system made it increasingly difficult to preserve traditional park values. Yet it was confident that the system could accommodate these demands and still fulfill its preservation mission. It challenged NPS leaders to advance a "broad and dynamic" vision that reflected the size and diversity of the park system, but defined that vision in vague and narrow terms, emphasizing the individual visitor experience. "Preserving park resources more nearly unimpaired may ultimately depend on more widespread respect, by an increasingly crowded and developed nation, for the visitor experiences that are less and less available outside the national parks," the report concluded. "In communicating to a wider audience the experiences of awe, solitude, adventure, communion, repose, and reinvigoration to be found in national parks, the conservation community can aid the continuing evolution of the park ideal to help preserve the parks for this and future generations."[4]

The problems identified in these and other studies persisted. As the decade of the 1980s closed, the NPS struggled with declining morale, the increasing complexity of the park system and programs, serious fiscal constraints, and inadequate personnel and organizational structures. The attempt to improve NPS scientific resource management through training, funding, and staffing as recommended in the various reports had had only partial success. Park Service leaders planned a major meeting of employees and their partners to address some of these growing challenges.

The Vail Agenda

In October 1991 the NPS convened a 75th Anniversary Symposium in Vail, Colorado, to analyze the problems facing the NPS and make recommendations that would help chart the agency's course for the 21st century as an organization, as steward of the parks, as host to their visitors, and as an environmental leader—in effect to reassert its leadership role in shaping the national park system. Working groups focused on four areas of NPS policy and management: organizational renewal, park use and enjoyment, environmental leadership, and resource stewardship. Six strate-

gic objectives framed the work: resource stewardship and protection, access and enjoyment, education and interpretation, proactive leadership, science and research, and professionalism.

The findings and recommendations from the symposium were published in 1992 as *National Parks for the 21st Century: The Vail Agenda*. *The Vail Agenda* recognized that the Park Service's "portfolio of parks" had expanded to include a broad array of sites—from scenic rivers to historic battlefields. The park system had been constructed to serve many different constituencies and purposes, and these constituencies, whether backpackers, urbanites or others, measured the Park Service's performance based on that aspect of the park system that had direct value to them. Few understood or cared that the NPS mission was much broader. Yet, the report noted, "Appreciation of the multifaceted mandate of the Service is essential if one is to effectively define what it means to be a leader in this agency."[5]

Echoing earlier studies, *The Vail Agenda* found that the NPS budget had failed to keep pace with visitation and pointed to the immediate need for a massive investment in organization and parks. However, NPS historian Bill Brown noted that by failing to include cost figures for implementing its recommendations, the report remained "a wish list of 90 distinct recommendations." Also missing was a clear vision of how the national park system as an institution should fit into an evolving society. Nor was there a strong, direct appeal for public support. Brown encouraged the NPS draw upon its legislative mandate to state more emphatically "what the parks must be in our society, how they must be nurtured with people and resources to accomplish the social purposes that we as a nation have agreed upon for them." What the Park Service needed, Brown concluded, was nothing less than "a national crusade."[6]

Though the report included important recommendations concerning park use and enjoyment, its analysis was sometimes confusing and its recommendations related to natural resources, such as the call for inventorying and monitoring park resources, echoed those of earlier studies. Others topics included external threats, improving cooperation with universities and managers of neighboring public or private lands, educating the public about environmental issues, increasing and professionalizing NPS staff, increasing funding for science and natural resource management, and securing a legislative mandate for scientific research in the parks. *The Vail Agenda* issued a challenge to the Park Service warning that "the only failure will be inaction," a challenge that continues to resonate.[7] At the close of the Vail meeting, NPS Director James M. Ridenour voiced a similar concern: "It is clear to me that we will need an ongoing commitment and process to keep our collective feet to the fire to make sure that our efforts do not just generate another report to gather dust on a shelf."[8] Yet for all the bold objectives, the problems outlined were all ones that the NPS had been reluctant to address. Although the report prompted some agency restructuring, Interior officials and agency leaders showed little enthusiasm for major change.

Preserving Nature in the National Parks

Problems with natural resource management received even greater scrutiny after the Vail symposium. For example, the

National Academy of Sciences came out with a critical report called *Science and the National Parks* in 1992. In 1997 NPS Historian Richard West Sellars published *Preserving Nature in the National Parks: A History*. This well-documented, carefully crafted history of NPS natural resource management revealed that the NPS had been negligent in the extreme when it came to pursuing a core function of its mission: preserving natural resources unimpaired for the enjoyment of future generations.[9]

Unlike previous studies, *Preserving Nature in the National Parks* inspired a substantial institutional response. In August 1999 Park Service leaders announced a major initiative, the Natural Resource Challenge, to substantially improve the way the NPS managed the natural resources under its care. The NPS appealed to Congress and within the first few years of the Challenge, had garnered an increase of approximately $80 million in base funding for natural resource management and research in the parks. Since its inception, the Natural Resource Challenge has substantially increased the role of science in the Park Service's decision-making, revitalized and expanded its natural resource programs, strengthened its partnerships with the scientific community, and shared its knowledge with educational institutions. Although the Natural Resource Challenge has proven successful, there has been no similar initiative or effort on behalf of cultural resources.

Rethinking the National Parks for the 21st Century

As the Natural Resource Challenge gathered momentum, in late 1999 NPS Director Robert G. Stanton asked the National Park System Advisory Board to address the complex, "multi-dimensional" mission of the NPS and make recommendations for the future and to prepare a report on the "purposes and prospects" for the NPS in the coming decades. More succinct and focused than previous studies, *Rethinking the National Parks for the 21st Century: A Report of the National Park System Advisory Board*, which came out in 2001, reiterated the Park Service's founding mission: to ensure that these places would never be impaired and would be available to "inspire and inform future generations." It called on leaders "to re-examine the 'enjoyment equals support' equation" and to enhance the public's understanding of and appreciation for the importance of resource protection. The Advisory Board sought to take a "fresh look" at the NPS within the existing social, political, and economic context and to identify ways that the NPS could better serve the American public. It framed a more expansive social contract. Parks, it warned, could no longer be thought of "as islands with little or no connection, cultural or ecological, to their surroundings."[10]

The Advisory Board recommended that the NPS increase its commitment to education; encourage the study and public discussion of the American past and link park sites to the broader themes of American history; focus more attention on the conservation of natural systems and biodiversity; adopt and advance the principles of sustainability; actively explore and emphasize the connections between native cultures and the parks; encourage collaboration among park and recreation systems from the local to the federal level to promote a widely accessible outdoor recreation network; and develop a more diverse work-

force. The recommendations reflected the impact of the large number of cultural and historic sites that had come into the park system during the 1990s and the mounting pressure on park boundaries. It also reflected the agency's increased program responsibilities and greater emphasis on education and environmentalism. The study encouraged the NPS to reaffirm the meaning and value of parks, conservation, and recreation and to expand the education and research role of the parks. Expressing its vision for the NPS, the report concluded, "By caring for the parks and conveying the park ethic, we care for ourselves and act on behalf of the future. The larger purpose of this mission is to build a citizenry that is committed to conserving its heritage and its home on earth." The report sparked little response.[11]

Discovery 2000

As the new century opened, the process of reassessment continued. In the fall of 2000, Director Stanton convened a major servicewide conference in St. Louis, Missouri, called "Discovery 2000." More inclusive than traditional superintendents' meetings, it included partners; representatives from various federal, state, and local agencies; Indian tribes; concessionaires; nonprofit organizations; and foreign parks. There was greater representation of women and minorities than in the past. The stated goal of the conference was to develop a vision of the NPS role in the life of the nation in the 21st century; to inspire and invigorate the Park Service, its partners, and the public about this vision; and to develop new leadership to meet future challenges. The dialogue was to focus on the long-term future of the Park Service and the park system. The format was a mix of inspirational plenary sessions, with such distinguished guest speakers as scientist E.O. Wilson and historian John Hope Franklin, and small group sessions and workshops where participants engaged in spirited discussions on a variety of pressing topics.

The conference came at a time of modest expansion, budget increases, and significant change. Yet, the problems the Park Service faced, the problems the NPS and its partners tackled at the conference, were remarkably similar to those a decade earlier: development around park borders, invasive non-native species, air pollution, and deteriorating roads and facilities. The conference was organized around four familiar themes: cultural resource stewardship, natural resource stewardship, education, and leadership. Participants discussed education, resource protection, the role of science, biodiversity, threats from outside park boundaries, demographic changes, leadership, environmentalism, and sustainability. But, as with many of the earlier efforts, participants left with no clearly articulated plan or agenda to guide real reform. Developing a clear agenda for the 21st century had never been the conference's purpose. As noted earlier, one of the major goals of the conference was to inspire, and by any measure it succeeded in this. However, inspiration alone would not be enough to prompt dramatic change, and the momentum generated at the conference soon waned.[12]

Since 1980 the various studies and conferences discussed above have repeatedly highlighted concerns related to education, leadership and management, threats from outside park boundaries, the role of science, environmentalism, and the need to

improve resource stewardship. The reports laid out a vision for the NPS and the park system that often fell short, just as the Park Service fell short in its response. Some of these reports recommended that the NPS develop a comprehensive program to inventory parks' natural resources and monitor their condition over time. The Park Service repeatedly expressed its intent to do this, but made little progress.

State of the Parks–1980, for example, highlighted the need for improvements in determining what cultural and natural resources existed in each park, their current condition, and the degree to which they were threatened. In its response, the NPS called for resource management plans to identify the condition of each park's resources and the problems managing them. Yet, between 1987 and 1996 the General Accounting Office (now the Government Accountability Office) reported three times that the Park Service had made only limited progress in fulfilling the requirements for information and monitoring identified in 1980.[13]

Another recurring theme from these reports and conferences was lack of adequate funding. However, with few exceptions the reports failed to detail the specific costs associated with their findings and recommendations. Except for *Preserving Nature in the National Parks*, none called for or sparked a major campaign to secure additional funds. None appealed directly to the American public for support. None actively enlisted the grassroots support within the Park Service that is so critical to success. None fully addressed the fundamental question of what the national parks should be and should mean in a rapidly changing society. None were able to effectively and powerfully assert the NPS purpose. Though there were repeated references to "the park ideal" and "park values," most failed to articulate a clear vision and mission for the Park Service and the park system. To be fair, the NPS's mission and responsibilities had become so complex that the authors of these studies might have found producing a single mission statement or statement of park values simply too difficult.

Why did these studies and reports keep revisiting many of the same issues? Why were the problems and concerns identified in the reports not addressed more forcefully? The answer is not entirely clear. Certainly budget constraints and inadequate political support were factors. Some of the responsibility lay with the NPS and its own resistance to change. Park Service leaders seem to have absorbed the reports and made modest changes, but then retreated to their comfortable cultural behavioral patterns. In addition, most of the studies failed to include any requirement for accountability or milestones against which progress could be judged.

Yet, as we have seen, the reports also had some positive impacts. Most importantly, they focused attention on the critical issues affecting the Park Service and the parks. They articulated the pressing problems and challenges in clear and sometimes compelling ways. In some instances, they resulted in organizational change, budget increases, and improved training. Yet none prompted long-term, fundamental change. As the system grew larger and more complex, the challenge of addressing the issues noted above only became greater. *The Vail Agenda* set out to answer the question "Why would a nation want a system of national parks?" as a way of defining the purpose of the National Park Service. The

question remains as challenging, relevant, and urgent today as at any time in the Park Service's history.

The NPS mission has grown well beyond what founders Stephen Mather and Horace Albright envisioned; it has become much more complex than preserving and managing park sites. The Park Service now has responsibility for managing a broad range of programs, and its legislative mandate has grown to include clean air and water, protection of archeological resources, historic preservation, endangered species, wild and scenic rivers, 40 national heritage areas, large cooperative landscape projects, and environmental protection. The national park system has expanded from managing a collection of the great scenic parks to administering hundreds of diverse sites and programs and participating in civic and social pursuits. As the mission has grown in complexity, so too has the enormousness of the issues the Park Service must face. At the same time, change and growth have also created a new context of opportunity, one in which boldness, creativity, and a new set of skills will be required.

As the NPS reflects on its role and purpose in anticipation of its second century, what can we learn from these earlier assessment efforts and their outcomes? It becomes clear that significant fundamental change will require broad vision, bold leadership, outside-the-box thinking, a clear articulation of goals, careful planning, clear standards of accountability, a detailed budget that provides adequate funding, grassroots public support, a strong support base within NPS, and thoughtful, close collaboration with its partners. Any vision for the next century clearly must focus on more than preserving the individual visitor experience; it must be firmly linked to the common good. The NPS and its partners must continue to develop and embrace a broader view of what the national parks are for.

Acknowledgments

The author would like to thank Richard West Sellars, Dwight Pitcaithley, Loran Fraser, and Rolf Diamant, who reviewed the manuscript and provided valuable comments.

Endnotes

1. For a detailed discussion of the (A. Starker) Leopold Report and the National Academy of Sciences Reports, both in 1963, see Richard West Sellars, *Preserving Nature in the National Parks: A History* (New Haven: Yale University Press, 1997).
2. *National Parks for a New Generation: Visions, Realities, Prospects* (Washington, D.C.: The Conservation Foundation, 1985), xxxi.
3. *National Parks for a New Generation*, xviii.
4. *National Parks for a New Generation*, 310.
5. National Park Service, *National Parks for the 21st Century: The Vail Agenda* (Washington, D.C.: National Park Service, 1992), 101–103.
6. William E. Brown, "Report and Reflections on Vail," November 22, 1991, NPS Park History Office Files.
7. National Park Service, *Vail Agenda*, 39.
8. "Talking Points for Vail Ridenour Concluding Speech," October 10, 1991, NPS Park History Office Files.

9. Sellars, *Preserving Nature*, 280–290.
10. National Park Service, *Rethinking the National Parks for the 21st Century: The National Park System Advisory Board Report* (Washington, D.C.: National Geographic Society, 2001), 2–3.
11. *Rethinking the National Parks*, 13.
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13. U.S. General Accounting Office, Report to the Ranking Minority Member, Subcommittee on National Parks, Forests, and Lands, House Committee on Resources, "National Park Service: Activities within Park Borders Have Caused Damage to Resources," GAO/RCED-96-202, August 1996, 4.

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Join the Centennial conversation!

Do you have a comment on the ideas presented in this essay? Ideas of your own to share? Whether it be criticism, praise, or something in between, we want to hear your thoughts on the National Park Service, its centennial, and the future of America's national park system. Write us at nps2016@georgewright.org and we'll post your comments on our Centennial webpage (www.georgewright.org/nps2016.html).

CELEBRATING 40 YEARS OF THE WILD & SCENIC RIVERS ACT:
AN EVOLUTION OF RIVER PROTECTION STRATEGIES

SUE JENNINGS AND ABBY MILLER, GUEST EDITORS

Celebrating Forty Years of the Wild and Scenic Rivers Act

Sue Jennings

TWO THOUSAND EIGHT IS AN IMPORTANT YEAR FOR RIVERS, marking as it does four decades of protection provided by the National Wild and Scenic Rivers Act. Given the importance of rivers, both to individuals and the nation, it is an anniversary worth acknowledging.

Growing up in the North Woods of Michigan, I was surrounded by water. From canoeing on the Au Sable River, to hiking along the Tahquamenon, moving waters have been an important influence in my life. These rivers and streams were a consistent source of exploration and discovery—both an open schoolyard and a warehouse of life lessons, in metaphor—that fed my curiosity, nourished my soul, and, at times, served as a refuge. Though I didn't understand it at the time, the rivers and the woods through which they flowed were an important part of my own personal growth, development, and history. I am convinced that the time I spent listening to the birds along the river banks, or watching the life cycles ebb and flow as the seasons progressed, are experiences that contribute to who I am today. The emotional connection and inspiration I felt then are resurrected each time I hear a red-wing blackbird buzzing along a marsh, frogs singing in chorus, or the thump of a beaver tail hitting the water. I am reminded that these and other such experiences are my touchstone, a grounding point of reference.

Collectively, just as for me individually, rivers are an important part of America's natural and cultural heritage. They have been sources of physical sustenance and spiritual inspiration, provided an impetus for human settlement, and served as paths for exploration, commerce, and travel. If we are to fully understand America's history, it is imperative to fully understand the contributions that rivers have made to our nation's growth, development, and conservation ethic. In many respects, rivers are analogous to our wilderness areas, which, as Roderick Nash (Lawliss and Davis 2004) observes, are our historical documents—

our libraries and a living repository of history and knowledge that cannot be obtained without direct, firsthand experiences. They are integral to who we are as a nation. To allow our waterways to deteriorate is, to paraphrase Nash, equivalent to tearing pages from our most important historical documents.

For four decades, the National Wild and Scenic Rivers Act has protected our nation's most spectacular rivers and serves as an important tool for balancing development and preservation. From the Allagash, Delaware, and Obed, to the Missouri, Merced, Snake, and Trinity, the stories of our nation's signature rivers are preserved by this pioneering law. Championed by Senator Frank Church of Idaho, and signed into law by President Lyndon B. Johnson on October 2, 1968, the act declares that

> . . . certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

Notable for safeguarding the special character of certain rivers, the act purposefully strives to balance development with permanent protection for the country's outstanding free-flowing rivers and their associated values. In doing so, it establishes a visionary template for a collaborative approach to river protection involving federal, state, and local partners.

The act emerged following nearly two decades of bitter controversy over the proposed construction of hydroelectric dams within Hells Canyon along the Snake River. The dispute propelled Senator Church into an 18-year battle that would define his career (Ewert 2001). The drama at Hells Canyon involved one of the largest accidental fish kills in our nation's history, along with an unusual lawsuit where the Department of the Interior sued the Federal Power Commission (asserting a proposed project would have adverse affects on fish and wildlife resources), and resulted in a historic Supreme Court decision where the definition of the public good was expanded to include environmental values (Ashworth 1977; Ewert 2001). During this period, similar controversies were playing out in the West and across the nation. Likewise, increasing levels of education, personal income, and awareness helped spawn a greater inter-

Obed Wild and Scenic River, Tennessee. Photo courtesy of NPS.

est in environmental issues. The nation's environmental conscience was re-emerging into a modern environmental movement, which challenged the premise of sustainable hydropower. The stars could not have aligned more perfectly. The time was ripe for a new direction in managing our nation's river resources.

As we approach the 40th anniversary of the act, it is an appropriate time to reflect on where we have been and where we are today, and to renew our commitment to river protection beyond the next 40 years.

The Snake River and the Hells Canyon controversy

Along the northern border between Oregon and Idaho, the Snake River has carved out sheer vertical cliffs through a rugged landscape, making a stunning gorge deeper than the Grand Canyon. Desolate and seemingly impenetrable, the walls of Hells Canyon rise up an astounding 7,900 feet, and, in some places, are less than five miles apart. The canyon features dramatic changes in vegetation, supports a variety of wildlife, and offers stunning vistas of Idaho and Oregon from the rim. In addition to a diverse array of plants and animals, the Snake was home to extraordinary salmon runs—at one time it produced nearly 40% of all the salmon and steelhead in the Columbia River Basin (Ewert 2001).

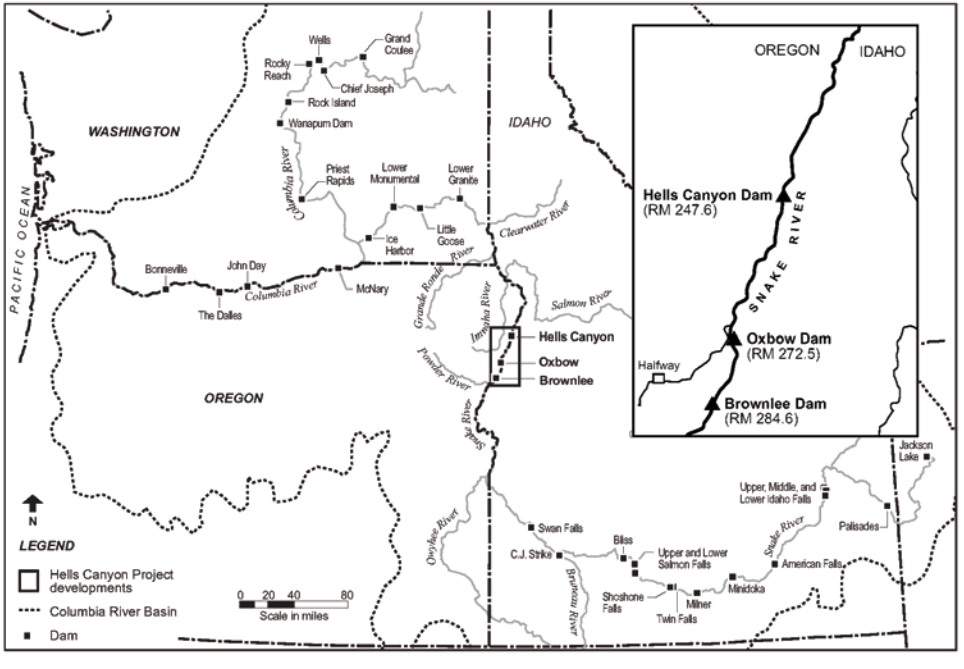
The canyon has an equally rich cultural history. Home to Native Americans and the subject of Nez Perce legend, the gorge is a storehouse of prehistoric artifacts, petroglyphs, and other important archeological relics. In more recent times, several explorers came through the area in search of transportation routes. Captain Meriwether Lewis, as part of the Lewis and Clark expedition, described the area as a "high broken mountainous country" where the river banks were "in most places solid and perpendicular rocks, which rise to a great hight [sic]" (Lewis et al. 2002). Further attesting to the canyon's difficult landscape, members of this historic expedition were convinced by a Shoshone chief that the river and mountains were inaccessible (Ashworth 1977). Later, in the 1830s, after arriving at Hells Canyon as part of an expedition to the American West, U.S. Army Captain Benjamin Bonneville observed: "Nothing we had ever gazed upon in any other region could for a moment compare in wild majesty and impressive sternness with the series of scenes which here at every turn astonished our senses and filled us with awe and delight" (Ewert 2001). Unsettled, rugged, and remote, Bonneville and other explorers were forced to abandon the gorge time and again. It wasn't until gold was discovered in Idaho in the 1860s that a renewed interest in accessing the canyon emerged. Homesteaders, prospectors, and ranchers came to establish mining towns and small communities. With the conclusion of the Nez Perce War of 1877, rapid development followed. It was not long after that plans were in place to harness the immense hydroelectric potential of the Snake.

By the late 1940s and early 1950s, federal dam construction was sweeping the nation. Large rivers were dammed, and eventually this remote gorge, with its fast-flowing waters, was seriously considered by the federal government for its development potential. During this period, the U.S. Army Corps of Engineers and other federal agencies had completed feasibility studies in the Columbia River basin, which included the Middle Snake River (Ashworth 1977). Two federal dams, one at the Hells Canyon site and another downstream near

the confluence of the Salmon River, were proposed. In 1952, yet another proposal emerged that advocated building a massive federal dam at Hells Canyon Creek. This proposal would have been six feet shy of the Hoover Dam in height and would have maintained a reservoir storage capacity of 4.4 million acre-feet of water, effectively stagnating 93 miles of river behind the dam (Ewert 2001). Likewise, Idaho Power, a private company, was securing private ownership claims within Hells Canyon. By 1953, permit hearings were underway for a series of three privately owned dams within the gorge: the Brownlee, the Oxbow, and the Hells Canyon. The controversy was beginning to boil. In the early 1950s, the concern was not *should* the dams be built; rather, the issue pertained to ownership. Should the dams and their hydroelectric generating potential be publicly or privately owned?

Church, at the time of his election to the Senate in 1956, supported federal dam development. He felt strongly that the federal government had the best long-term capability for both protecting the region's water rights and ensuring economic growth. Church asserted that federally funded hydroelectric projects would save taxpayer dollars (Ewert 2001). Others supported privately owned and operated dams. However, by this time, preservation of salmon and steelhead runs for their economic and cultural importance was gaining support, as was protecting the canyon's scenic values and associated public recreational opportunities. The debate over how to best develop hydropower for economic growth, irrigation, and other needs soon intensified as the environmental movement grew. Church struggled with balancing his own beliefs, which favored development as an economic

Location of Hells Canyon, Oxbow, and Brownlee dams. Source: Federal Energy Regulatory Commission.



growth stimulus, with those of a growing environmental movement within his own state and across the nation.

The Oxbow incident

Following a bitter battle between federal and private interests, Idaho Power prevailed, and construction for the Hells Canyon projects began in 1955. The Brownlee Dam was completed in 1958, the Oxbow Dam in 1961, and the Hells Canyon Dam in 1967. However, construction was not completed without incident. As part of the permit condition for licensing, Idaho Power was required to ensure protection of the anadromous fishery. Idaho Power's plan was to transport salmon around the 205-foot-high Oxbow Dam and release them into the river as a means to maintain viable runs during construction. Unfortunately, in 1958, the attempt failed and decimated the entire fall Chinook salmon and steelhead run. This debacle, which included trap failures, isolation of fish in an unaerated pool downstream of the dam, and poorly organized logistics, led to, according to one historian, "one of the greatest anadromous fish disasters in history" (Ewert 2001). The U.S. Fish and Wildlife Service was called in to survey the damage, and according one report "approximately 4,000 adult Chinook salmon and steelhead died on site" and "50 percent of the 14,000 salmon which were collected and transported around the project did not survive to spawn. The success of the 3,700 steelhead trout which were passed remains to be determined. In addition to the environmental catastrophe, the monetary loss from their failure to spawn was literally incalculable" (Ewert 2001) .

The Oxbow tragedy focused national attention on the limitations of dam technology. The controversy surrounding the Brownlee, Oxbow, and Hells Canyon dams had a significant impact on other dam construction. Elsewhere across the country the public was witnessing the unforeseen effects of hydropower dams in other cherished locales—including the loss of recreational whitewater, important floodplain habitat, and important Native American sites. As the issue made its way through the courts, public sentiment in support of the environment strengthened. Environmental quality was rapidly becoming an integral part of America's perception of "the good life" and commensurate to a high standard of living (Ewert 2001). By the 1960s, the debate between the environmental costs and economic benefits of hydropower was raging. Litigation continued to follow on the heels of licensing actions. In 1964, the proposed High Mountain Sheep Dam on the Snake River (with both a private and publicly funded option) was litigated. In a highly unusual move, the Department of the Interior sued the Federal Power Commission in an effort to protect salmon and steelhead from the negative impacts associated with impounding the Snake. The case made it to the Supreme Court, where Justice William O. Douglas, writing for the majority, interpreted the Federal Power Act to require the consideration of alternatives to federal development, including no development. Douglas wrote: "The test is whether the project will be in the public interest. And that determination can be made only after an exploration of all issues … including future power demand and supply, alternative sources of power, the public interest in preserving reaches of wild rivers and wilderness areas, the preservation of anadromous fish for commercial and recreational purposes, and the protection of wildlife."

Aniakchak Wild and Scenic River, Alaska. Photo courtesy of Troy Hamon/NPS.

(Ashworth 1977). The Supreme Court required the Federal Power Commission to reconsider the application.

By the mid-1960s, there was sufficient public concern over the inexorable loss of free-flowing rivers to force change. Church, who witnessed the environmental losses associated with dams, began to share this concern. He wisely recognized that the mounting public sentiment was creating "a groundswell of public concern for the fate of these majestic streams, many of them threatened by dams which would forever destroy their beauty and ecology." Church warned that "if we fail to give these rivers, which are assets of unique and incomparable value, statutory protection now, while there is still time, we shall have only ourselves to blame later, when time has run out." The 20-year debate over the development or preservation of the 110-mile free-flowing stretch of the Snake in Hells Canyon changed Frank Church (Ewert 2001). Clearly, his awareness and appreciation of the role of dams in the larger environmental picture deepened, as did his commitment to balancing development and preservation and his skills in seeking reasonable solutions through consensus.

Passage of the Wild and Scenic Rivers Act

In March 1965, Church introduced the National Wild Rivers Bill, which prohibited dams on certain select rivers. Fully supported by the Johnson administration, this landmark legislation, designed to preserve forever in a free-flowing condition some of the nation's most precious rivers, was signed into law on October 2, 1968, as the National Wild and Scenic Rivers Act. Officially known as Public Law 90-542, Section 1(b) of the act expresses congressional policy for the rivers of the United States:

> The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-

> flowing condition to protect the water quality of such rivers and to fulfill other vital conservation purposes.

Today, the act serves as the nation's primary river conservation authority. By establishing a national wild and scenic rivers system, the act established a policy that balances the federal government's role in damming and channelizing rivers for power, flood control, and agricultural purposes with protection of the free-flowing character and associated values of selected rivers for present and future generations.

Establishing a system of protected rivers: How the act protects rivers

The legislation outlines how rivers become part of the national system, how they are managed, what kinds of developments can occur within a river's corridor, and how the federal government and its partners can cooperatively share stewardship responsibilities (National Park Service 2007). The Bureau of Land Management (BLM), National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS) and the U.S. Forest Service (USFS) are the four federal agencies responsible for administering, regulating, and managing designated rivers in the national system. In order to qualify for federal designation, a river or river segment must be in a free-flowing condition, have good water quality, and be deemed to have one or more "outstandingly remarkable" scenic, recreational, geologic, hydrologic, fish, wildlife, ecological, historic/cultural, or other similar values. The act requires the establishment of a boundary, classification of river segments, and the development of comprehensive river management plan.

Segments may be added by Congress, or a state may apply—through its governor—to the secretary of the interior for designation under section 2(a)(ii) of the Act. For state-administered rivers in the system, the state bears the primary responsibility for management through state and local statutes and regulations. Where no federal lands adjoin state-administered segments, the NPS has oversight responsibilities, and, on behalf of the secretary of the interior, is responsible for evaluating impacts of certain projects under section 7 of the act.

Once included, every river in the national system is to be administered in a manner that will not only protect, but *enhance* the values that made it eligible for inclusion; namely, the river's free-flowing condition, its remarkable values, and water quality. This is often referred to as the "anti-degradation, affirmative protection" clause. The act is nearly unique in requiring the improvement of a protected natural resource's integrity, function, or condition. Importantly, the act establishes federal water rights. The act does not specify the quantity of the right; the amount of the federal right varies from river to river depending on the river's flows, its unappropriated flows at the time of designation, and the values for which it is being protected (Baldwin 2001).

Recognizing the importance of a watershed approach, Congress envisioned river protection to be accomplished by mutual cooperation on the part of federal, state, local, and private partners. As such, federal agencies may assist, advise, and cooperate with states in the designation and management of rivers, and may seek opportunities for sharing management responsibilities with states, political subdivisions, landowners, private organizations, or other partners.

Niobrara National Scenic River, Nebraska. Photo courtesy of NPS.

Congress also recognized that river protection does not always require public purchase and ownership of land. In some instances, river values can be protected by methods other than land acquisition (local zoning, restrictions on development on floodplains or other sites where development is incompatible, or donations of development rights to land trusts). Most wild and scenic rivers are managed to accommodate and reflect local community and landowner interests.

Importantly, section 7 of the act provides the four administering agencies with a powerful regulatory tool. Often called the heart of river protection, section 7 serves as a prohibition or limitation on certain federally assisted water resources projects. The intent is to preserve designated rivers, as well as congressionally authorized study rivers, in their free-flowing condition and to protect them from the harmful effects of dams and other types of water resources projects that involve construction within the river's bed and banks. Additionally, section 7 prohibits federal agencies from approving water resources projects that are proposed for locations above, below, or on a tributary of a designated (or study) river (National Park Service 2007). As such, river-administering federal agencies serve in a regulatory capacity during the permit review process by scientifically evaluating proposed federally assisted water resources projects that might affect designated or study rivers or their tributaries. Harmful projects can be denied. Because of its inherent veto authority, section 7 is an effective

action-forcing tool—early coordination with state, local, and private entities within the watershed is thus essential for project implementation to occur. Properly planned, most project proposals can be designed in a manner that avoids or minimizes impacts, yet is compatible with the goals of the act.

Celebrating decades of river protection

Since its passage in 1968, the act has served as a visionary template for a nationwide system of federal, state, and locally protected rivers providing a wide range of benefits to the American public. In its entirety, the act is considered one of the most important pieces of conservation law we have. In contemplating this legislation to protect our nation's rivers, Representative William Anderson of Tennessee rightly observed, "And I count myself more fortunate with each passing season to have recourse to these quiet, tree-strewn, untrimmed acres by the water. I would think it a sad commentary on the quality of American life if . . . we could not secure for our generation and those to come the existence of . . . a substantial remnant of a once great endowment of wild and scenic rivers." Indeed, we have much to celebrate.

Over the last 40 years, a great deal has transpired. In 1968, there were eight inaugural components in the national wild and scenic rivers system. The "original eight" comprised the Middle Fork of the Clearwater and the Middle Fork of the Salmon in Idaho, the Eleven Point in Missouri, the Middle Fork of the Feather in California, the Rio Grande in New Mexico, the Rogue in

Missouri National Recreational River, Nebraska/South Dakota. Photo courtesy of NPS.

Oregon, the St. Croix in Minnesota and Wisconsin, and the Wolf in Wisconsin. Since then, an astounding 11,290 miles within 165 rivers have been included in the national system. Significant fisheries, riparian corridors, and recreational opportunities are among the outstanding values protected on rivers such as the Skagit, Trinity, and Noatak. The natural beauty of New England is reflected in the Allagash, Farmington, and Westfield rivers. The clean, pristine waters of the Big Darby, Namekagon, and St. Croix serve as important refugia for federally listed species. History abounds where traces of prehistoric communities are protected along the John Day, Snake, and Rio Grande. Appalachia's rich cultural history comes alive along the Bluestone and Gully. As a result of this legislation, rivers that have played a fundamental role in shaping our nation's history, such as the Missouri and Merced, are preserved forever.

Importantly, the formation of the Interagency Wild and Scenic Rivers Coordinating Council in 1995 has greatly improved interagency coordination among the four federal agencies charged with administering the act. A model for interagency cooperation, the work of the council has resulted in the production of technical papers, guidance documents, and training curricula that assist agency staff to fulfill the requirements of the act. Today, the council continues to address a broad range of emerging issues, provides technical expertise to river managers, and serves as a vital resource to local governments and nonprofit organizations on the intricacies of the act.

Charting a new course

Yet, with the passage of time, it has become clear that our management approach needs to be refurbished in order to make it relevant and sustainable. Certainly, taking full advantage of all the act's provisions has proven to be difficult. The act has complex requirements influencing the management of resources and resource attributes as varied as water quantity and quality, minerals, agriculture, fisheries, archeological resources, and varied forms of recreation. The range of involved jurisdictions and ownership further compounds the complexities of the act. Consequently, effective implementation of the act has been a challenge to agency personnel with shrinking budgets and staff, and can be confusing to the public. Key issues demand attention relating to regulatory responsibilities, resource stewardship, and river policy.

In the face of global climate change, droughts and flooding, accelerated wetland losses, and water quality and quantity issues are becoming grave. Already, water wars, once heard of only in the western states, have come to the heartland along the Niobrara and Missouri rivers, and are brewing in the East. As demand increases for water for agricultural, hydropower, and energy development, the pressures on our nation's river resources continue to intensify. The rapid proliferation of energy corridors, wind turbines, cell towers, and other developments within river watersheds have left agencies and partners unable to respond. Our nation's wild and scenic rivers may very well become important repositories or refugia for fish and other aquatic resources, and riparian habitats along rivers could provide important corridors for movement of species. Already, the largest group of endangered species in the United States—mussels, fish, and crayfish—depends on a habitat of clean, abundant water. These species' continued decline could well be a harbinger

of intensifying conflicts associated with water management if we fail to respond.

Forty years after the passage of the act, the time is once again ripe to bring river stewardship into the forefront of the national consciousness—a time to re-evaluate current management policy and approaches, and to chart a bold new course for the next 40 years. First and foremost, we must encourage efforts that promote our rivers as valuable assets, fundamental to our nation's health, safety, and way of life. This goes beyond balancing today's development trends and resource pressures with preservation goals; our challenge is to integrate river protection and consideration of environmental services into our economic equation.

Second, we need to re-invigorate our constituents so they become tomorrow's river champions. Our efforts need to focus on educating, inspiring, cultivating, and motivating a generation of youngsters (and adults) so that they fully understand the value of rivers. We need to cultivate advocates who view rivers from an ecological perspective, who understand their role in our nation's history, and who value rivers as a source of physical sustenance and spiritual inspiration.

In his introduction to *A Sand County Almanac*, Aldo Leopold wrote that "conservation is getting nowhere because it is incompatible with our Abrahamic concept of land. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.... That 'land is a community' is the basic concept of ecology, but that 'land is to be loved and respected' is an extension of ethics." We need to revive our land, and water, ethic.

Third, our management approaches should focus on enhancements—how to restore systems and undo the mistakes of the past. Such a focus could take advantage of this generation's incredible energy and enthusiasm for new technologies and innovation and direct it toward developing innovative river and watershed restoration technologies.

Finally, we need to work towards building environmental coalitions with non-traditional partners, including business and industry. There is an incredible opportunity in this arena to develop an economy that values healthy resources while diversifying our portfolio of supporters.

As we celebrate 40 years of the Wild and Scenic Rivers Act, I invite you to answer the call of the river. Jump in and engage in the ongoing conversations with river scientists and historians, resource managers and policy analysts, educators and interpreters. Reach out to non-traditional partners and seek innovative ways to restore our watersheds. Look for opportunities within the local community and beyond to institutionalize environmental standards and ensure these standards and core values are not abdicated. Insist on an educational system that produces environmentally literate students—it is imperative that today's youth are given an opportunity to get out to the river's edge, to learn about streams in their own back yard, and to understand their watershed. Only then will they begin to connect rivers to their own history and their personal lives, to associate rivers as an essential link to their future, and thus restore culture. This is the type of land ethic that leads the way to sustainable co-existence. Like the vocal groups that propelled Frank Church into being an advocate for rivers, and others who were instrumental in

our landmark environmental protection laws, without an educated, inspired, and vocal constituency to advance an idea, we could very well lose what so many have worked so hard to achieve.

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The Wild and Scenic St. Croix Riverway

Kate Hanson

Unlike the western rivers designated in the 1968 Wild and Scenic Rivers Act, which largely flow through federal lands under the authority of a single agency, the St. Croix National Scenic Riverway passes through a variety of jurisdictions and is managed cooperatively by federal, state, and local entities (Figure 1). The course of management at the riverway over the past 40 years illustrates the challenges of multiple-jurisdiction management, the successes that can be attributed to its wild and scenic status, and current issues.

It was the threat of a 610,000-kilowatt power plant in Oak Park Heights, Minnesota, proposed in the 1960s, which triggered action leading to designation of the St. Croix National Scenic Riverway, one of the first eight rivers designated as part of the 1968 Wild and Scenic Rivers Act. The riverway includes the St. Croix River and a major tributary, the Namekagon.

Other river development proposals had been debated since the 1800s, including an idea that persisted for decades to connect Lake Superior with the Mississippi via the Namekagon and St. Croix Rivers. As early as 1870, the U.S. Army Corps of Engineers had considered damming the Lower St. Croix to create a reservoir and control navigation on the Mississippi (Merritt 1979:72–77, 289).

By the late 1920s, Northern States Power Company (now part of Xcel Energy) had acquired almost 30,000 acres along the St. Croix for power-generating facilities. In the 1940s, struggling farm cooperatives in northern Wisconsin and Minnesota wanted the Corps of Engineers to create a "little TVA of the north" along the St. Croix River. The Izaak Walton League was instrumental in fighting off this proposal (Karamanski 1993:29–30, 33).

By 1953, there were 23 dams and hydroelectric plants in the St. Croix Basin, including five small dams on the upper Namekagon River. However, the middle and lower St. Croix remained a free-flowing North Woods stream, popular among canoeists and anglers (Karamanski 1993:38).

By the 1960s, the Twin Cities metropolitan area was growing rapidly, extending farther out from the core cities of Minneapolis and St. Paul. Blufftop, floodplain and farmland property along the St. Croix was being subdivided for homes and commercial developments. Ever more people were coming to the river to swim, boat, fish, sail, water-ski, canoe, camp, and enjoy the scenery.

The Oak Park Heights plant, proposed by Northern States Power, would have been one of the largest in the nation, and it set off a firestorm of public opposition. Activists formed the Save the St. Croix Committee, with representatives from both Wisconsin and Minnesota (Karamanski 1993:50).

Figure 1. The St. Croix River, about midpoint on its course from Solon Springs, Wisconsin, to the confluence with the Mississippi River. While there are places along the riverway where communities or rural private residences are visible, large stretches remain undeveloped and provide undisturbed, natural views. Photo courtesy of the author.

The notion that the St. Croix and Namekagon deserved protection was not new. But not until the late 1950s did these rivers come to be perceived as national, rather than local, resources.

A newspaper editor in Chisago County, Minnesota, was among the early advocates for national protection, writing in 1958: "If Mr. Public has a place or places to play in the future, now is the time to consolidate all efforts here in the upper Midwest and ask for a gigantic St. Croix Federal Park, perhaps named the 'River of Pioneers National Park'" (Norelius 1958).

Wisconsin Senator Gaylord Nelson first championed the cause of St. Croix and Namekagon protection in response to the controversial Oak Park Heights power plant proposal. At a January 1965 hearing in response to the proposal, he made a moving appeal for river protection, stating: "Call the roll of the great American rivers of the past … the mighty Hudson, the thermally polluted Delaware, the Ohio, the Mississippi, the Missouri, and even the Minnesota.… The story in each case is the same: they died for their country" (Nelson 1965).

In the national political arena, Nelson was joined by Walter Mondale, then a junior senator from Minnesota (and later, vice president), to introduce a 1965 senate bill (S. 897) to establish a St. Croix National Scenic Waterway (Karamanski 1993:73–75). Both men had ties to the rivers and their dedication to protection would be lifelong.

The 1965 bill passed the Senate, but was laid over in the House. Controversy had developed, largely over concerns about possible condemnation of land by the National Park Service. In 1967, Nelson and Mondale again introduced legislation to create a St. Croix National Scenic Riverway (S. 368). Representative Joseph Karth introduced a companion bill in the House of Representatives. The Nelson/Mondale and Karth bills were virtually identical to one another and to the earlier S. 897.

At the same time, Nelson and Mondale were backing efforts to enact national river protection legislation. When it became apparent that a national bill had momentum, they used that as a vehicle for the St. Croix legislation. As a result, the St. Croix River upstream of the communities of Taylors Falls (Minnesota) and St. Croix Falls (across the river in Wisconsin), along with the entire Namekagon River, were designated as the 252-mile St. Croix National Scenic Riverway in the 1968 Wild and Scenic Rivers Act.

The lower 52 miles of the St. Croix (downstream of Taylors Falls/St. Croix Falls) were not included in the original designation. The National Park Service (NPS) was concerned that this stretch of river, particularly the last 25 miles before the confluence with the Mississippi River (known as Lake St. Croix), did not have wild and scenic river characteristics because of its lake-like quality and the level of existing development.

The governors of Wisconsin and Minnesota petitioned the secretary of interior to include the lower 52 miles in the federal wild and scenic rivers system, and Congress designated the Lower St. Croix National Scenic Riverway in 1972, with direction that the states would have management responsibility for the Lake St. Croix stretch of river and NPS responsibility for the remaining 27 miles.

While there were two separate designations, the entire Namekagon and St. Croix Rivers are considered the St. Croix National Scenic Riverway. The Namekagon and St. Croix above Taylors Falls/St. Croix Falls are referred to as the Upper St. Croix; the Lower St. Croix is the river downstream of these two communities.

At the time of designation, supporters were concerned primarily with maintaining free flow, protecting scenic resources, eliminating industrial pollution, and preventing loss of public access and recreational opportunities. Early management focused on acquiring land and scenic easements within the riverway boundary, removing structures, and developing landings, campsites, visitor centers and other public facilities. Over the years, NPS initiated programs for facility maintenance, resource protection, interpretation, and resource management. Today, river management has evolved to address a host of concerns that likely were not in the forefront of people's minds forty years ago.

Mixed land ownership and multiple management entities

The St. Croix and Namekagon rivers flow through multiple jurisdictions. The wild and scenic boundary is roughly a quarter-mile on either side of the river and, within the 252-mile federally administered portion of the riverway, encompasses about 97,500 acres, including land and water surface. Of this, NPS has acquired 20,503 acres (above the ordinary high water line) in fee simple at a cost of $37.3 million, and holds easement interests in about 14,137 acres of privately owned land (above the

ordinary high water line) at a cost of $8.6 million. The remainder of land within the boundary is a mix of other public land (about 28,000 acres), municipal and private land, and Indian trust land. Thus, NPS has direct management authority over only about one-fifth of the riverway.

A variety of other entities own, manage, regulate, or have other interests in land and facilities within the riverway boundary, including the following federal, state, tribal and local government agencies:

- Wisconsin Department of Natural Resources (land use, water quality, wildlife areas, state parks, state forests, public landings, trails, law enforcement);
- Minnesota Department of Natural Resources (land use, state parks, landings, law enforcement);
- Minnesota Pollution Control Agency (water quality);
- The U.S. Army Corps of Engineers (wetlands, in-stream disturbance);
- U.S. Forest Service (a small portion of the Chequamegon National Forest);
- Eleven counties (private land use, forests, parks, landings, roads, bridges, trails, law enforcement);
- Thirty-three townships and seven municipalities (private land use, roads, parks, docks, landings, trails, law enforcement);
- Indian tribes (Indian trust lands and treaty rights for traditional resource uses);
- Transportation agencies (roads and bridges);
- Utilities (electrical transmission lines, oil and gas pipelines, cell towers); and
- Private landowners (residences, retreat centers, camps, docks).

It is essential for NPS to work with these other parties when wild and scenic river management intersects with their interests and activities, or visa versa.

Cooperative management

The riverway is managed through a variety of formal and informal partnerships. For example, separate management commissions are in place for the lower and upper portions of the riverway. NPS, Wisconsin Department of Natural Resources, and Minnesota Department of Natural Resources are represented on the Lower St. Croix Commission. These three agencies, along with Xcel Energy (formerly Northern States Power Company, which donated significant acreage for the riverway) comprise the Upper St. Croix Management Commission, which addresses management of the Namekagon and the St. Croix above Taylors Falls/St. Croix Falls.

Land use on non-public lands within the riverway is governed by state and local governments. The states have established special riverway land use regulations that must be adopted and implemented by local units of government for both the federal and state-administered portions of the Lower St. Croix. There are no riverway-specific land use regulations on the Upper St. Croix, although state wetland, shoreland, and land use regulations apply.

NPS has no legal authority over local land use. Our role is to support the states and "encourage" local governments or individual landowners to follow land use practices that will protect the river. We must interact with the various local governments on a regular basis, attending town board and city council meetings where river-related matters are on the agenda, communicating regularly with local zoning officials, reviewing proposals for subdivisions, cell

towers, wind towers, gravel mining, roads, and other developments, and otherwise engaging in matters affecting the river. We are frequently asked why we "can't do something" about an issue and, despite the fact that we exercise no authority, are often held accountable if there's a decision unfavorable to the river.

In addition to the two management commissions, a number of coordinating groups and less formal partnerships are in place to address specific resources or resource issues at the field level. Some examples:

- The St. Croix Basin Water Resources Planning Team has pooled resources to conduct extensive research on water quality and take cooperative action to protect water quality (Figure 2). Members include NPS, U.S. Geological Survey, the Minnesota and Wisconsin departments of natural resources, Minnesota Pollution Control Agency, the U.S. Army Corps of Engineers, the Twin Cities Metropolitan Council, the Science Museum of Minnesota/St. Croix Watershed Research Station, several counties, soil and water conservation districts, and nonprofit organizations.
- The Interagency Mussel Coordination Team, comprising staff from the U.S. Army Corps of Engineers, U.S. Fish

Figure 2. Maintaining good water quality is crucial to the survival of freshwater species such as mussels. Here, NPS aquatic biologist Byron Karns (right), filters water to obtain mussel veligers for the Interagency Mussel Coordination Team. Dan Kelner, with the U.S. Army Corps of Engineers, is driving the boat. Photo courtesy of the author.

and Wildlife Service, the state natural resource departments, and the Lac Courte Oreilles Indian community, is working to control the spread of zebra mussels, protect the riverway's 40-plus species of native freshwater mussels, and propagate and reintroduce two threatened and endangered species of freshwater mussels.

- The St. Croix Conservation Collaborative meets regularly to share information on methods of protecting land and coordinating land acquisition and land protection efforts of various land trusts and agencies. The group has established priority areas for land protection within the watershed.
- An interagency Fisheries Committee formed to develop a fisheries management plan for the riverway and is cooperating to carry out research and habitat improvement projects.
- NPS and state park biologists work together to control invasive plants, monitor rare plants, and carry out restoration projects.
- U.S. Fish and Wildlife Service and NPS staff are pooling resources to carry out prescribed burns.
- A Lower St. Croix Partnerships Team, comprising local government representatives, meets every other month to review land use decisions that have been made by individual communities, with a goal of achieving consistency in implementing riverway land use rules.
- Law enforcement officers from NPS, the states, counties, and local governments meet regularly about fishing, hunting, boating and other regulations and coordinate response to emergencies and enforcement needs.

Use and limitations of easements

For a number of years following designation of the riverway, NPS emphasized protecting land within the park. The Wild and Scenic Rivers Act allows fee-simple acquisition of up to 320 acres/mile. Where NPS was unable to acquire land in fee simple, because of the acreage limitation or an unwilling seller, purchase of scenic easements offered an alternative method of land protection. In the acquisition heyday, as many as ten NPS lands specialists were working at St. Croix. As more land was protected, the acquisition needs diminished and so did the lands staff. However, the work did not end with purchase of the easements.

Today, NPS holds 1,163 scenic easements within the riverway—about 37% of the scenic easements in the entire national park system. It holds an additional 65 riverway conservation easements (about 1.5% of the system total). At the time of enactment of the Wild and Scenic Rivers Act, easements were a relatively new tool that, because of acreage limitations on fee ownership, offered a means to protect more land within the riverway boundary. In retrospect, their limitations are apparent, not only because NPS is geared more to managing land held in fee-simple title than easements, but also because the easements provide only partial protection.

The St. Croix's scenic easements do not prohibit subdivision or development that conforms to local land use regulations. They place conditions on activities that would diminish the integrity of the view from the river, such as cutting vegetation or building a structure that would be visible, but they do not address ecological integrity by protecting rare or sensitive habitat.

With funding from the St. Croix Valley Community Foundation, NPS currently is working with the West Wisconsin Land Trust to update the easement records by researching county lands data for information on tract subdivision and current ownership. With this information, we will be able to communicate with the landowners to encourage private stewardship and build a stronger relationship with the riverway.

Water quality protection

The Wild and Scenic Rivers Act was crafted largely in response to concerns about industrial pollution directly entering rivers. Today, there is widespread recognition that the health of a river depends on the health of its watershed.

The St. Croix has long been considered pristine, in part because of its wild and scenic river designation. The water quality, along with the scenery, is what has attracted recreational use for generations, and people have taken it for granted.

This year, both Minnesota and Wisconsin designated Lake St. Croix, the farthest downstream portion of the riverway, as an "impaired" water, because levels of phosphorus and chlorophyll a exceed Clean Water Act standards. It was a wake-up call.

Research carried out by the interagency St. Croix Basin Water Resources Planning Team over the last decade has provided a wealth of information about water quality. We now know that 80% of the nutrient and sediment loading to the St. Croix is from nonpoint sources, such as agriculture and stormwater runoff (St. Croix Basin Water Resources Planning Team 2004:5).

The Basin Team's research has further determined that a 20% reduction in phosphorus loading will return water quality to the condition of the 1940s, prior to major agricultural development in the watershed. Based on this information, in 2006, Minnesota and Wisconsin entered into an agreement to work to achieve a 20% nutrient reduction goal (St. Croix Basin Water Resources Planning Team 2004:6).

While the "impaired" listing is distressing, it requires establishment of a total maximum daily load (TMDL) for phosphorus entering the St. Croix. This will be an important step toward restoration of water quality.

Because NPS has no regulatory authority over either private land use or water quality, it is imperative to work with the various agencies that have this role. The Basin Team provides a forum for cooperation and is leading efforts to set a TMDL.

In 2007, through its Great Lakes inventory and monitoring (I&M) program, NPS began comprehensive water quality sampling at 13 sites along the Namekagon and St. Croix rivers. NPS funds sampling every other year, but the St. Croix Valley Community Foundation provided funding for sampling in 2008. Through the Basin Team, NPS monitoring is being coordinated with that being done by other agencies along the riverway and key tributaries.

The work to establish a TMDL received a boost recently with notification that the St. Croix will receive 2008 NPS Centennial cost-share funding to develop a watershed model that predicts nutrient and sediment loading. The $200,000 NPS funding for this project will be matched with contributions from the Twin Cities Metropolitan Council and the Minnesota Pollution Control Agency. The modeling will be done by the Science Museum of

Minnesota's St. Croix Watershed Research Station.

The future

Just as those who crafted the 1968 Wild and Scenic Rivers legislation could not have predicted everything that would be involved in managing rivers in 2008, we cannot foresee the complexities and challenges of river management in 2048. After all, how many of us imagined that one day human beings would tear across streambeds on all-terrain vehicles, submerged and using snorkels?

Since the riverway's designation, NPS and its partners have developed extensive knowledge about its resources. These two rivers support a wonderful diversity of species, including 350 vascular plants, 265 lichens, 270 birds, 218 aquatic invertebrates, 18 amphibians, 14 reptiles, 60 mammals, 40 native mussels, 70-plus species of fish, and more than 40 listed species. Now, we must be concerned about how climate change will affect the ecology of the riverway and management of these resources.

Three research projects currently underway by U.S. Geological Survey teams will add to our knowledge of water quality and its effect on the riverway's threatened and endangered and native mussels and other aquatic life. One team is sampling for the presence of pharmaceuticals and chemicals in personal care products entering the river from several wastewater discharge points. Another team is studying the movement of nutrients through backwaters. The third team is studying the effect of food quality on unionid mussel survival and growth rate.

Researchers from Macalester College in St. Paul, Minnesota, are studying the impact of an increasing amount of fine sediment that is being deposited in an area identified as habitat essential for the recovery of Higgins' eye pearly mussels (an endangered species; Figure 3).

As human population grows, so too will demands for recreation (Figure 4), as well as the need to respond to evolving outdoor interests and new technology. NPS statistics indicate that visits to St. Croix National Scenic Riverway grew from 413,305 in 1996 to 523,588 in 2007 (NPS 2008). The NPS data represent the number of visits to NPS landings and other facilities but do not consider riverway use originating from non-NPS facilities, such as state boat launches, state parks and forests, county forests, public marinas, private docks, and other facilities.

As part of a new Lower St. Croix management plan being implemented this summer, NPS has placed more restrictions on

Figure 3. Higgins' eye pearly mussel (*Lampsilis higginsii*), one of the riverway's two endangered mussel species. Research is underway by the U.S. Geological Survey to determine sediment impacts on mussels in a critical habitat area. Photo courtesy of NPS.

Figure 4. A number of businesses rent canoes throughout the riverway. Several years ago, NPS began requiring that outfitters obtain commercial use permits. Some businesses had operated for decades, since before the riverway was established, making it challenging to implement this requirement. This is a typical scene on the Lower St. Croix on a summer weekend. Photo courtesy of NPS.

where people can camp and the size of groups; this is in response to resource damage, use conflicts, and concern that without more active management, river users would no longer have the type of recreational experience intended for a wild and scenic river.

NPS interpreters are introducing programs that provide new ways to experience the Riverway—virtual geocaching, for example. We must continue to find ways to engage people with this resource in order to have public support for its continued protection.

At the St. Croix, there is a sense of urgency about stepping up river protection efforts. In early May 2008, former vice president Mondale convened 60 leaders of communities, nonprofit organizations, and agencies involved in management and protection of the St. Croix and Namekagon rivers. His invitation letter articulated the current concerns:

> The assaults on the St. Croix watershed by development, run-off and loss of habitat put at risk the ribbon of Riverway we protected 40 years ago. Without a renewed commitment to protection of the river and its watershed, we could lose the most unique National Wild and Scenic River in the nation. While there is much excellent effort underway on the St. Croix, we need to do more—and we need to do it now (Mondale 2008).

For a day, meeting attendees, some of whom had been involved in securing the St. Croix's wild and scenic river designation, discussed strategies for addressing the issues of today. They are exploring formation of an organization to promote river and watershed stewardship. All recognize that the National Park Service and its various management partners are not, by themselves, able to adequately protect the St. Croix and Namekagon.

The threats to the St. Croix National Scenic Riverway are not unique. River managers throughout the country are dealing with development pressure, water quality protection, water rights, easement management, land protection, threatened and endangered species protection, the need to manage use more intensively, exotic species control, the uncertainties of climate change, and many other challenges.

There is a need to renew commitment to the St. Croix Riverway and other wild

and scenic rivers, whether managed by the National Park Service or another agency. A large part of today's public was not yet born when the Wild and Scenic Rivers Act and other environmental laws of the late 1960s and early 1970s were passed, and they have little knowledge of the conditions that led to efforts to protect some rivers in a free-flowing, unimpaired state. Others assume that once a river has been designated, it is protected and needs no additional support. As managers, we need to see that these special places have continued relevance in a changing world.

The National Park Service will benefit from a renewed commitment to the wild and scenic rivers it is charged to care for. An NPS task force was formed several years ago to assess the status of NPS wild and scenic river management and develop recommendations for the future. The task force has completed its report, which includes a recommendation to establish a wild and scenic rivers program to provide servicewide policy and management guidance.

The exodus of baby-boomer professionals from river management agencies is well underway. New and younger employees need opportunities to develop expertise, and we need to pass on institutional memory that can be a touchstone for future management. Partnerships with states and other entities need renewed attention to ensure that commitments to shared management survive over time.

Those who float, paddle, fish, or otherwise enjoy a wild and scenic river can be its best advocates, if managers can effectively communicate the significance of the river and the actions that are needed to protect its unique characteristics. I'd like every person who comes to the St. Croix and Namekagon to have an experience so special that they'll become a friend for life.

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Partnership Wild and Scenic Rivers

Jamie Fosburgh, Joe DiBello, and Fred Akers

Revisiting the Wild and Scenic Rivers Act

THE NATIONAL WILD AND SCENIC RIVERS SYSTEM was established through enactment of Public Law 90-542 in October 1968. The Wild and Scenic Rivers Act is a visionary piece of legislation, laying the framework for a national system of rivers protected from federal development projects under section 7 of the act, as well as prompting states and local river protection efforts with federal assistance and incentives under section 11 of the act. The main purpose of the act as defined in section 1(b) is to make it the policy of the United States

> that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

The only river included in the initial legislation from the private-lands-dominated northeastern United States was the Allagash, which was proposed as the inaugural component of a class of "state-administered" wild and scenic rivers under section 2(a)(ii) of the act (pending anticipated application by Maine's governor). Absent the unique Allagash resolution, none of the original components of the system were found in the Northeast—not surprising given the relative lack of federal lands, the density of the population, and the region's prevalence of communities based around their rivers. And yet, the act clearly anticipated that such rivers should be considered and included, with specific provisions limiting land acquisition authority on rivers where communities had enacted "compatible" zoning (section 6(c)), and encouraging local and state participation in administration and management (sections 10 and 11).

Early designation efforts

Early congressionally authorized studies of potential wild and scenic rivers in the private-lands, community-based setting of the populated Northeast all failed to result in designation. These early studies, including the Housatonic (Connecticut), East Branch Fish Creek (New York), Wood/Pawcatuck (Rhode Island), and others, uniformly failed to embrace the planning and assistance provisions of the act to solve the fundamental questions of how to protect national river values on private lands without a massive federal acquisition campaign.

The studies resulted in questions, not answers, such as:

- How do you protect identified "outstandingly remarkable" values of a river when they are not on public lands?
- How will local, state, and federal jurisdictions coordinate?

- What is the role of landowners?
- Who is in charge?
- How will coordination occur?
- Who has the funding responsibility?
- What is the federal role?
- Will there be condemnation authority?
- What local zoning or other non-federal protection standards will be sufficient?

Partnership innovation emerges

Congress amended the Wild and Scenic Rivers Act in the late 1970s, and again later, to limit federal land acquisition and mandate cooperative federal, state, and local planning conservation efforts, which opened the door to management innovation and collaboration. At about the same time, planners with the Department of the Interior in the East were using civic engagement to work in partnership with various private and government experts and states and local governments interested in river conservation. In these activities, no federal management or designation was promised or expected, but the planners nonetheless utilized the assistance authorities found in sections 10 and 11 of the Wild and Scenic Rivers Act. This principle would soon be developed and formalized as the National Park Service (NPS) Rivers, Trails, and Conservation Assistance Program.

As top-down and more collaborative, locally driven planning and management approaches began to meld and blend, a river conservation model built on alternatives to direct federal management and administration began to take form.

In 1984, Rolf Diamant and Glenn Eugster, who at the time were land use planners with NPS from Boston and Philadelphia, respectively, and Chris Duerksen, who was an attorney and senior associate at The Conservation Foundation, published *A Citizen's Guide to River Conservation.* This "how-to" book emphasizes building multi-interest citizens' coalitions through community involvement in river and stream conservation efforts. This book has been and continues to be used as an important reference for the study and designation of many wild and scenic rivers using the local partnership planning model.

Pioneering wild and scenic river efforts

Several pioneering efforts picked up the challenge, and in different ways, have laid the groundwork for a new approach to wild and scenic rivers on non-federal lands.

Upper Delaware River (New York/ Pennsylvania; 1978). The designation of the Upper Delaware River in 1978 (Figure 1) was the first time that Congress had designated a river with an (almost complete) prohibition against federal land acquisition and yet a mandate to NPS. Congress directed NPS to achieve Upper Delaware River management and protection goals and develop the management plan for the river, in coordination with local communities organized into an advisory committee. The development of the plan was completed in 1986, but was controversial and difficult in the post-designation setting.

The Upper Delaware National Scenic Recreational River was the place where the

Figure 1. Upper Delaware National Scenic Recreational River. Photo courtesy of NPS.

concept of a partnership river took form. Stakeholder conflicts required a team of practitioners skilled in working with community leaders to design a process to develop a community-based management plan. Here is where the NPS planners refined and further learned the lessons of balancing federal management with state and local needs and those of the private sector to meet the requirements of the Wild and Scenic Rivers Act, and to conserve the river and manage recreational use in partnership.

In 1986, the Upper Delaware National Scenic and Recreational River management plan was completed. One of the lessons learned is that there is a need for community and resident engagement throughout the planning process. Another observation made was that it is important to discuss river management in addition to eligibility during the study process. If river management plans could be developed prior to designation, more understanding, acceptance, and broader consideration of alternatives would occur and the federal or NPS role would be better and more appropriately defined.

Wildcat Brook (New Hampshire; 1984 study, 1988 designation; Figure 2). Spurred by the threat of unwanted hydroelectric development, the town of Jackson, New Hampshire, successfully partnered with members of Congress and NPS on the authorization of a new kind of wild and scenic river study—one that would answer the questions that thwarted earlier unsuccessful designation efforts by developing and implementing a successful river conservation plan as the centerpiece of the study process.

The plan, developed by the town with support of NPS and a specially formed local advisory committee, identified and implemented local zoning, conservation easements, and riverfront restoration elements necessary to protect the river's special values. The Wildcat Brook river conservation plan in turn became the basis of federal legislation in 1988 to designate the Wildcat as a component of the national system—with the support of landowners, local and state officials, and the federal government.

Westfield River (Massachusetts; 1993). Planning for the Westfield River (Figure 3) utilized a similar approach, but one that took advantage of the built-in mechanisms of section 2(a)(ii) of the act to limit and define the federal role. The critical element still was to complete the plan in partnership with local communities and landowners prior to designation. For the Westfield, this was accomplished through the assistance of NPS acting under the Rivers, Trails, and Conservation Assistance

Figure 2. Scenic Wildcat Brook at Jackson, New Hampshire. Photo courtesy of the authors.

Figure 3. Westfield Wild and Scenic River. Photo courtesy of Chris Curtis.

Program (rather than under a congressionally authorized study), and through state planning grants.

Chris Curtis, of the Pioneer Valley Planning Commission, initiated this process in 1984, also choosing to form a locally based advisory committee to assist in developing the conservation plan. In 1992, Massachusetts Governor William Weld submitted a completed greenway plan to the secretary of the interior with the support of local communities, landowners, and state and federal officials. The submitted plan was the basis of the Westfield's designation in 1993 as a state-administered component of the national wild and scenic rivers system.

Great Egg Harbor River (New Jersey; 1992). The Great Egg Harbor River was studied and designated as part of the national wild and scenic rivers system by Congress in 1992 based on its outstandingly remarkable cultural, historic, recreational, and natural resource values, thereby becoming a cooperatively managed unit of the national park system. The Great Egg Harbor was the first national wild and scenic river to incorporate an extensive tidal estuary (Figure 4). The primary partners were local conservation advocates, residents, four counties, and 12 municipalities. Through citizen advocacy, all 12 municipalities resolved to recognize that their economic and cultural vitality were supported by their close proximity to the Great Egg Harbor River and designated tributaries. They also recognized that the health of the Great Egg Harbor River is dependent upon the economic, cultural, and environmental policies of its surrounding municipalities. As a result of this recognition, they agreed to participate in the designation process and long-term management of the river.

With NPS, county and state agencies, and local advocates, these municipalities formed the Great Egg Harbor River Planning Committee. Through participation in this committee, the municipalities assisted in the preparation of local river management plans and a comprehensive manage-

Figure 4. Estuary of the Great Egg Harbor River. Photo courtesy of the authors.

ment plan for the long-term management and protection of the federally designated segments of the Great Egg Harbor River and its tributaries.

This planning process identified the need to continue a formal organization to monitor implementation of the comprehensive management plan and assist the 12 municipalities, individually and collectively, in dealing with matters concerning the Great Egg Harbor River system. The citizen advocates incorporated and became the Great Egg Harbor Watershed Association, which was written into the management plan as the "host organization." It was agreed that the 12 municipalities and the Great Egg Harbor Watershed Association would establish the Great Egg Harbor National Scenic and Recreational River Council. The council's role is to provide ongoing monitoring, coordination, and assistance in implementing the comprehensive management plan to the participating municipalities and NPS. While the earlier cases involved partnerships, the Great Egg Harbor River was the first true partnership wild and scenic river (PSWR), and its river council process is used as a model for other PWSR river councils and committees.

Fulfilling the model: PWSR designations today

With a refined planning and management approach established around alternatives to direct federal management and administration, NPS has been called on to address a growing demand for wild and scenic river protection for "private lands rivers" in more urban environments on the East Coast. Starting in 1986, Congress has authorized NPS eligibility studies for 12 river systems in seven states from New Hampshire to Florida.

Partnership wild and scenic rivers, as they are now referred to, share the following common principles and management systems:

- No federal ownership or management of lands (and federal ownership is not authorized in legislation or recommended in the management plan)
- Administration of the designation and implementation of the management plan is accomplished through a broadly participatory "council" or "committee" organized and convened for each river specifically for this purpose.
- Land use continues to be governed by local communities and states through existing laws, regulations and authorities.
- The river management plan is written and implemented through a broadly participatory process involving guidance from locally based representatives. The plan is locally developed with NPS assistance and is locally approved prior to federal designation (as a part of the feasibility study). The plan, locally approved and endorsed by relevant state and federal authorities, forms the basis of the designation and guides subsequent management.
- The costs and responsibilities associated with managing and protecting river resources are shared among all of the partners—local, state, federal, and nongovernmental. Landowner participation and volunteerism is an essential element of the partnership and viewed as the backbone of success.

As the administering agency, NPS is responsible for implementing section 7 of the Wild and Scenic Rivers Act, reviewing projects that are federally funded, spon-

sored or licensed to ensure consistency in preserving identified "outstandingly remarkable values" for which the river was designated. This responsibility is coordinated with each river's council or committee. NPS is also authorized to provide technical and financial assistance to river organizations.

What is distinctive about these designations (Table 1) is the reliance on federal, state, local partnerships in river management and conservation. The designated rivers are administered by NPS but the partnership organizations are responsible for day-to-day management. They are similar to national park units in that there are specific NPS management and administrative responsibilities and line-item operating appropriations for each of the areas. The difference between these areas and traditional units of the national park system is that there is minimal federal ownership and a reliance on cooperation and partnership with other government and private organizations.

Another key factor to the dynamic nature of PWSRs is the growing and active leadership role that Congress plays in the process. Based on local grassroots interest and concern for river conservation, over the last 20 years members of Congress from seven East Coast states have repeatedly introduced and pushed Congress to pass bills to study and designate almost a dozen rivers with over 500 river miles. And these same members of Congress have developed an informal partnership to work together to support more stewardship funding for the management implementation and long-term protection of these PWSRs.

Paralleling this leadership in Congress, local partners from each PWSR have formed a national network, called "Partnership Wild and Scenic Rivers," that works to support the needs of this growing program and ensure the success of PWSRs.

Table 1. Partnership wild and scenic rivers.

	Wild Miles	Scenic Miles	Recreational Miles	Year(s) Designated	Website
Eightmile River		25.3		2008	www.eightmileriver.org
Farmington River	0	0	14	1994	www.farmingtonriver.org
Great Egg Harbor River	0	30.6	98.4	1992	www.greategg.org
Lamprey River	0	0	23.5	1996 & 2000	www.lampreyriver.org
Maurice River	0	28.9	6.5	1993	www.cumauriceriver.org/pages/Maurice.html
Westfield River	2.6	42.9	32.6	1993 & 2003	
Sudbury, Assabet & Concord rivers	0	14.9	14.1	1999	www.Sudbury-Assabet-Concord.org
Musconetcong River			24.2	2006	www.musconetcong.org
Wekiva River	31.4	2.1	8.1	2000	www.floridastateparks.org/wekiwasprings
Lower Delaware River	0	25.4	41.9	2000	www.state.nj.us/drbc/wild_scenic.htm
White Clay Creek	0	24	166	2000	www.mercury.ccil.org/~wcwa/

River conservation challenges and opportunities for today and tomorrow

The PWSRs have established a model for successful adaptation of the Wild and Scenic Rivers Act to a community-based, private-lands setting. In 2007, the Ash Institute for Democratic Governance and Innovation at Harvard University's John F. Kennedy School of Government named PWSRs to its list of the top 50 government innovations linking citizens with important public services. Legislation to conduct Vermont's first-ever wild and scenic river study (for the Missisquoi River), which is based on the partnership model, is also pending, and the success of the upper Farmington River designation has prompted a newly authorized study of the remainder of that river system. In May 2008, in the 40th anniversary year of the national wild and scenic rivers system, Congress has fittingly enacted protection for the nation's newest wild and scenic river, based on the PWSR approach: 25.3 miles of the Eightmile River in Connecticut.

There are many more valuable rivers to protect in our country, and the partnership model is an intelligent and cost-effective one for the conservation of hundreds of miles of rivers and thousands of acres of riparian land at a small fraction of the cost of full acquisition. By working together with Congress, federal agencies, state governments, local governments, non-governmental organizations, private landowners, and citizens, we should be able to unlock the door to including many more rivers in the national wild and scenic rivers system.

The PWSR approach complements the still-active and important consideration of wild and scenic river designations predominantly on federal lands of the Bureau of Land Management, U.S. Forest Service, and National Park Service, where hundreds of deserving rivers lie within the boundaries of established federal areas. As we celebrate the 40th anniversary of the national wild and scenic rivers system and look forward to the 50th and beyond, the PWSR approach offers the promise and potential to fill out the national system by creating a successful mechanism to manage and protect important rivers outside the federal domain.

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2(a)(ii)-Designated National Wild and Scenic Rivers: The Confluence of Local Management and Federal Protection

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THIS PAPER EXAMINES A SPECIAL CLASS OF WILD AND SCENIC RIVERS: those designated under section 2(a)(ii) of the Wild and Scenic Rivers Act. Using a case study, it highlights the benefits of this type of designation and also the challenges that such rivers face.

Unlike other national conservation programs, such as the national wilderness system or national trails system, rivers designated under the Wild and Scenic Rivers Act (Act)—through provisions in section 2(a)(ii)—allows the states to obtain many of the benefits of the act, including protection from the harmful effects of federal water resource projects. This section was the result of a considerable evolution in thinking by Congress: it allows the governor of a state both to apply to the secretary of the interior for national designation and to serve as the principal manager of the river. With this provision, Congress expressed a clear intent to encourage the states to share in the responsibility of preserving selected rivers of the nation. In fact, the House report expressed the hope that "all the states will become active partners in the development of the national Scenic Rivers System" (Haas 2007).

Qualifying 2(a)(ii) rivers are included in the national system following an eligibility study that comes at the request of a state governor. They are managed by the state without cost to the federal government, although technical assistance is permissible and encouraged. The 2(a)(ii) rivers must be managed to protect and enhance their free-flowing condition, water quality, and outstandingly remarkable values. The state or local administering agency is responsible for establishing boundaries, classifying the river, and protecting water quality and river values. Section 2(a)(ii) is ideally suited to rivers where there is a strong tradition of state or local management and protection.

To date, 19 river segments, representing over 1,800 miles of protected river (NPS 2007), have been designated through section 2(a)(ii) of the Wild and Scenic Rivers Act. Those rivers offer a set of advantages and challenges that distinguish them from their congressionally designated cousins. Benefits include the possibility of a much shortened designation time-frame and greater ease of designation where there are concerns about federal management; contributions to community pride, involvement, and economies; and increased river protection owing to multiple levels of involvement. Challenges include those faced by other rivers, such as development

impacts, as well as shifting state priorities and funding shortfalls. The case study below will look at these in detail.

Why 2(a)(ii)? A case study of Ohio's Little Miami River

If rivers designated under section 2(a)(ii) receive the same protection as congressionally designated rivers but require funding from state and local agencies, what makes the 2(a)(ii) designation more suitable or appealing for a particular river than congressional designation and its accompanying federal funding? While not representative of all 2(a)(ii) rivers in the national wild and scenic rivers system, the generally successful outcomes of Ohio's wild and scenic rivers program reveal the advantages of designation through section 2(a)(ii).

The mainstem of southern Ohio's Little Miami River, the first in the state to become a national wild and scenic river, runs 105 miles through a 1.1-million-acre watershed before joining the Ohio River (Figures 1 and 2). Though the watershed is primarily made up of agricultural land, it also includes developing regions east of the Cincinnati–Dayton metropolitan area. Three million people live within thirty minutes of the river, and the Little Miami aquifer is tapped by twelve communities along its mainstem.

Benefits to the states and local communities. Importantly, 2(a)(ii) rivers offer unique benefits to the state(s) and communities through which they run. First, there are benefits related to the designation process itself. One of these benefits is its brevity: designation by the secretary of the interior may take less time than congressional action (Haas 2007). Thus, if a state desires to include a river in the national system within a particular period, the 2(a)(ii) designation process may appeal most. If there is a threat, such as a dam or otherwise, a state can act quickly to ensure protection. Moreover, once a river enters the national system under section 2(a)(ii), the local and state agencies shouldering the management responsibilities often have access to federal technical assistance for their river protection programs. For example, on the Little Miami, federal resource agencies such as the U.S. Fish and Wildlife Service or National Park Service have provided important technical assistance in streambank stabilization techniques and the development of a comprehensive river management plan.

While there has been little use of eminent domain for congressionally authorized wild and scenic rivers, in some cases there are nonetheless fears of federal acquisition. Since the federal government is specifically prohibited from expending funds on section 2(a)(ii) rivers, using this type of designation can be easier where such fears exist.

The growth of state-level river management and protection programs is an important benefit to states with 2(a)(ii) rivers. For

Figure 1. The Little Miami River. Photo courtesy of Ronald Levi.

Figure 2. Railroad bridge over the Little Miami. Photo courtesy of Little Miami, Inc.

example, following the passage of the act in 1968, Ohio modeled its existing state-level scenic rivers program after the national program. Because of that program, Ohio now protects sections of 13 rivers and their tributaries—754 stream miles in total at the state level (Gable 2008). Of those 13 rivers, three have met the criteria for inclusion in the national system pursuant to section 2(a)(ii): the Little Miami River, the Little Beaver Creek complex, and the Big and Little Darby creeks. Though those rivers were first protected by the provisions of Ohio's state-level scenic rivers program, local agencies and groups petitioned the governor to seek secretarial designation.

Ohio rivers designated under section 2(a)(ii) have contributed significantly to local communities' identity, tourism, and economic growth, primarily because of the attention that comes from a national wild and scenic river designation. When a 2(a)(ii) river is designated, one of the immediate benefits is a surge of local pride from the people who worked to protect the river to the level requisite for designation. Even citizens who did not participate actively in efforts toward a river's national designation have a sense of ownership when a local resource is recognized with a national title. That pride often fosters appreciation, which results in a shift of perspective: people come to see the river as an amenity worth protecting (Gable 2008). When more people are aware of and experience the positive attributes of a river, they become likely to see it as a local amenity. They grow proud of the river, they appreciate it, and they want to protect it.

Likewise, when viewed as a community amenity, tourism and river-based recreation opportunities expand locally. Fishing, canoeing, hiking, and other water-dependent activities offer undeniable benefits to the local economy. A 1999 study of the Little Miami Bike Trail, for example, proved that visitors spent an average of over $13 per visit to the trail on food, beverages, and auto expenses (OKI 1999:31). Recreation opportunities are beneficial economically, but they also make the river accessible to local school groups, citizens, and out-of-state visitors. Again, Ohio's Little Miami River provides an example: canoeing draws about 100,000 people each year (Partee 2008). That is 100,000 customers for the river's six canoe liveries and 100,000 people who annually benefit from the protection afforded the Little Miami as a result of its 2(a)(ii) wild and scenic river designation. According to Little Miami, Inc. (LMI), a private, non-profit land trust, 500,000 people recreate in some way along the Little Miami every year.

State-level protections usually grow from grassroots, community protection efforts. Consequently, 2(a)(ii) designation often requires attention at two legislative and geographical levels—the local and the state—before it gains protection through the federal act. Such multiple levels offer numerous opportunities for citizens living within the watershed to maximize river protection (Haas 2007) The local river man-

agement model detailed in section 2(a)(ii) fosters participation from the citizens whose work helped establish state protection in the first place. In some cases, those residents organize local non-governmental organizations, citizen groups, and other non-profit organizations that offer supplementary funds and volunteer time in the name of river protection. Though such local organizations have no legal or decision-making authority over the rivers, they may cooperate with state and local management agencies in restoration and fundraising efforts. Perhaps most significantly, they represent a means for local people to participate and work in concert with the efforts of state and local management efforts.

LMI provides an excellent example of such an organization. Founded in 1967, LMI was the key local advocate for the Little Miami's inclusion in the national wild and scenic river system and Ohio's state scenic river program. Over the years, LMI has exerted considerable influence in the watershed of the river. The organization also played a lead role in the passage of the Little Miami Forest Preserve law in Ohio. Funded by the support of over 500 member families and individuals, as well as foundation grants, LMI has co-funded a study of endangered mussels in the Little Miami watershed and created the Little Miami Scenic River and Trail Center in Loveland, Ohio—a site that educated close to 15,000 visitors in 2007, its first full year of operation.

Eric Partee, LMI's executive director, calls the organization a "land trust plus." It acts as a traditional land trust by securing conservation easements and acquiring lands, but it also pays attention to details of water quality and uses persuasion to address local issues relating to zoning, taxation, and development. For example, LMI successfully presented a case before the Ohio Supreme Court for the establishment of property tax exemption for conservation lands in Ohio. As the pressures of development threaten riparian zones, maintaining water quality and a viable habitat corridor are principal goals of LMI—especially important because the Little Miami supports habitat for six state and/or federally endangered and threatened aquatic species (Partee 2008).

Though LMI has no legal authority over the river, the organization seeks mutual benefiting opportunities, and operates with what Partee describes as a "cordial, but firm" position in its response to local issues. That means working in a close partnership with local officials and zoning and planning staff to encourage developers to implement sustainable practices that benefit both the river and development goals. Partee observes of LMI's approach, "We've gotten enough inroads with developers and the development community that they have at least some degree of comfort to call us" before they plan projects that may seriously impact the river (Partee 2008).

More than just attracting people for river-based recreation opportunities, state-supported 2(a)(ii) river designations have a positive effect on the community by engaging local municipalities and zoning commissions. In some cases, the Ohio Department of Natural Resources (ODNR) provides matching dollars to park districts or conservation projects that support state-level conservation goals on 2(a)(ii) rivers. In contrast, the federal management and administration of congressionally designated rivers often limits river managers' influ-

ence on local zoning. On 2(a)(ii) rivers in Ohio, these cooperative conservation projects, most often funded by grants received by the state, benefit all parties because they require limited investment from the state and are implemented through a local partner (Gable 2008).

Benefits to the river. The example of the Little Miami embodies one of the most important set of advantages associated with 2(a)(ii) designation: a river gains protection. Because the 2(a)(ii) designation process results in a river having both state and federal legislative protections, there is greater opportunity to focus attention and resources on the river. And, as Eric Partee of LMI believes, "it's always best to layer the protection. The more layers, the better." He also points out that the dual requirements of both state- and federal-level protection criteria act as a system of checks and balances for each other, ensuring that designated rivers receive the full attention they deserve from both state and federal agencies (Partee 2008) Similarly, Bob Gable, scenic rivers program manager at ODNR, observes that because of this dynamic, national designation of Ohio's rivers was a natural outgrowth of local action. Under 2(a)(ii), without the protection of the state first, a river could not be protected as a national wild and scenic river (Gable 2008).

In the case of the Little Miami River, local involvement led to expansion of the portion of the river and its adjacent lands being protected. Though the upper Little Miami was designated in 1973, the lower reaches did not meet eligibility requirements because of water quality issues and the magnitude of visual intrusions along the corridor. This attracted attention and sparked the communities along the river to organize. Following a tremendous grassroots effort at the local, regional, and state levels, citizens worked to clean up the lower section, remove abandoned buildings, and establish local ordinances to protect the corridor. In 1980, the state re-petitioned the secretary of the interior, and, following further review, the lower Little Miami River was designated. This has been the first and only instance when a segment was first denied inclusion into the system and later deemed eligible.

ODNR cooperates with riverfront property owners to help them with riparian land management issues and forest restoration (Gable 2008). LMI, in turn, has worked to secure riparian protection with acquisitions and conservation easements. Since the upper river's designation as a national wild and scenic river, LMI has acquired more than fifty nature preserves along the Little Miami, which amount to almost 2,000 acres of riparian forest land. Today, nearly half of forests along the banks of the Little Miami are protected through land ownership or conservation easements held by LMI and other conservation entities; nearly a quarter of the riparian forests remaining are protected by local zoning ordinances.

Benefits to the nation. Finally, section 2(a)(ii) provides an additional pathway for eligible rivers that would not otherwise be included in the national system. First, congressional action can be difficult to obtain, which means secretarial designation more quickly. Also, as noted above, the 2(a)(ii) local management model often appeals when there is local concern over federal regulation. By providing an alternative in instances when congressional designation may not be suitable, 2(a)(ii) rivers thereby

boost the number of protected river miles—and all at no or very little expense to the federal government (Haas 2007).

Challenges for 2(a)(ii) rivers

Though 2(a)(ii) river success stories serve as useful models for river management, these rivers nevertheless are facing challenges. As with so many rivers across the country, watershed development around 2(a)(ii) rivers is a principal concern. Developments such as housing projects, road construction, and commercial uses threaten rivers by increasing the number of impermeable surfaces in a watershed, increasing the temperature and volume of runoff, contributing more pollution to the water, and increasing turbidity. While these issues are not unique to 2(a)(ii) rivers, they can overwhelm state programs and staff that are already taking on additional responsibilities.

A second challenge is the public's tendency to misunderstand state and federal authority over private riverfront property rights. Though the act specifically prohibits the federal government from condemning land adjacent to a 2(a)(ii) river, some landowners express concern over potential federal condemnation. In those instances, state management agencies must confront the misconception that a federal designation removes or limits private property rights. While this may make 2(a)(ii) designation somewhat less difficult than other national wild and scenic river designation, it nonetheless poses a challenge. In Ohio, the only regulatory authority held by the state is over publicly funded projects within a 1,000-foot corridor of the 2(a)(ii) river. A state must devote significant time and energy at all levels to make the extent and limits of its authority clear (Gable 2008).

Additionally, due to their federal protection and local management, 2(a)(ii) rivers may lead to uncertainty about the distribution of funding and management responsibilities. This requires a substantial, long-term commitment on the part of the state to ensure the river is managed to the federal standard. However, as state and local agencies are reorganized and budgets are modified under changing political climates, the commitment becomes blurred with competing state priorities, and confusion may rise about who is responsible for what management actions and what costs (Haas 2007).

LMI'S Eric Partee points out that state budgets cannot always commit the resources needed to protect a river, which is why local non-governmental cooperation is so beneficial on 2(a)(ii) rivers (Partee 2008). In the case of the Little Miami River, LMI's efforts and resources have helped supplement funds allocated from the state.

A related challenge for 2(a)(ii) rivers emerges as a result of changing times. When a river is first designated as part of the national system, the Wild and Scenic Rivers Act requires that a comprehensive river management plan (CRMP) be developed for it. The CRMP, which must be completed within three full fiscal years of designation, should clearly articulate the river's outstandingly remarkable values and identify management goals, requirements, and responsibilities. The CRMP should also provide a management framework for when, where, and what types of development can occur; express guidelines for the intensity of development; and establish zoning recommendations. Moreover, the document should address how conflicts

will be resolved, provide strategies to reach long-term goals, and establish a monitoring program. While CRMPs are critical to river management, the act does not include a provision that they be updated; as a result, management strategies may not receive the review they deserve when changes occur in the federal, state, and local political climates and in the watersheds of the rivers themselves (Jennings 2008).

Strategies for future success

As 2(a)(ii) rivers and their managers face these challenges, what are the best policy strategies to promote protection into the future? What lessons have been learned?

Bob Gable believes that public education is critical. When local landowners understand the value and benefits of protected rivers, they support the establishment of sustainable programs that can benefit all. Through public meetings, hearings, and presentations, agencies can help local landowners understand the facts and goals of protection.

Gable also believes in the necessity of what grows from educational efforts: cooperation and trust between local residents and the agencies involved. Establishing trust takes time, of course, and "where people are skeptical," Gable observes, "it takes more time." But that time is worth the trust that emerges when different parties reach an understanding of each other's individual aims. As Gable has learned, a river benefits most when people understand and trust each other (Gable 2008).

That trust and understanding between parties reflects what Eric Partee of LMI believes is critical to management success: a commitment to protection on a local level (Partee 2008). From his analysis and from Gable's, then, it is clear that successful 2(a)(ii) river management must reside at the intersection of federal protection and local commitment. The river inhabiting that confluence is armed with the authority of federal protection and the support and energy of local agencies and communities. That river is a 2(a)(ii) river.

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Commercial Grizzly Bear Viewing in the Fishing Branch (Ni'iinlii Njik) Protected Area, Yukon, Canada

Erik Val

Introduction

Over the last two decades, the settlement of First Nations land claims in Canada's northern territories has led to the creation of national and territorial parks and protected areas. Located in the Yukon Territory, Fishing Branch (Ni'iinlii Njik) Protected Area is conserved through the 1995 Vuntut Gwitchin Final Claim Agreement. The 6,500-km^2 area protects cultural and natural resources, most notably unusually high concentrations of salmon and grizzly bear. The protected area consists of both public and First Nation lands, a first in Canada, if not North America. The area is cooperatively managed in partnership as an ecological unit by the Yukon and Vuntut Gwitchin governments.

In 2000, a jointly developed and approved management plan identified objectives and guidelines to protect the area's natural and cultural resources. The plan further identified the essential conditions to allow for commercial grizzly bear viewing in the protected area. After fulfilling these conditions, a controlled pilot bear-viewing trial started in Fishing Branch Protected Area in fall 2006.

This paper will document the steps taken over the last ten years to prepare for commercial bear viewing at Fishing Branch Protected Area. Comparisons will be made to other bear-viewing operations in Alaska and northern British Columbia. The paper will conclude with a summary of lessons learned related to cooperatively preparing for and managing such activities in remote wilderness areas.

This case study demonstrates the positive role land claims can have in promoting conservation and the effectiveness of partnerships in protected areas management, especially related to the development of a new, highly specialized activity within the wilderness-tourism industry.

Geographic, historic, and political context

The Yukon is one of Canada's three northern territories and spans an area from the Northern Rockies in British Columbia to the Beaufort Sea. While large in area (450,000 km^2), the territory is sparsely populated (30,000). First Nations (a term which denotes most of Canada's indigenous peoples) make up about a fifth of the population. The city of Whitehorse is the service center and seat of government for the Yukon. Fifteen small, predominately First Nation villages are scattered across the territory. The small Vuntut Gwitchin First Nation community of Old Crow is located

in the northern Yukon on the Porcupine River. Fishing Branch Protected Area is located 100 km south of Old Crow and crosses the Arctic Circle (Figures 1 and 2).

Over the last two decades, comprehensive negotiations have been conducted across northern Canada to settle First Nation and Inuit land claims. Similar to the effect that the 1971 Alaska Native Claims Settlement Act had in creating over 100 million acres of protected areas through the 1980 Alaska National Interest Lands Conservation Act, settled land claims in the Yukon also have created large tracts of protected areas. Land claims have established new or confirmed existing national and territorial parks, park reserves, heritage rivers, national wildlife areas, and territorial habitat protection areas. These areas total about 61,500 km^2, or some 13% of the territory. Settled claims also define the management objectives for these protected areas, cooperative management regimes for government and First Nations, and how First Nations can benefit economically from protected area establishment and operations.

In 1995, the Vuntut Gwitchin First Nation of Old Crow settled its land claims. The settlement included the creation of a 170-km^2 territorial ecological reserve on the

Figure 1. Location of Fishing Branch Protected Area in northern Yukon. The small box indicates the area of Yukon Parks' ranger camp and the commercial bear-viewing site.

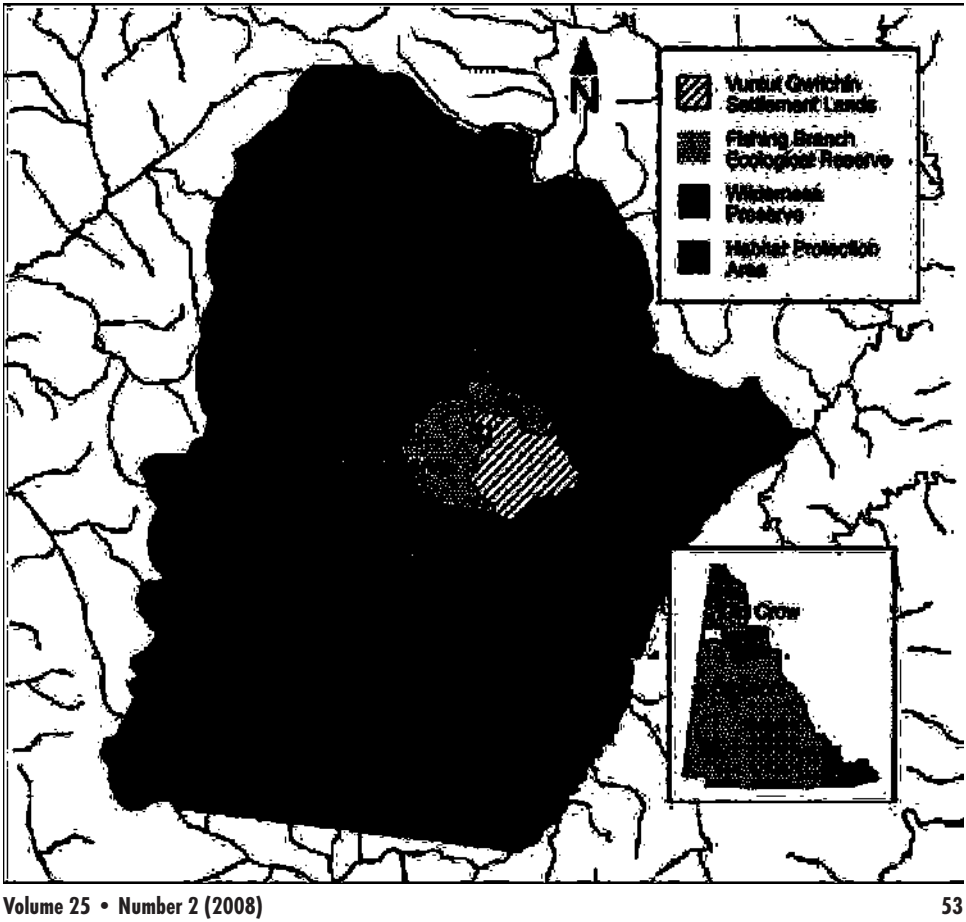

Figure 2. The Yukon Parks' ranger station and bear-viewing facility located along the Fishing Branch River at the base of Bear Cave Mountain (extreme left of photo). © 2008 Fritz Mueller, all rights reserved. Used by permission of the photographer.

Fishing Branch River pursuant to the Yukon Parks and Land Certainty Act. Also through the claim, an additional 140 km^2 of First Nation settlement land was added to this protected area. This addition is a significant contribution to conservation and is a groundbreaking first in Canada, if not North America.

Together, these protected areas are cooperatively managed by the Yukon and Vuntut Gwitchin governments under a jointly developed management plan, which was approved in 2000. The primary objective of the plan is to manage the area as an ecological unit to protect the full diversity of wildlife (particularly salmon and grizzly bears) in a Beringian karst landscape. While wildlife protection is the priority, the plan also recognizes the possibility of introducing commercial grizzly bear viewing as a means to provide visitor opportunities, promote ecological awareness and wilderness tourism, and provide economic benefits for the First Nation.

In 2004, an additional 6,200-km^2 territorial wilderness preserve and habitat protection area was added to the ecological reserve and the settlement lands (see Figure 1). The two governments also collaboratively developed a management plan for these two protected areas.

The ecological and cultural significance of Fishing Branch Protected Area

The Fishing Branch River is located in the Ogilvie Mountains of northern Yukon, and is of exceptional ecological significance. It is the seasonal gathering place for grizzly bears that come to feed on salmon (Figure 3). Spawning salmon depend on the constant water temperatures of the river, which wells up through the karst substrate.

Figure 3. One of the annually returning grizzly bears fishing for chum salmon in front of the viewing facilities along the Fishing Branch River. © 2008 Fritz Mueller, all rights reserved. Used by permission of the photographer.

Karst landscapes develop over millennia as limestone is eroded by water. This dissolution process results in towers, fissures, sinkholes, complex underground drainage systems, and caves, all of which help to maintain the constant annual water temperatures (Figure 4). This provides unusually late but ideal salmon spawning conditions, which start in mid-September and continue until late October or early November (Figure 5). The constant water temperature also creates a micro-climate that affects the river valley's vegetation and wildlife habitats, thereby increasing the biodiversity of the area.

The Fishing Branch area is also of cultural significance. The area was not covered in the last Ice Age and the cold, dry environment in the ancient karst caves in the surrounding mountains are optimal for preserving organic matter. The caves contain evidence of human occupation that date to the last Ice Age. Altered caribou and mammoth bones located in an area northwest of the Fishing Branch have been dated to about 25,000 years ago and may be the oldest known traces of human occupation in North America.

For thousands of years, the Vuntut Gwitchin, who now live in the community of Old Crow, have depended on the land for all aspects of life. The elders call the Fishing Branch River *Ni'iinlii Njik,* "where the fish spawn," and have considered the area as the source of life and food. The continuation of the Gwitchin culture is based on traditional subsistence harvesting, which in turn depends on a healthy, stable ecosystem, such as is found at the Fishing Branch.

Preparations for commercial grizzly bear viewing

The Vuntut Gwitchin Land Claim

Figure 4. One of many caves located on Bear Cave Mountain used by bears as dens in the fall after the salmon run on the Fishing Branch River. © 2008 Fritz Mueller, all rights reserved. Used by permission of the photographer.

Figure 5. The "ice bear": Unique to the Fishing Branch River, the fall salmon run provides late-season feeding opportunities for grizzly bears that become encrusted in ice and jingle as they move. © 2008 Fritz Mueller, all rights reserved. Used by permission of the photographer.

Agreement defines the management objectives for Fishing Branch Protected Area, which includes the protection of the full diversity of wildlife, particularly salmon and grizzly bears. The claim also identified the need for visitor services, learning opportunities, public education, and economic opportunities for the First Nation.

Based on these broad objectives, the protected area management plan states that while bear viewing is secondary to protection of wildlife and its habitat, effectively managed viewing has the potential to (1) increase public understanding and appreciation of bears and bear ecology, (2) increase public understanding of appropriate human behavior in bear habitat, and (3) under controlled circumstances, increase tourism and provide economic benefits.

To ensure effective management of the protected area, a Committee of Managing Agencies (CMA) has been established, representing the Yukon and Vuntut Gwitchin governments and includes Yukon Parks, the territorial Fish and Wildlife Branch, the local Renewable Resources Council, and the federal Department of Fisheries and Oceans (which operates a fish-counting weir downstream from the viewing site). When required, the Archaeological Survey of Canada and the territorial Heritage Branch participate on the CMA.

The management plan defined the conditions and operational guidelines related to preparing for commercial bear-viewing operations. The CMA oversaw these preparations to ensure that the management plan's conditions and guidelines were followed. These conditions and guidelines include:

Visitor access and use. Visitor access to the settlement lands and ecological reserve during the bear-viewing season (September 1 to November 1) is by permit only and limited to a maximum of five persons per day (four visitors and one guide) with a maximum stay of seven days (Figure 6). This approach maintains the wilderness character of the area; avoids disturbance to fish, bears, and other wildlife; and limits the need for facility development.

Qualified bear-viewing guide. During the viewing season, visitors are required to use the services of a qualified bear-viewing guide who is permitted to provide such services. This approach provides a safe and high-quality wilderness experience.

Bear–human risk management plan. Before bear-viewing operations could start,

Figure 6. Bear-viewing activities at the Fishing Branch River are limited to five individuals, including the guide, for up to one week at a time in September and October. © 2008 Fritz Mueller, all rights reserved. Used by permission of the photographer.

a detailed bear–human risk management plan was required, as was a controlled pilot trial. The operational and emergency procedures defined in the plan are designed primarily to (1) minimize the adverse effect of human activities on bears and salmon, (2) minimize the probability of conflict between bears and humans, and (3) provide information on how to respond appropriately if a conflict between humans and bears occurs.

Bear behavior research and monitoring. Research and monitoring is an essential part of assessing and evaluating whether management principles and operational procedures are being effectively implemented. Three years of research were undertaken by a graduate student from Simon Fraser University before viewing operations started. This research documented bear and salmon populations and baseline patterns of bear behavior in the viewing area, and developed a bear behavior data-collection protocol. These data will be used in the future to assess the impact, if any, of viewing operations on bear behavior, primarily on spatial and temporal patterns of feeding.

Limited facility development. Consistent with the management principles and in keeping with the wilderness character of the area, facility development was been kept to a minimum, consisting of a main cabin/wash house, two sleeping cabins, an outhouse, and high-storage cache (Figure 7). Built and owned by the Yukon government, these facilities support several activities, including (1) year-round management operations, (2) commercial bear viewing in the

Figure 7. The Yukon Parks' ranger station is leased for two months annually under a park use permit to a private sector–First Nation joint venture to provide grizzly bear-viewing activities according to a human–bear risk management plan.

fall under lease to an operator, and (3) non-commercial activity at other times of the year that supports research, monitoring, and public education.

Bear-hunting prohibition. In order to protect the bear population in the ecological reserve and settlement lands, no resident or non-resident non-aboriginal harvesting is permitted. While having the right to hunt, the First Nation has voluntarily closed the area to bear and moose hunting by its people.

In addition to the required steps identified in the management plan, a number of other initiatives were undertaken prior to viewing operations starting, as follows:

Commercial joint venture. To effectively and safely provide bear-viewing opportunities, a First Nation–private sector joint venture, Bear Cave Mountain Eco-Adventures, was created. This joint venture is managed by a bear-viewing guide with over 20 years of experience and who is familiar with area. He has partnered with the Vuntut Gwitchin Development Corporation, the business arm of the First Nation.

Bear-viewing plan. A commercial bear-viewing plan was developed by the joint venture to demonstrate how the business would start the trial operation and then continue into full operations in the future. This plan is closely linked to the operational and emergency procedures described in the bear–human risk management plan.

Use permit. Under the Parks and Certainty Act, Yukon Parks regulates activities and development in territorial parks through the issuance of permits. To prepare for this, the Yukon Department of Justice undertook a thorough review of the bear–human risk management plan. As a matter of due diligence, the review ensured that all requirements of the plan were recorded as legal terms and conditions of the activity permit. The permit was issued to the joint venture to allow trial operations to start in September 2006.

Partnerships leading to commercial bear viewing

Table 1 summarizes the key steps and partnerships leading to the creation of bear-viewing operations at Fishing Branch Protected Area. This process started in 1995 with the settlement of the Vuntut Gwitchin Land Claim Agreement and continued to September 2006 when trial operations started. Throughout the process, the partners, including the First Nation and Yukon governments, Simon Fraser University, and the professional bear consultant and experienced bear-viewing guide mentioned above, were able to learn about the initiative in depth and share the experience of working together towards a common goal.

Critical factors in the development of this activity hinged around the nature of bear behavior, the careful planning and construction of facilities, and controlling human activity. The protected area and risk management plans provided the steps to prepare for the operation. Outside expertise to complete these steps was critical in the process. Analyzing the experience of similar activities elsewhere was valuable. Facility development demanded careful planning and sensitive construction practices and scheduling. Similarly, the comprehensive bear–human risk management plan was essential to achieving a level of confidence in the bear-viewing plan and to providing definite guidelines for visitor operations. Monitoring the activity will be equally critical in addressing operational concerns and issues at all stages to ensure visitor safety and protection of the bears.

Key Activities	Result	Key Partners & Contributions			
		First Nation (VG)	Government (YG)	University (SFU)	Private Sector*
Settle Land Claim 1995	- established objectives & boundaries - outlined management plan - recognized bear viewing	settlement land (143 km^2)	designation (PLCA) public lands (170km^2)	not applicable	not applicable
Prepare Management Plan 2000	identified co-management structure (CMA) & operational conditions: - viewing only with qualified guide - viewing limited to 5 including guide - bear-human risk management plan - baseline bear behavior research - bear behavior monitoring protocol - limited facility development - bear-harvesting prohibition - start operations on trial basis	co-developed & approved with YG	co-developed & approved with VGFN	not applicable	not applicable
Prepare risk management plan 2004–05	identified detailed operational requirements & safety procedures to minimize risk to bears & viewers	CMA member/reviewer	CMA member/reviewer technical oversight coordinated & funded	not applicable	consultant prepared guide reviewed
Complete research & monitoring 2004–06	- established pre-viewing patterns - developed monitoring protocol	CMA member/reviewer	CMA member/reviewer technical oversight coordinated & funded	researched & prepared monitoring protocol	consultant & guide reviewed
Develop facilities 2004–06	constructed basic facilities: - 1 cook cabin, 2 sleep cabins, 1 outhouse, 1 wash cabin & 1 food cache	contracted community labor	built & funded	not applicable	consultant & guide reviewed
Establish First Nation/private sector joint venture 2005	- provided viewing opportunities - ensured experience & expertise - provided First Nation benefits - prepared bear-viewing plan	First Nation participated by Development Corporation & provided resources	not applicable	not applicable	guide provided experience & expertise
Prepare & issue use permit/commence operations 2006	- issued 3 year permit to joint venture for trial operation - permit conditions-based risk management plan	issued use permit to joint venture for settlement lands	issued use permit for ecological reserve; YG Justice involved to ensure due diligence	not applicable	as joint venture partner, guide

Vuntut Gwitchin (**VG**) Yukon Government (**YG**) Simon Fraser University (**SFU**) *Private Sector (bear consultant & viewing guide) Committee of Managing Agencies (**CMA**)

Table 1. Activities and partnerships leading to commercial bear viewing at Fishing Branch Protected Area.

Comparative analysis of viewing sites in Alaska, British Columbia, and Yukon

In order to compare the management controls and safeguards developed for the Fishing Branch operations, 13 other bear-viewing sites in Alaska and British Columbia were assessed. The work was prepared as part of the bear-monitoring benchmark and protocol development research undertaken by Simon Fraser University. Only sites where the primary activity is bear viewing related to spawning salmon were considered. Both viewing site conditions and management regimes were compared.

The results showed the following similarities and differences between Fishing Branch and the other sites, using 14 different characteristics:

Accessibility. Along with one other site in British Columbia, Fishing Branch is the most difficult and expensive to access, as visitors can only arrive by expensive charter helicopter. Most of the other sites are accessible by float plane or boat. Only two can be reached by road.

Infrastructure. Viewing and lodging infrastructure, as well as physical barriers to reduce bear–human interactions, were compared. About half the sites have all three forms of infrastructure. The other half operate on a day-use basis without lodgings. At Fishing Branch, viewing is conducted primarily from riverbanks without physical barriers, with modest visitor infrastructure.

Agency staff/qualified guides. Only two of the 14 sites have no agency staff to orient or guide visitors and have no requirement for visitors to use viewing guides. Fishing Branch has no agency staff on site, but is one of five sites that requires the use of a qualified bear viewing guide.

Bear viewing as primary use. Fishing Branch is one of only three sites where bear viewing was the primary and original designed use of the site when established. Bear viewing evolved over time in about half of the other sites.

Managing agencies. All sites are either managed by federal, provincial, state, or territorial agencies. Fishing Branch is one of four that also includes a First Nation in cooperatively managing the site, and is one of two sites where First Nations' lands are used in the viewing operation. As noted above, the commercial viewing operation is jointly owned by a First Nation development corporation and a qualified bear-viewing guide.

Access rules. Almost all 14 sites, including Fishing Branch, have rules and regulations controlling visitor movements when on site. Fishing Branch is one of only four sites that strictly controls visitor access and requires viewers to be accompanied by a guide at all times.

Viewing regulations. Daily visitor limits vary among the 14 sites, from a minimum of four to a maximum of 64, with Fishing Branch along with one other British Columbia site having the lowest. Six sites have no daily limits at all. Four provide only day-viewing opportunities, with others being multi-day, including Fishing Branch. Three have a permit reservation system to control visitor numbers, while five self-manage, including Fishing Branch, which is permitted under strict operating conditions, including those governing visitor numbers. Half the sites have daily viewing schedules, while the others, including Fishing Branch, allow viewing only during daylight hours.

User fees. The six sites that have a daily user fee charge between CDN$10.00 and $87.50. Fishing Branch is among the eight sites that do not charge a daily user fee

per se. However, the all-inclusive commercial guiding fee for Fishing Branch is high, at about $1,500 per day per client. A $1,500 lease fee is paid by the commercial operator for the eight-week use of park facilities.

Education/safety/interpretive programs. Only one of the 14 sites provides no prior or onsite education, safety, or interpretive information programming. The other sites, including Fishing Branch, provide safety information that generally encompasses viewer movement and behavior, including encounter response and food storage and disposal. Information provided at Fishing Branch by the guide also includes how to respond to emergencies, viewer obligations and camp duties, and, as an ecotourism operation, extensive natural history of the bears, salmon, and other species, as well as cultural history of the area and First Nations.

Viewing distances. Five sites have stipulated minimum viewing distances, which vary from 3 to 100 m, with the average being 30–50 m. Five sites, including Fishing Branch, have variable distances established by the guide dependent on the tolerance of individual bears—which, among other factors, is determined by viewer numbers.

Habituation. The Fishing Branch is one of seven sites that uses bear habituation (i.e., getting bears used to people, not food conditioning) as a means to improve viewing quality and bear–human safety. Five of those seven sites, including Fishing Branch, use qualified viewing guides to undertake habituation. Seven sites do not have an active habituation program.

Monitoring program. Only five of the fourteen sites, including Fishing Branch, have ongoing monitoring programs to measure the impact of viewing on bear behavior. The Fishing Branch program is based on three years of bear behavior research that led to the development of a data collection protocol, which the guide uses during viewing operations.

Emergency procedures. Eight of the 14 sites have established procedures to respond to a bear mauling, including victim assistance procedures, information recording, communications/notification protocols, and post-incident reporting. Being isolated with only one guide, Fishing Branch viewers are made aware of emergency procedures and have quick access to a detailed onsite response manual and satellite phone/ HF radio.

Other permitted activities. Only five sites, including Fishing Branch, prohibit other uses, such as angling and sport and subsistence bear hunting. Three sites allow only angling. Four allow both sport and subsistence bear hunting. The size of bear hunting closure areas vary from 4 to 14,000 km^2. For Fishing Branch, the mandatory closure area is 300 km^2 around the immediate viewing site, and is voluntary in an additional surrounding 6,000 km^2.

Overall comparative summary

Compared with 13 other sites, Fishing Branch is one of the two smallest, with remote operations that provide highly controlled viewing conditions through the mandatory use of a qualified bear-viewing guide at a relatively high (4:1) viewer-to-guide ratio. This allows variable viewing distances without physical barriers, as the guide can identify individual bears and is familiar with their tolerance to viewers. As a relatively new, government–First Nation co-managed protected area, comprehensive pre-operational planning was possible, and

focused on preparing exclusively for bear-viewing activities. These preparations included (1) developing a bear–human risk management plan, (2) undertaking bear behavior research and creating a monitoring program, and (3) approving a detailed commercial bear-viewing plan.

Conclusion: Lessons learned related to planning for commercial bear viewing

The 10-year process leading up to commercial bear viewing at Fishing Branch demonstrated a number of important lessons learned:

Establish protected areas through land claims. Settled land claims provided the legislative means to establish the protected area, which included the contribution of First Nation-owned lands, a first in conservation in Canada, if not North America. This provided an equal partnership between the territorial and First Nation governments.

Develop management plans with First Nations. The joint development of the management plan ensured First Nations' participation in determining the objectives for the protected area, which included commercial viewing as a means to both protect the bear and provide visitors safe viewing opportunities.

Cooperate and partner early. Taking a cooperative, shared approach to planning and management was fundamental to success. Working with other key players (i.e., the Vuntut Gwitchin Development Corporation, the bear-viewing guide, Simon Fraser University, and the consulting bear expert) early on, and continuously throughout all stages of planning and operating, was crucial.

Apply the precautionary principle. A measured, conservative approach to an activity such as bear viewing was essential and used throughout the preparation of both management plans. In the absence of fully knowing all implications, the precautionary principle was used by initially setting restrictive use limits and conditions.

Be comprehensive and patient. All that needed to be done was completed prior to starting operations, even as pressure mounted to start earlier when wilderness tour operators and photographers wanted to view bears before the planning was complete. The viewing operations will be phased in slowly. This will allow operating and marketing programs to be tested and adjusted if necessary.

Build capacity through joint ventures. The commercial joint venture with the viewing guide and the First Nation development corporation was encouraged and provided the expertise needed for safe operations. The joint venture also will provide the training and experience necessary for the First Nation to eventually assume control of the operation.

Integrate planning and operations. Activities leading up to viewing operations were interrelated and nested together. This approached ensured that human–bear risk management plan reflected the objectives of the overall management plan; that the bear-viewing plan reflected the operating conditions of the risk management plan; and that the terms and conditions of the activity permit reflected the requirements of the risk management plan.

Involve legal counsel. Legal counsel was involved in preparing the activity permit to ensure a degree of due diligence by demonstrating that all reasonable steps were taken to minimize the risk related to the operation. The exact operating procedures and protocols contained in the risk

management plan were used as the terms and conditions of the activity permit to ensure consistency and clarity.

Government-owned facilities. The facilities were built and are owned by the Yukon government. They were kept to a minimum and are leased for bear viewing to the joint venture in the fall and are used for ranger operations and research for the rest of the year. Government ownership ensures control over the facilities and, if required, makes it simpler for Yukon Parks to cancel or not renew the activity permit for non-compliance.

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Editor's note: The name "Gwitchin" is rendered several ways in English: Gwichin, Gwich'in, and Gwitch'in, among others. We have adopted the spelling used on the Vuntut Gwitchin First Nation government website, www.vgfn.ca.

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CLIMATE CHANGE AND CULTURAL HERITAGE

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Climate Change and Cultural Heritage: Local Evidence, Global Responses

Michelle L. Berenfeld

RECOGNIZING THE URGENT THREATS TO BOTH NATURAL AND CULTURAL RESOURCES posed by global climate change, the World Monuments Fund (WMF) organized a panel discussion at the 2007 George Wright Society Conference that gathered professionals in the fields of historic preservation, nature conservation, and green building and asked them to examine how these disciplines could collaborate to develop strategies both for adapting to those impacts and mitigating those threats by sustaining built and natural environments.[1]

WMF is a non-profit organization based in New York City that works to protect and preserve cultural heritage sites around the world—sites of all types and from all periods. Setting an agenda for protecting cultural heritage at that scale is a challenge, and in 1996, WMF launched a program that would allow it to gain the information it needed to see that larger picture—the World Monuments Watch List of 100 Most Endangered Sites.[2] The Watch List has since become the main tool WMF uses to learn about the dangers posed to cultural heritage sites around the world. To create the list, every two years WMF solicits nominations from governments, non-governmental organizations (NGOs), universities, grassroots organizations, and professionals in the field. From these nominations, a panel of international experts—convened by, but independent of, WMF—selects a group of 100 sites that present a snapshot of the state of global cultural heritage at a given time. Through the Watch List, WMF calls attention to and attracts support for not only 100 individual places, but also key issues in the field. In the past, major themes of the list have included issues such as conservation challenges in the developing world, threats to cultural heritage in areas of armed conflict, and the challenges of preserving Modern architecture. In addressing these challenges, WMF has been able to draw on established methods of the field of historic preservation. While each project and program presents

unique challenges, for the most part they can be addressed using familiar tools.

In 2008, however, the Watch List presented WMF with a challenge that promises to change the way preservationists will have to think about what we do: global climate change. Although the specific threats posed by climate change are familiar (water, bugs, soil erosion, etc.), and while politics and economics have always affected cultural heritage conservation, climate change will expand and exacerbate those known challenges. More important, however, is that climate change is not just a historic preservation problem; it is perhaps the most far-reaching and wide-ranging problem of our time and will affect every sector of human life for years to come. It is for this reason that historic preservationists cannot afford to work in a vacuum, and to focus only on our specific concerns. At the same time, there are ways that the field of historic preservation can make a positive difference in the world's response to climate change, but in order to be effective, we must rethink our methods—both in how we work and how we explain our work to the public.

Environmental threats—both natural and human-made—have long threatened cultural sites. Monuments that have stood on the Earth for centuries—enduring symbols such as the Great Wall of China or the aqueducts of the Roman empire—have always suffered from exposure to wind and rain, and plain old age, and in the last century especially, new factors such as pollution and other human-made environmental factors have taken their toll. Addressing these problems has been difficult, but it has also given preservationists experience—the experience needed to address the larger-scale versions of these threats that come with climate change. Historic buildings also provide substantial, and thus far largely unexamined, information about how and why the built environment survives or doesn't over the long term. Therefore, in addition to developing new strategies for adapting and responding to climate change threats, the field of historic preservation must also focus attention on helping to convince the public to act to stop global warming by raising awareness of the threats posed to treasured monuments and historic places.

The 2008 World Monuments Watch List demonstrates that climate change impacts are already being felt today at cultural heritage sites around the world. These sites are only the canaries in the coal mine, however, and many more sites and cities around the world are vulnerable. Predictably, rising sea levels pose a substantial problem. A large portion of the world's population lives now and has always lived along the coasts and in cities built along major rivers, and so with them are many of the world's cultural sites and historic cities. In addition to rising sea levels, changing weather patterns will also cause substantial damage to historic buildings. Designed to withstand one set of environmental conditions, many historic structures will have to be adapted to survive as those conditions change. For instance, places that were once dry will be wet, and vice versa; rising temperatures will pose threats to wooden buildings in northern regions as termites and other pests are able survive at higher latitudes. As we consider global predictions about climate change impacts, it is clear that sites on every continent are in danger—from ancient sites in Peru threatened by melting glaciers to whole swaths of the Pacific Rim that will be under water, and everything in between.

Evidence

In examining cultural heritage sites on the 2008 Watch List that are threatened by the impacts of climate change, the most desperate case seems to be Herschel Island, in the Canadian Yukon. Located on the Beaufort Sea near the border between Alaska and Canada, Herschel Island is in the fastest-warming part of the world (Figure 1, no. 1).[3] It is home to a historic whaling town founded in the 19th century and an ancient Inuit site that was settled some 1,000 years ago (Figure 2).[4] The warming of the ocean and the melting of sea ice in this region have caused increasingly severe storms and sea-level rise, and, with them, coastal erosion. Rising waters are overtaking land once occupied by the historic wooden buildings of the whaling village. Melting permafrost is causing ground slumping, which is destroying archeological remains and burials that are being revealed by melting and retreating soil.

Herschel Island is currently included on Canada's World Heritage Tentative List, which is the precursor to nomination to the UNESCO World Heritage List, but the ongoing losses at the site could prevent that nomination from going forward.[5] The Yukon government and the Yukon Historical and Museums Association (YHMA) have been working to protect the cultural heritage of Herschel Island, taking measures such as moving historic buildings back from the coastline and carrying out salvage excavations. The nomination to the 2008 Watch List, however, stated that previously established strategies would have to be adapted given the urgency and irreversible nature of the threats posed to the site by climate change. The caretakers of Herschel Island are now focused almost entirely on salvage measures and documentation of the site so that some record of its history will be preserved for the future. They are undertaking scientific documentation of the buildings and sites and a documentary film project is being developed to record the culture and traditions of the place.[6]

There are many more sites farther south that are not so far along as Herschel Island, but which face similar challenges or will soon. The problems of warming seas and the resulting more-violent storms are expected to threaten many coastal towns and sites in northern Europe, for instance.

Figure 1. Map showing locations of cultural heritage sites impacted by climate change. Numbers are referenced in the text. Source: World Monuments Fund.

Figure 2. View of the historic settlement of Herschel Island, Canada. Photo courtesy of World Monuments Fund.

In Norway, a picturesque fishing village at Sandviken Bay (a 2006 Watch Site), near Bergen, is located in an area that is predicted to experience increasingly violent seas and winds (Figure 1, no. 2).[7] Melting permafrost is a growing problem in northern latitudes, and many large cities and towns are vulnerable as the ground beneath them shifts and melts.[8] Even in more temperate climes, some of Europe's oldest and most revered sites are threatened by rising seas and coastal erosion. On the Outer Hebrides of Scotland, for instance, the archeological remains of Norse settlements from the Middle Ages are quickly disappearing as a result of eroding coastlines. In Baleshare, the problem is so acute that archeologists have appealed to the local community to help them record them before they are gone.[9]

At the other end of the Earth, in Antarctica, the bases built by the early explorers of the continent remain exactly as they were left at the beginning of the last century, complete with jars of mustard on pantry shelves and socks hanging on laundry lines (Figure 3). These explorers' huts are time capsules of another age, filled with undiluted information about the lives of the men who built them and the adventures they had. In the winter of 2007, the hut of Captain Robert Falcon Scott was bombarded with more than 100 tons of snow over the course of a few months, far more than

Figure 3. Interior view of Ernest Shackleton's hut, Antarctica. Photo courtesy of World Monuments Fund.

had previously been recorded, thought by some to be caused by warming temperatures. Interestingly, our knowledge of historic levels of precipitation is based in part on the records that the original explorers kept. They were interested in climate science and recorded some of the first scientific data on climate fluctuations in Antarctica—information that is used to track climate change today.

The inclusion of the explorers' huts on the 2008 Watch List was met with skepticism from some members of the public, and WMF was contacted by one scientist who pointed out that the increased snowfall might have been caused by factors other than global warming.[10] On the other hand, we also heard objections based on the idea that Antarctica was not melting "that fast," i.e., that it would be at least 50 years until substantial portions of the land ice on the continent would melt. As the caretakers of sites that are hundreds, if not thousands of years old, preservationists must view a threat of loss in fifty years as imminent. Indeed, the fact that we can point to changes that are rooted in the time scale of human history may be our most effective strategy in supporting public action to halt climate change.

Not all climate change threats are about ice and snow and water lines. In Africa, huge areas of the content, and particularly the wide strip of land known as the Sahel, are experiencing drought and desertification, and when it does rain, it often rains more intensely.[11] Increasingly dramatic shifts between wet and dry and hot and cold across the Sahel and in other parts of Africa are also wreaking havoc on agriculture and people, as well as cultural heritage.

The Chinguetti Mosque, in Mauritania, was founded in the 9th century and was once a stop on the caravan trade route through Africa (Figure 1, no. 3; Figure 4). It was also an important center of Islam, and today a major collection of medieval Islamic manuscripts is housed there. A World Heritage site that was first included on the Watch List in 2006, the Chinguetti Mosque is now threatened by desertification, which brings with it not just encroaching sands that cover and erode building material, but also the danger of flash flooding.[12] When heavy rain falls in these areas, the dry earth and sand cannot absorb water quickly

Figure 4. Chinguetti Mosque, Mauritania. Photo courtesy of World Monuments Fund.

enough and it rushes through the site and into buildings, causing dangerous conditions as well as damage.[13]

Also in West Africa, another World Heritage site, known as the megalithic circles of Senegal and Gambia, is also threatened by drought and dramatic wet–dry cycles. The vast area covered by these remarkable assemblages has suffered drought and increasingly dramatic temperature fluctuations in recent years (Figure 1, no. 4; Figure 5). The sharp changes in temperature and humidity have caused many of the stones to crack, but more damaging for this unique landscape is soil erosion. Drought has caused a substantial loss of vegetation and, with it, soil erosion, which is exacerbated when it does rain. The significance

Figure 5. Megalithic circles in Senegal. Photo courtesy of World Monuments Fund.

and grandeur of the megalithic circles, like those of Stonehenge and other Neolithic sites around the world, depends in large part on their arrangement within the landscape. As the soil beneath them weakens and moves, however, stones topple over—leaving piles of rocks, in essence—and destroying much of the meaning and visual impact of the monuments.

In the Himalayan region of northern India, traditional temples and towns appear as simple mud and wood structures set in a spectacular landscape (Figure 1, no. 5; Figure 6). Inside, these apparently humble buildings have beautiful and complex interiors, decorated with elaborate paintings and brightly colored sculpture (Figure 7). A traditionally arid climate, this region used to experience rain largely as light sprinkles, but in recent years the area has experienced short, but heavy, downpours that the traditional mud structures are simply not equipped to withstand.[14] In the longer term, these temples and towns are also threatened by melting glaciers of the Himalayas, which will themselves cause flooding through runoff and glacial lakes bursting their banks. The experience of getting to these buildings, along with their setting in the natural landscape, are closely tied to their significance and purpose. As we think about how to preserve the cultural heritage of this region, it is important to consider this context. If we wait too long to act, we may be forced to take emergency measures that will have a dramatic effect on this context—such as the construction of incongruous shelters or the extraction of precious interior paintings and sculpture for their protection or dispersal to museums. These

Figure 6 (above). General view of the town of Leh, India. Figure 7 (right). Interior decoration at the Sumda Chunn temple in Ladakh, India. Photos courtesy of World Monuments Fund.

sorts of salvage responses will dramatically alter these sites, and the meaning for the people who built and use them, and to those who journey to see them, would be lost.

In another part of Indian subcontinent, the low-lying nation of Bangladesh has always struggled with flooding. The historic city of Sonargaon, which contains thousands of extraordinary and elaborate buildings constructed by aristocrats and kings in the Middle Ages (Figure 1, no. 6; Figure 8), has been deteriorating for years because of neglect and lack of resources, but this deterioration is also exacerbated by flooding caused by the loss of natural barriers—such as mangrove forests—and by rising seas. Bangladesh is also one of the most vulnerable countries in the world when it comes to climate change, both as a result of

Figure 8. A flooded historic building in Sonargaon, Bangladesh. Photo courtesy of World Monuments Fund.

its geography and its economic status. Even conservative estimates of future sea level rise would result in flooding that would displace tens of millions of people in Bangladesh.[15] Flooding on this scale, combined with the poverty and lack of infrastructure in this densely populated country, will cause a humanitarian crisis of enormous proportions, and by that point, the protection of cultural heritage sites may no longer be feasible.

As we consider these issues, we need only look to Louisiana for an example of such a scenario. New Orleans, which is home to one of the largest collections of historic buildings in the country, presents a case study (Figure 1, no. 7). New Orleans is not only a cautionary tale of natural disasters waiting to happen—and possibly more frequently and with greater severity as the Earth warms—it is also an example of how cultural heritage can and will be lost in those disasters if we don't prepare for them, and, how deeply that loss will be felt. Thousands of the distinctive houses of New Orleans were damaged by Hurricane Katrina, but many more have been destroyed since the storm through short-sighted demolition in the effort to clean up. Now, a substantial part of the fabric of the city—its character and history and one of the reasons people want to go there—has been lost. Now that the disaster has passed, the people who lived in New Orleans before the storm want to return to their brightly colored shotgun houses and Creole cottages. In addition, the distinctive built environment is a key attraction for visitors, whose funds fuel an important economic engine of the city.

The historic buildings of New Orleans are not simply charming for tourists and residents, however; they are also practical architectural responses to the climate—built up on piers in case of floods (of normal levels), constructed out of cypress wood that comes from the nearby swamps and is more resistant to damage caused by humidity, and made with high ceilings and windows that provide cross breezes in hot weather. Tearing down and replacing these houses with buildings that could be constructed anywhere not only destroys the character of the city and its history, but is also bad environmental strategy.

Responses

A key challenge of addressing the threats posed by climate change is how to convince people to act collectively towards a common goal and to do so without the promise of immediate or visible results. Indeed, if effective, much of the action required to halt global warming will have little or no discernible effect for most people, as the goal of these actions is in large part to prevent change. Convincing people to radically change their behavior in order to maintain the status quo is an exceedingly difficult task.

Climate change is a global threat, but preservation, like politics, is local. Most of the work of historic preservation is done on the state, city, or even neighborhood level, and it has long been difficult to coordinate efforts on a wider scale—to agree on priorities, and to make collective decisions about what to spend our money and time on, and on what to save and what to sacrifice. In order to effectively prepare for and adapt to the impacts of climate change and to use historic preservation as a means for mitigation of its effects, however, preservationists—and natural conservationists—must think differently and work together in new ways.

This presents a number of challenges, but it is clear from some examples of how we are working today that new approaches are necessary. One such example is the conservation project now under way at Fort Jefferson in the Dry Tortugas (Figure 1, no. 8). Constructed on a spit of land off the southern tip of Florida and part of Dry Tortugas National Park, Fort Jefferson is the object of a multi-year, multi-million-dollar conservation effort led by the National Park Service.[16] Fort Jefferson is endangered by exposure to salt air, rusting internal metal structures, and the eroding ground on which it was built. This building is one of many coastal historic sites in the U.S. that are threatened by rising sea levels and other threats posed by climate change, and although many sites may be protected from those threats through thoughtful conservation and maintenance, it is important that we consider the question of how to allocate resources for these efforts. Predictions about climate change impacts would seem to indicate that Fort Jefferson is likely both to experience significant further damage as a result of increasingly severe hurricanes and storms, and, by the end of the century, to be frequently flooded if not largely under water.[17] With sites like this in mind, the question of allocating resources must be expanded to consider new factors. For instance, New Orleans is a city of hundreds of thousands of people that is also in danger and already suffering, and many more historic places where people live and visit around the country and the world, and which could arguably be considered more important to human history, are also vulnerable. In addition to historical significance,

the cultural heritage community's response to climate change must take into account how historic sites contribute to or are part of the human habitat, and how protecting them may support efforts to adapt to and mitigate climate change threats overall. This includes incorporating historic sites into sustainable development and economic planning. This is particularly important as we consider the potential impacts on major cities such as London and New York. In London, the Thames Barrier already works to keep that river from overflowing its banks and flooding the city—and there are concerns about how long it will continue to be able to do so.[18] In New York, much of the city was built on reclaimed land, and densely populated areas—not to mention international airports that move millions of people and tons of goods each day—already are at or close to sea level. These and other cities all contain historic sites that are threatened by climate change, and which will only become more vulnerable as humanitarian and economic concerns grow more urgent.

It is time for the cultural heritage community—together with governments, NGOs, and other stakeholders—to make some hard decisions. One way to do this would be to undertake a sort of "triage" for cultural heritage, in which three main categories of sites are identified:

- Sites that are doomed.
- Sites that are so important that we are willing to save them at almost any cost.
- Sites that could be saved if we plan ahead and consider climate change in conservation efforts.

For those sites that are doomed, we must accept these losses rather than invest time and money in them. Like the caretakers of Herschel Island are already doing, we need to stop trying to shore up doomed places and start documenting them now, or else we will lose them from history forever.

For those sites that must be saved at all costs, we have to start thinking about this now, and try to build some kind of consensus about what places humanity simply cannot live without—and for which we are willing to take heroic measures to protect. These sorts of heroic measures have been taken before, but they are expensive and can be controversial. A few decades ago, with the construction of the Aswan Dam in southern Egypt, many ancient monuments were going to be flooded and the world decided that it was worth it to literally move mountains to save the great temple of Abu Simbel, built by the pharaoh Ramses in the second millennium BC. The temple at Abu Simbel was originally sited on a spot along the Nile meant to impress Nubians sailing up to Egypt. To protect it from flooding that would come with the construction of the Aswan Dam, the temple was moved to another site. The imposing royal message to the Nubians was sacrificed, but Ramses and his temple were saved.

In Venice, a city that has been struggling with water since the day it was built, huge engineering projects to protect the city are underway—giant floodgates and breakwaters are being built to protect it. How long this will hold off the waters is anyone's guess.[19] The time is now to begin to identify these save-at-all-costs sites around the world and determine which are the most vulnerable to climate change impacts.

The third category—those sites that can be protected through strategic planning and interventions—is the largest and the most complex. It includes the many sites around the world that require conservation and protection for many of the usual rea-

sons—neglect, lack of resources, exposure, old age—but which will suffer more dramatically as a result of climate change. These include such places as Kilwa Kisiwani in Tanzania, where WMF is developing its first project that specifically seeks to address climate change impacts on a cultural site by demonstrating new ways to approach cultural resources within their natural environments (Figure 1, no. 9). Kilwa is a World Heritage site on the east coast of Tanzania that was occupied from the Middle Ages through the Colonial era. Preserved there are the ruins of early palaces, forts, houses, and a mosque, all set within a picturesque seaside landscape (Figure 9).

The buildings at Kilwa are deteriorating as a result of coastal erosion and exposure to salt air and wind. These problems will be exacerbated by global warming and rising sea levels, but right now they are also caused by the loss of the natural protective barrier along the coast—mangrove forests. WMF is working with the Tanzanians to preserve the Gereza Fort at Kilwa and to restore mangrove barriers at the same time. While this probably won't save the site for centuries, WMF chose this project to serve as an example of the new way that we have to think about cultural heritage preservation—shoring up the sites of Kilwa without addressing the land beneath them is pointless. If we can demonstrate successful alternatives, however, perhaps we will be able to encourage our colleagues, governments, and supporters to think this way about other places and work with us to make smart decisions in the future.

This is just one example of the types of integrated, multidisciplinary approaches that historic preservationists need to consider and develop. If we want to preserve

Figure 9. The Gereza Fort at Kilwa Kisiwani, Tanzania. Photo courtesy of World Monuments Fund.

our cultural heritage in its natural habitat, which happens to also be our own, we must approach the work of cultural heritage preservation from new angles. We have to ask ourselves: Do we want to experience the wonders of the world in the future as their creators did—in the deserts, jungles, plains, and cities in which they were built—or do we want to consign them to museums and display cases, or risk losing them completely? The answer for those of us charged with preserving cultural and natural heritage is clear, but we have a long way to go to explain these threats and their consequences to the wider public.

An important part of our efforts to change the way the cultural heritage field as well as public policy address the threats posed by climate change will be specialists' ability to demonstrate that preserving existing historic buildings is an inherently "green" activity. There is much to learn from those human-made structures that have survived for generations, including how to design for repair and maintenance instead of replacement, how to build structures that are well-suited to their natural environment, and how traditional methods and locally available resources can support sustainable construction along with economic and community development.

Effective public education and change depends on collaboration. The cultural heritage preservation and environmental conservation movements share a common mission to protect and sustain existing resources; however, there has been limited collaboration between the two disciplines. The threats posed by global climate change present us with the need and opportunity to develop an integrated approach to preserving and sustaining the built and natural environments by pooling our resources, consolidating our efforts, and sharing our skills and experience to further our shared goals. Such an effort would bring together the fields of nature conservation, cultural heritage preservation, and sustainable development to develop strategies that will increase public interest and awareness of efforts to address climate change threats; gather and disseminate information about climate change threats to cultural and natural resources among public and professionals; and undertake projects that demonstrate core principles and strategies.

Additionally, on the issue of mitigation of climate change threats, while it is important for cultural and natural heritage professionals to set an example by reducing our own carbon footprints, there is much more that we have to contribute. The work of heritage conservation itself can also contribute substantially to mitigation efforts. The environmental benefits of preserving historic buildings are many, including the simple fact of reusing and repairing instead of replacing existing structures, as well as the advantages of using traditional, locally sourced materials that are well suited to local environments and therefore require fewer resources to heat and cool and maintain. It is also essential that we more systematically integrate natural and cultural heritage conservation, that is, undertake projects that focus on the conservation of cultural sites along with the natural environment that surrounds them. In short, we have much to learn, but also much to teach, and the time to act is now.

Endnotes

1. The panelists were Rebecca Beavers, coastal geologist, Geologic Resources Division, Natural Resource Program Center, National Park Service; Dinu Bumbaru, policy director for Heritage Montreal and secretary general of ICOMOS International; and Charles Allen III, assistant director for external relations of the Center for Bioenvironmental Research (CBR), Tulane and Xavier Universities, and president of the Holy Cross Neighborhood Association of New Orleans, Louisiana. The session was organized and chaired by the author.
2. Information about WMF, the Watch program, and individual sites on the list are available at www.wmf.org.
3. IPCC 2007a, 30, 32, Figure 1.2; IPCC 2007e, 620.
4. See Yukon Environment, *Herschel Island–Qikiqtaruk Territorial Park Management Plan,* 14, 17–18, for a discussion of climate change and other stressors on the site.
5. The Tentative List entry for the site can be found at http://whc.unesco.org/en/tentativelists/1939/. See also Colette et al. 2007, 58–59.
6. The film is being developed by Fresh from the Yukon, Inc., Productions.
7. For a discussion of climate change impacts and adaptation strategies in Norway, see Sygna et al. 2004. A news story in Oslo last year about a collapse of an unoccupied apartment building cited increasingly severe weather caused by global warming as a factor in its deterioration (Berglund 2007).
8. Anisimov and Reneva 2006, 172 and passim; IPCC 2007d, 486.
9. For information about the shoreline archeology project in Baleshare and other parts of the islands, see www.shorewatch.co.uk/index.htm.
10. WMF is grateful to A.J. Monaghan for the information he provided. For some of his work on the subject, see Monaghan, Bromwich, and Schneider 2008, and Monaghan, Bromwich, Chapman, and Comiso 2008. Analysis of climate change impacts and development of predictions remains a subject of some debate among climate scientists. For an overview of some of the questions that continue to be debated, see IPCC 2077c, 663 and passim.
11. On desertification, erosion, and other soil degradation in West Africa, see Elasha 2006, 7, Figure 2, 19, and 16–17, 19–20 for discussion of changes in rainfall patterns. See also IPCC 2007f, 436, for a brief overview.
12. Cassar et al. 2007, 24, Box 8.
13. A historic example of the dangers of flash flooding to desert sites is the ancient Nabataean city of Petra, where the Siq—a deep and narrow valley that leads into the city—was outfitted with elaborate water management systems by its ancient residents. In 1963, several tourists were killed as a result of flash flooding in the Siq and Jordanian authorities have since taken steps to prevent flooding.
14. For information about rainfall patterns and variability in this region, see IPCC 2007d, 471–473.
15. IPCC 2007d, 484–485.
16. Information about the restoration project can be downloaded from the NPS website: www.nps.gov/drto/upload/Restoration%20site%20bulletin4.pdf.

17. IPCC 2007e, 630 and passim.
18. Connor 2008. For a general discussion of threats to London cultural heritage, see Colette et al. 2007, 66–69. See also www.environment-agency.gov.uk for information about increased use of the Thames Barrier in recent years and plans for the future.
19. For recent discussions of the barriers project (popularly known as the "Moses" project) to protect Venice, see Merali 2002; Cocks 2005–2006, 23–27; and Jamiolkowski and Ulam 2005–2006, 28–29. For a case study on Venice by the UNESCO World Heritage Centre, see Colette et al. 2007, 70–71.

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Sustain the 9!: Greening of the Holy Cross/Lower 9th Community

Charles E. Allen III

Introduction

THE LOWER 9TH WARD, JUST AS MUCH OF NEW ORLEANS BEFORE HURRICANE KATRINA, has been a community with poor energy efficiency and limited investment in environmental sustainable architecture and infrastructure. Residents of the Holy Cross/Lower 9th ward pay high utility bills for homes that are not properly weatherized or insulated. Residential construction investments during the post-Katrina recovery period have brought about an unprecedented opportunity to increase the awareness of area residents as to what it means to be energy efficient and sustainable. City-mandated, neighborhood-level strategic planning in the Holy Cross/Lower 9th community has increased residents' desires to understand more about what these concepts mean. And, as we undertake this project, we will explore how other communities have prepared more effectively for future environmental shocks as part of an overall comparative recovery analysis (Campanella et al. 2004).

At the center of this activity has been the Holy Cross Neighborhood Association (HCNA) of the Holy Cross neighborhood of the Lower 9th ward. It has been joined by its principal academic partner, the Tulane/Xavier Center for Bioenvironmental Research (CBR).

HCNA is your all-American neighborhood organization of the Holy Cross neighborhood of New Orleans. Founded in 1981, HCNA's mission is to improve the living conditions and serve the needs of its residents, preserve cultural and architectural heritage, serve as a clearinghouse for information, and actively represent the interests of the neighborhood in dealings with city, state, and federal agencies, private businesses, community organizations, and individuals, for the purpose of improving the community.

CBR is a research and training partnership between Tulane and Xavier universities. Its mission is to conduct and coordinate interdisciplinary research and learning to enhance global understanding of environmental issues, provide solutions through innovative applications and communication, and inform policy and practice.

Another premier partner in the Holy Cross/Lower 9th post-Katrina recovery has been the World Monuments Fund (WMF). WMF's support has come in the form of actual financial contributions and volunteer effort, as well as recently listing the Holy Cross Historic District, along with all of New Orleans' historic neighborhoods, on WMF's 2008 *Watch List of 100 Most Endangered Sites.* Through this list, WMF calls attention to and helps attract addition-

al support for this local community as it further works to recover itself in a green sustainable manner.

Sustainable planning

From February to June 2006, with the help of CBR staff and supported by funding from the U.S. Department of Energy via the Louisiana Department of Natural Resources, the Holy Cross/Lower 9th community undertook a strategic planning process that focused on energy-efficient, sustainable recovery post-Katrina. A result of this planning process, a recovery plan was developed, known as *Sustainable Restoration: Holy Cross Historic District & Lower 9th Ward.* Contained in this plan are recommendations from residents of the Lower 9th, including Holy Cross, on the reconstruction, repair and restoration of their neighborhood. The report is divided into four main sections. The first, "Urban Design and the Built Environment," is followed by recommendations in three categories traditionally associated with sustainable development: "Economy," "Environment," and "Quality of Life."

Sustainable practices

Building on the ideas envisioned by the community in the Holy Cross/Lower 9th sustainable restoration plan, HCNA, with funding from Mercy Corps and the Blue Moon Fund, has established a project called the Lower 9th Ward Center for Sustainable Engagement and Development (CSED). CSED's mission is to increase the awareness and understanding of Lower 9th ward residents regarding energy efficiency and environmental sustainability during the post-Katrina disaster recovery and investment period. CSED also works to assist returning Lower 9th residents with resources and training on rebuilding their homes energy efficiently through community bulk purchasing, enabling acquisition of low- or no-cost rebuilding materials for residents.

An ultimate intent of this project is to instill in residents an interest in knowing whether a product or substance that they will be using in their personal rebuilding is harmful or not to their own health and that of the environment (McDonough and Braungart 2002).

Numerous groups and individuals have approached the Lower 9th community recently to assist residents in the monumental strategic planning that they have been required to go through to prove community viability. These same groups and individuals will be the principal ones bringing information on green sustainable development and energy efficiency. The Office of the Federal Environmental Executive defines "green building" (an important component of sustainable development) as the practice of (1) increasing the efficiency with which buildings and their sites use energy, water, and materials, and (2) reducing building impacts on human health and the environment, through better location, design, construction, operation, maintenance, and removal—the complete building life cycle (Cassidy et al. 2003).

Potential implications for policy

To ensure that the relevance of this sustainable recovery work extends beyond the Lower 9th neighborhood and New Orleans, qualitative and quantitative research tools are being utilized to monitor and evaluate the Lower 9th community's recovery. Through questionnaires, the CSED and

CBR are routinely assessing residents' knowledge relative to sustainable recovery, and trying to determine the uptake of sustainable practices and identify any limits to implementation of such practices. This survey tool will be developed with input from state agencies, local and national non-profit organizations, and community leaders. Once completed, the results will be compiled in a report for submission to the RAND Gulf States Policy Institute and shared with local residents and stakeholders. The sustainable development and green building sector has rarely focused on the working class and minority communities in the United States. Lessons learned from this community-driven recovery effort will highlight current strengths and weaknesses of policy incentives and inform non-profit organizations beginning to work with these communities. More importantly, the information gathered from residents and stakeholders will help further influence the course of action, shaping energy and environmental policy in the region.

Conclusion

With the enormous degree of devastation that occurred as a result of Hurricane Katrina, the New Orleans area and the Lower 9th ward in particular have the great opportunity to rebuild and re-develop its community with an emphasis on sustainability and energy efficiency. It is anticipated that this community-driven recovery, developed and implemented in the Lower 9th Ward, will be replicable in neighborhoods throughout New Orleans, and across the U.S., with the potential to yield a more energy-efficient, environmentally attentive, and sustainable community for all coastal communities and regions as a whole. And, New Orleans and the Gulf Coast, led by the Holy Cross/Lower 9th, could become that city and region that *care did not forget*.

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Protecting Cultural Resources in Coastal U.S. National Parks from Climate Change

Maria Caffrey and Rebecca Beavers

THE U.S. NATIONAL PARK SERVICE MANAGES OVER 84 MILLION ACRES OF LAND on which are located around 26,000 historic structures. One hundred fifty areas under Park Service management are designated as "cultural landscapes." The impact of climate change on cultural resources will challenge many resource managers, in particular those responsible for protecting America's heritage in national parks. Rising sea level and projected increases in average annual temperatures will undoubtedly impact many parks' natural resources, which have led some to ask, "What is being done to protect cultural resources from climate change?"

This paper will discuss what steps have already been taken to uphold the Park Service's mission to "preserve unimpaired the natural and cultural resources and values of the national park system…" (NPS 2007a). In particular, we discuss how cultural resources are being impacted by observed changes in climate and discuss how we expect cultural resources to be affected over the next century, based on projections by the Intergovernmental Panel on Climate Change (IPCC).

Fort Massachusetts in Gulf Islands National Seashore and Cape Hatteras Lighthouse in Cape Hatteras National Seashore will be used here as examples of large-scale measures that are being taken to preserve cultural resources that would otherwise be lost to a changing climate.

Literature review

When many of us think of climate change and cultural resources, we may think of the cultural resources that are currently endangered by rising sea level in some of the oldest cities of the world, such as Venice or London. In early 2007, UNESCO listed twenty-six examples of World Heritage sites (out of 830 total) that are threatened by climate change (UNESCO 2007). These sites represent areas of global significance that are immediately at risk from changing climatic conditions. The list is categorized based on whether the sites are (1) glaciers, (2) areas of high marine biodiversity, (3) areas of high terrestrial biodiversity, (4) archeological sites, or (5) historic cities and settlements.

While these sites are important, they are merely examples of well-known sites that need protection. The question of how we protect those sites has been the subject of a number of reports and research conducted by various players, including those at multinational (e.g., UNESCO 2006, 2007), national (e.g., Cassar 2005) and academic (e.g., Dietz et al. 2003; Wallach 2005; Hassler 2006) scales. However, while the ecological impacts of climate change have been discussed extensively in the liter-

ature, Carter et al. (2001) have found any discussion of resource management and sustainability to be lacking. Overall, the discussion of what can be done to protect fixed sites that cannot naturally adapt to a changing climate, such as cultural heritage sites, has been largely overlooked by those in anthropology, archeology, geography, and other academic fields, leaving the discussion of what should be done about this issue almost exclusively to those in governmental institutions. This lack of research interest partly may be due to the lack of immediate "catastrophic" levels of impact by climate change. Patterson et al. (2006) point out that it can be difficult to plan for climate change due to temporal incongruities between cultural tourism (that can change over the scale of a few years) and ecological changes that are expected to occur over decades.

UNESCO (2006) outlined some suggested ways to predict and manage the effects of climate change. This report takes an even-handed approach to climate change that emphasizes preparation over a variety of temporal and spatial scales. In suggestions to resource managers, the report lists the following steps as part of a suggested strategy:

- Take preventative actions that include monitoring, reporting, and mitigation measures that should be "environmentally sound choices and decisions at a range of levels: individual, community, institutional and corporate."
- Employ corrective actions to adapt to changing climatic conditions.
- Share knowledge.

This approach also follows the work of Patterson (2003), in which she states that climate and tourism is a "two-way street" that needs both *mitigation* where (in this case) cultural tourism can impact climate, and *adaptation* to climate's impact on cultural resources. Patterson et al. (2006) further echo the work by UNESCO by stating that mitigation and adaptation must involve stakeholders on a number of levels to be successful, which has been the case for the examples that will be discussed in this paper. Tourism is a vital part of protecting cultural resources because tourist dollars can contribute to protecting sites of cultural significance. However, it should not be forgotten that tourism itself can also harm these areas, not only by on-site impacts but also by less-obvious impacts such as using cars that release greenhouse gases to get to the sites. The National Park Service relies on fees paid by visitors to assist them in maintaining and protecting the parks. With escalating temperatures in some regions and increasing sea level among other threats from climate change, the question arises: "Can the financial cost of protecting these resources exceed their cultural value?"

Whitehead and Finney (2003) tested willingness to pay to protect cultural resources in North Carolina through a survey of 884 members of the public. The study asked respondents how much they would be willing to pay to protect submerged cultural resources (shipwrecks) found around Cape Hatteras, North Carolina, as a one-time tax increase. Respondents were also asked how much more they would be willing to pay based on the number of submerged shipwrecks saved. Overall, they found respondents willing to pay to protect cultural resources, although the number of shipwrecks being saved did not play a major role in their decision-making.

However, this work did not include any questions regarding the length of time that

these resources should be protected. Climate change, which works on a scale of decades to centuries, will test how long these resources can be protected. In this paper, moving Cape Hatteras Lighthouse is a case in point of a measure that can only mitigate for nature's impacts for a limited amount of time before more must be done. In the meantime, managers are reassessing what preventative measures can be used around Cape Hatteras itself, and are monitoring and reporting the progress of sea-level rise and erosion around the site.

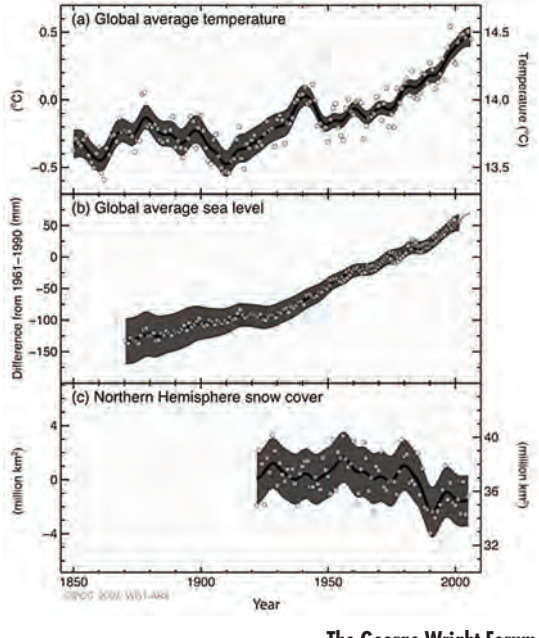
In contrast, Fort Massachusetts requires more immediate attention—a situation that has managers asking what would be the best way to protect it. The planning for the fort is currently in the UNESCO "corrective actions" stage of protection, whereby the site has to adapt now to climate change.

Climate change

In February 2007, the IPCC released its fourth assessment report on climate change. In addition to building on the work of their previous assessments by outlining its predictions for future impacts of climate change, the IPCC also discussed how changing climate is already impacting the Earth, and, crucially, what is causing these changes. For the first time the IPCC stated that changes in atmospheric gases (principally carbon dioxide, methane, nitrous oxide, and ozone) have significantly increased due to anthropogenic activities and that it is very likely (within a 90–99% probability) that these human influences are driving the observed changes in climate (IPCC 2007b).

IPCC predictions are built on six possible scenarios for future changes in society that could impact the level of anthropogenic greenhouse gases. These scenarios take into account changing rates of population growth, technology, and rates of economic development. From these scenarios, changes in the rate of sea-level rise and regional temperatures have been calculated (Figure 1). Surface air temperatures in the United States are predicted to warm by 2–3°C by 2100 along the western, southern, and eastern continental edges, with greater warming of up to 5°C in the North (IPCC 2007a). This increase in average annual temperatures will be accompanied by a 20–30% increase in precipitation in most regions that will manifest itself as more intense, short-duration storms that could result in flash flooding, particularly in the summer months. Projections by global circulation models also show a northward shift

Figure 1. Observed global average temperature, sea level, and northern hemisphere snow cover. Averages are relative to the 1961–1990 period. Circles represent yearly values. Source: IPCC 2007a. Reproduced courtesy of the Intergovernmental Panel on Climate Change.



in hurricane tracks, with an increase in the number of higher-intensity hurricanes and a decrease in moderate-intensity hurricanes (IPCC 2007b).

However, from a coastal management perspective, one of the most important changes in climate will be rising sea level. The IPCC predicts a global average sea-level rise of up to 59 cm by 2100, with average rates of rise almost doubling from 1.7 mm/yr^{-1} over the last century to 3 mm/yr^{-1} since the early 1990s (Rahmstorf 2007; IPCC 2007a). This number is expected to increase to at least 4 mm/yr^{-1} over the coming century (IPCC 2007a). In order to assess U.S. coastal national parks' ability to adapt to climate change, the National Park Service, in collaboration with U.S. Geological Survey, have published a number of reports using the rate of sea-level rise coupled with variations in mean significant wave height and tidal range and other geologic variables, such as the geomorphology, shoreline erosion/accretion rates, and regional coastal slope, to calculate a relative coastal vulnerability index (CVI) for 23 coastal parks to identify areas in the national park system that are susceptible to climate change.

While this research looks at physical parameters, this work can be used by cultural resource managers to help identify areas of cultural significance that could be submerged or lost to changes in landform (i.e., eroded or buried) in the future (USGS 2007a). Cultural resource managers can use the maps and reports to measure whether the area their resources are located in is of very low to very high vulnerability in comparison with the rest of their park. Results are also broken down further based on the six physical and geologic variables analyzed in each park report, which are posted on the CVI website. However, the CVI index does not quantitatively take into account the cultural or social values of the coastlines that are physically changing.

Fort Massachusetts, Mississippi

Fort Massachusetts is an example of a nationally significant resource of great cultural value that is threatened by rising sea level. It is a brick structure that cannot be moved and will therefore have to be protected using engineered measures, or else risk being lost to the rising waters of the Mississippi Sound and surrounding Gulf of Mexico. The question of what would be the best approach to protect the fort has been the subject of some debate in recent decades, particularly in light of predicted rises in sea level and other factors resulting from climate change. A number of "hard" (engineered, long-lasting measures) and "soft" (more natural, shorter-term) approaches have been taken to protect Fort Massachusetts from its changing environment. Harder measures, such as installing groins and sea walls, are longer lasting, yet are expensive to install, affect down-drift sediment transport, and, some say, detract from the aesthetic enjoyment of the structure. Soft measures, such as beach replenishment, are less intrusive, but they are usually short-term and can be more expensive over the longer term (French 2001).

The fort is part of Gulf Islands National Seashore, located approximately 20 km south of Mississippi on West Ship Island in the Gulf of Mexico (Figure 2). The fort was built during the Civil War (between 1859 and1866) and remained virtually untouched from 1870 until 1975. Gulf Islands National Seashore was created in 1971, with part of the legislation recognizing Fort Massachusetts as a structure of the first

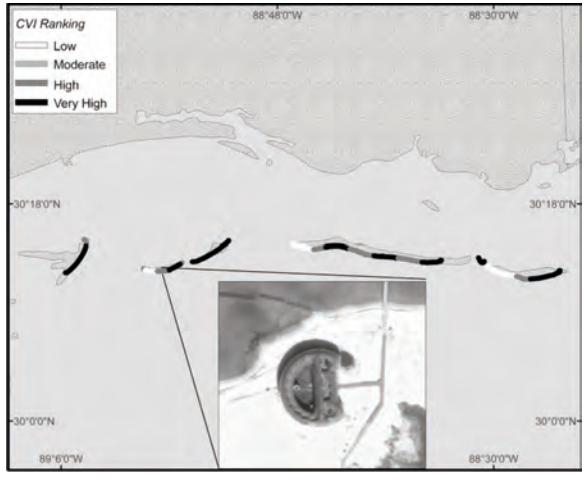


Figure 2. West Ship Island and Fort Massachusetts, with CVI assessment results (Pendleton et al. 2004a). Photo © 2007 DigitalGlobe, reproduced courtesy of Google.

order of significance because of its national significance as an "American Third System masonry fort" and for its unique "D" shape (Toscano 2004).

However, over a century of exposure to salt air, wave action from the Mississippi Sound, and a number of hurricanes, most notably hurricanes Camille (1969) and Katrina (2005), has begun to erode the brick building's mortar. Hard structures consisting of a seawall and groin were built around the fort in 1917 to protect it from erosion. In the 1960s, funding was raised by citizens of the "Save the Fort" committee to construct a circular rock jetty around the fort as a provisional breakwater to deflect some of the energy of waves eroding the shore (Figure 3).

However, debris and remnants of a lighthouse east of the fort continue to exacerbate efforts because they act as an unintended "hard structure," acting like a groin to capture sediment that could be used to protect the fort.

Soft approaches have also been taken, including dredging offshore and in channels to relocate sand back onto the national seashore's beaches, particularly on West Ship Island to renourish what has been eroded, using sediment of a similar size and composition. But this is not a permanent solution and ongoing maintenance is required. However, sea level continues to rise which, coupled with the geology of the area, will threaten Fort Massachusetts by making the structure increasingly more vulnerable to shoreline encroachment and inundation.

Pendleton et al. (2004b) found West Ship Island to have a "high" to "very high" vulnerability ranking based primarily on its barrier beach geomorphology, very high rates of erosion (more than 2 m per year), near-flat coastal slope (<0.3%), and minimal tide range (less than 1 m). While Pendleton et al. (2004b) found relative sea-level change to only be moderate around the island (2.5–3 mm/yr), this is still significant when the above factors are also taken into account. Furthermore, this rate would still amount to a rise in sea level around Fort Massachusetts of 2.4–2.9 m by 2100. Given the fort's current location a few meters

Figure 3. Fort Massachusetts during the 1950s, prior to funding for a rock jetty around the structure.

above sea level, it appears that intervention with either hard or soft measures to save the structure over the next century will be inevitable.

Cape Hatteras Lighthouse National Historic Landmark, North Carolina

Cape Hatteras Lighthouse National Historic Landmark provides an example of measures that have already been taken to react to changes in shoreline position resulting from a combination of natural and anthropogenic influences. The measures used to protect the lighthouse represent some of the more drastic (and costly) responses possible for resource managers. While a number of measures were employed over the years to protect the structure, ultimately the lighthouse had to be moved away from the receding shoreline. However, this type of action would not be available to many cultural resources, such as cemeteries, eroding battlegrounds, or historic forts such as Fort Massachusetts.

Cape Hatteras Lighthouse is one of three lighthouses found in Cape Hatteras National Seashore, the eighth-most-visited coastal park in 2006, with 2.25 million visitors (NPS Office of Statistics 2007). It was built during the period 1869–1870 for Atlantic ships passing along the Outer Banks of North Carolina in an area previously known as the "graveyard of the Atlantic" due to its treacherous conditions (NPS 2007b). Unfortunately these rough, stormy conditions have also proven hazardous to the lighthouse that was intended to protect ships from the storm-driven ocean waves and currents that wash over the Outer Banks and transport sediment into the sound. In 1869 and 1870 the lighthouse was constructed approximately 450 m from the shore. The lighthouse was a replacement for the first Cape Hatteras Lighthouse, constructed in 1803. The 1869–1870 lighthouse is the tallest in the nation, measuring 58.8 m, although it is best known for its distinctive black and white diagonally striped exterior, painted in 1873. The lighthouse is a significant cultural resource as a record-breaking historic structure of engineering significance, but also because it adds to the aesthetic enjoyment of the coastline, having been described as "one of the most striking and beautiful structures on the Atlantic Coast" (NPS 2007c).

However, over the first 130 years of the lighthouse's existence, erosion took its toll on the surrounding land. By 1935 already, waves had eroded most of the 450 m of beach in front of the lighthouse and the ocean reached to within 30 m of the base of the tower. A combination of natural changes and a number of protective measures postponed the threat for a number of years. Over the years, a number of erosion control projects have been initiated at the lighthouse site to protect the structure. They include: sheet pile groins (installed in the 1930s), beach renourishment (1966, 1971, and 1973), nylon sand-filled bags (1967), reinforced concrete groins (1967), a sandbag seawall (1971; Figure 4), piled rubble (1980), artificially created "seascapes" to capture sediment (1981), seawall revetment with artificial seaweed (1980s), and sand bag revetment (1990s) (Platt et al. 1988).

Despite these measures, increases in sea level and a number of high-intensity hurricanes continued to remove the sediment surrounding the lighthouse and threatened to engulf it. The National Academy of Sciences recommended in 1988 that the lighthouse be moved, but it was not moved until June 1999 due to

Figure 4. Sandbag seawall in front of Cape Hatteras Lighthouse, taken shortly after the seawall was constructed in 1971. The seawall was destroyed by wave action soon thereafter. Source: USGS 2007b. R. Dolan photo courtesy of U.S. Geological Survey.

lengthy planning and appeals against the plan. Eventually the lighthouse and keepers' quarters were moved southwest approximately 885 m to a new location that is again 450 m from the shore, at a cost of $11.8 million (Figures 5–6). The lighthouse was opened again to the public on May 26, 2000.

In 2004, Cape Hatteras National Seashore's coastal vulnerability assessment was published. Overall, 26% of the park was classified as having a "very high" relative coastal vulnerability (Pendleton et al. 2004a). Cape Hatteras Lighthouse was also classified as a "very high" coastal vulnerability in five out of six assessment criteria: geomorphology, erosion, relative sea-level change, mean wave height, and mean tide range (Figure 7). The coastal slope of the location was assessed as "high" vulnerability because the grade was 0.60–0.30% (Pendleton et al. 2004a).

Based on tide gauge data, sea level in nearby Beaufort, North Carolina, has been rising over the past 27 years at a rate of 3.71±0.64 mm/yr^{-1} (Zervas 2001; Pendleton et al. 2004a), which is higher than current IPCC global averages (IPCC 2007a). The North Carolina Division of Coastal Management (2004) has also determined that the shoreline in front of the lighthouse has been eroding at an average of 2 m/yr^{-1} over the past 50 years (not accounting for additions to the shoreline using artificial forms of beach nourishment and reinforcement), with the shoreline to the south of the lighthouse location eroding at an average of 3.7 m/yr^{-1}. This is particularly troubling given the projected increases in sea level and associated shoreline erosion brought about by anthropogenic warming. Based on these rates, the sea level of Cape Hatteras is conservatively expected to increase by 3.67 m by 2100, not accounting for changes in volume from increased water temperature and salinity (Miller and Douglas 2004).

Furthermore, high-intensity hurricanes with storm surges also contributed to a large amount of erosion around the lighthouse when it was in its previous position. Some 28 recorded hurricanes have directly struck Cape Hatteras National Seashore since 1854 (NOAA 2006). In 2003, Hurricane Isabel particularly impacted the barrier islands of capes Lookout and Hatteras. In particular, the IPCC has noted increased intense tropical cyclone activity in the North Atlantic since the 1970s, which is linked to increased sea-surface temperatures (IPCC 2007a). Given the expected increases in sea-surface temperatures resulting from anthropogenic warming, the IPCC

Figure 5. Cape Hatteras Lighthouse in its original location. Inset: The lighthouse in its current location. Photos courtesy of the National Park Service.

(2007b) now finds it likely that intense tropical cyclone activity will increase, which could further jeopardize the Cape Hatteras coastline and its cultural resources.

Although Cape Hatteras Lighthouse is presently out of danger from sea-level change, this does not mean that it will be protected indefinitely. Without the added push by anthropogenically driven warming, it is expected (based on the current rate of erosion) that the location of the lighthouse would have to reassessed again *at least* by 2199 (NPS 2007d). However, the factors discussed above brought about by climate change are expected to have a major impact on the rate of erosion around the historic landmark. This means that more may need to be done to protect the structure before the end of this century.

Discussion

Fort Massachusetts and Cape Hatteras Lighthouse are examples of corrective and preventive actions, respectively, that are part of Patterson's (2003) two-way street of adaptation and mitigation. However, UNESCO (2006) also stresses the importance of sharing knowledge to further protect cultural resources. The National Park Service has begun this process by encouraging national parks to take part in its Climate-Friendly Parks program, which is designed to help and educate resource managers about the impacts of climate change on their parks. Research by Pendleton et al. (2004a, 2004b) has also been used by stakeholders and managers to assess their parks' vulnerability to rising sea level in an easy-to-interpret manner so that mitigation strategies can be put in place. Many of these mitigation measures take years to research and organize funding for—steps which should be taken now so that resource managers are not caught unawares when increased sea level is on their resource's doorstep. In the

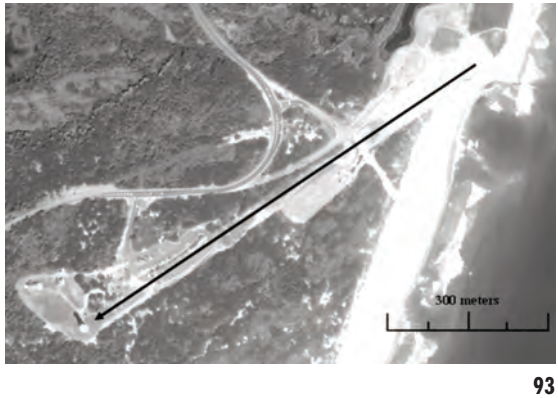


Figure 6. The path of the Cape Hatteras Lighthouse move. The arrow indicates the direction of movement from the lighthouse's original location. Photo © 2007 DigitalGlobe, reproduced courtesy of Google.

case of Cape Hatteras Lighthouse, it took 11 years from when a move was first proposed (in 1988) to when it was accomplished (in 1999). During that time the shoreline in front of the lighthouse had eroded further by approximately 22 m. Fort Massachusetts may not have 11 years to wait before something can be done to further protect it from sea-level rise and an eroding shoreline.

The dissemination of information about climate change's impact on coastal cultural resources is an ongoing process that will involve participation from the individual/public to the global/transgovernmental level of stakeholders. It should also not be forgotten that most cultural resources cannot be moved as Cape Hatteras Lighthouse was. This may be for practical reasons or because it is simply not economically possible to do so. The National Park Service has approximately 25 parks that contain lighthouses. It is unlikely that every lighthouse in those parks could be moved if threatened by changing environmental conditions. The National Park Service also has a number of sites of cultural significance, such as Fort Massachusetts, that cannot be moved. At these sites, the National Park Service must consider a strategy of retreat with selective preservation efforts, or implement harder structures such as rock armoring or sea walls to protect vital cultural resources, as rising sea levels limit the feasibility of keeping a sand buffer along the shoreline. Hard structures will not protect Fort Massachusetts from the impact of increased temperatures and the possibility of more-intense storms that could damage its structure. In 2005, Hurricane Katrina generated a 9-m storm surge that washed over the fort, causing significant damage (Fritz et al. 2007).

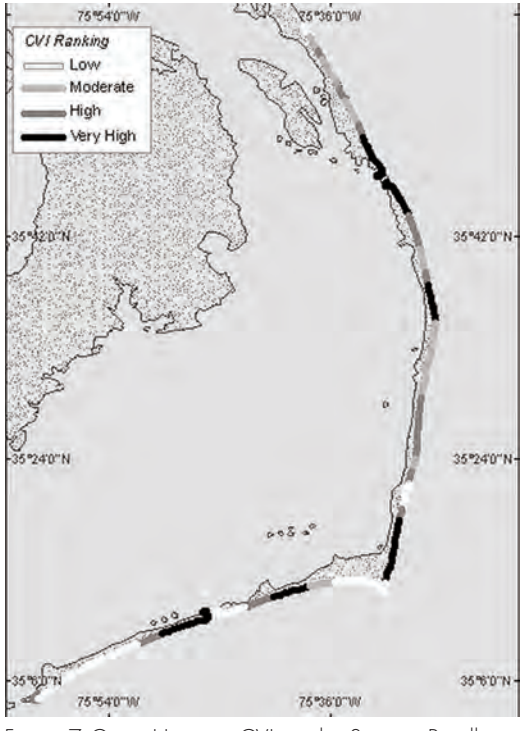


Figure 7. Cape Hatteras CVI results. Source: Pendleton 2007b.

It should also be considered that many national parks still contain valuable cultural artifacts on their grounds that have not yet been discovered. Recent erosion at Jamestown National Historic Site uncovered a location of significant archeological value that could have been eroded away had it not been for its discovery by park managers. There are still many sites on national park property that could be of significant cultural value to future generations but which cannot all be identified before the impacts of climate change take their toll (NPCA 2007).

Conclusions

The next decades hold a great deal of uncertainty for many cultural resources

throughout the world, particularly those in the coastal zone. Those in the U.S. national park system must be protected; however, this will be a difficult task in many cases, such as that of Fort Massachusetts. A number of financial and technological hurdles that require a high degree of resourcefulness must be overcome first. Cape Hatteras Lighthouse represents an extreme example of what engineering methods can be used to protect these resources; it is also an example of managers taking a more proactive approach to planning for climate change. Overall, the three steps of conservation outlined by UNESCO (2006) are effective means of dealing with climate change, but the question still remains as to whether it will be feasible to prevent damage by increasing sea level or changing environmental variables to all cultural resources.

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The Isle Royale Wolf–Moose Project: Fifty Years of Challenge and Insight

Michael P. Nelson , Rolf O. Peterson, and John A. Vucetich

> To hear even a few notes of [the song of ecology] you must first live here for a long time, and you must know the speech of hills and rivers. Then on a still night, when the campfire is low and the Pleiades have climbed over rimrocks, sit quietly and listen for a wolf to howl, and think hard of everything you have seen and tried to understand. Then you may hear it—a vast pulsing harmony—its score inscribed on a thousand hills, its notes the lives and deaths of plants and animals, its rhythms spanning the seconds and the centuries.
>
> — *Aldo Leopold*

Introduction

THE ISLE ROYALE WOLF–MOOSE PROJECT IS THE LONGEST CONTINUOUS STUDY of a predator–prey relationship in the world. Though it is easy to take this for granted, to assume that such a project happens simply because the researchers do it would be a mistake. This is quite literally a phenomenal accomplishment: something that exists outside of the realm of normal happenings, "an extraordinary occurrence."

The general details of the project are well documented (Mech 1966; Peterson 1977, 1995; Allen 1979; Vucetich and Peterson 2004a, 2004b, 2004c). The project is located on Isle Royale, a wilderness island and national park located in northwest Lake Superior, North America. Moose found their way to the 210-square-mile island in Lake Superior, fifteen miles from the Canadian coast near Thunder Bay, at the turn of the 20th century. For fifty years, moose abundance fluctuated with weather conditions and food abundance.

Wolves first arrived to Isle Royale in 1949—coincidentally just as humans were working to introduce them to the park—by crossing an ice bridge that connected the island to Canada. The lives of Isle Royale moose would never be the same. Within a decade Purdue University wildlife ecologist Durward Allen (Figure 1) recognized a rare opportunity to study the interactions between a newly established predator–prey relationship in a setting as close to a laboratory as ecologists get: an island ecosystem with a seemingly isolated population of a single predator and a single prey, a simple system where population dynamics are the result of moose and the wolves who eat them.

By a variety of measures the project has been successful. Several of the United States' most recognized contemporary wolf biologists and ecologists cut their teeth on the project, including L. David Mech (Figure 2), Doug Smith, and Mike Phillips.

Descriptions of the project are sometimes sprinkled with adjectives like "iconic" and "classic." In a recent issue of *Audubon* magazine, journalist Les Line (2008) dubbed Isle Royale's wolves "the most famous *Canis lupus* population in the world." The project has served as fodder for important scientific understanding, popular articles and books, and even artistic expressions (exhibited at www.isleroyalewolf.org).

While wonderful and inspiring in the case of the Isle Royale wolf– moose project, such success is fickle and tragically rare—yet critically important. In this essay, we review the administrative history of the Isle Royale wolf–moose project. From that historical narrative we infer what obstacles might represent a general challenge to long-term ecological research. Finally, while many take for granted that data collected from long-term research is especially valuable, the reasons why have not been explored in great depth. We conclude this essay by considering the importance of long-term research.

Figure 1. The originator of the wolf–moose study, Durward Allen. Photo provided by George Desort.

An administrative history

A 1986 study by the Institute of Ecosystem Studies (Strayer et al.) analyzed several long-term ecological studies. The supporting agency, the National Science Foundation (NSF), hoped to establish the foundation for a program supporting long-term ecological research by identifying factors common to successful programs. But it turned out there was no consistent theme, research characteristic, or subject of study that seemed to matter. The only point worth mentioning was that frequently there was one person whose commitment and interest provided the long-term foundation: "Every successful long-term study that we studied has had associated with it one (or a few) good, dedicated scientist who has devoted much time and energy to the long-term study" (Strayer et al. 1986:5).

For wolf–moose research at Isle Royale, one of these people was the late Robert M. (Bob) Linn (1926–2004), whose thoughtful support of research in national parks began with a career with U.S. National Park Service (NPS), but expanded thereafter to include all parks and equivalent reserves in the world. Durward Allen frequently spoke of Linn and the critical role he had played in helping to maintain the Isle Royale wolf–moose project. As the first naturalist for Isle Royale National Park (Figure 3), Linn had participated in an early winter study on the island, in 1956, when he and NPS biologist Jim Cole spent several weeks on the island in February, snowshoeing extensively, trying to estimate how many wolves were present and what their activities might mean for the isolated moose population.

Linn was also the person who had to deal with the aftermath, in 1952, of a private effort to introduce wolves to Isle Royale. Zoo-raised wolves were used, after a search in Michigan for wild wolf pups failed. After the four semi-tame wolves became uncooperative pests, Linn led efforts to remove them, knowing that there was evidence that wild wolves had recently made it to the island on their own.

In the mid-1950s there was substantial concern that the newly arrived wolves would increase and get out of hand, threatening the moose population and posing a danger to people (including some longtime residents of Isle Royale, whose efforts had helped establish the national park). Suddenly, sharing the island with an unregulated wolf population seemed a worrisome proposition. Anticipating a need to somehow rein in the wolf population, in 1956 Gordon Fredine, Linn's successor as chief biologist for the NPS, wrote to his close colleague Jim Kimball, commissioner of conservation for the state of Minnesota, and asked if Minnesota would accept some live wolves from Isle Royale. Kimball declined the invitation to participate, citing public opposition to wolves generally and the fact that Minnesota was spending (wasting, in Kimball's view) some $300,000 per year in bounty payments for dead wolves.[1] Linn wrote the reports and letters necessary to establish that the wolves were not a threat to people, and helped establish a policy whereby the NPS supported the existence of an unmanaged wolf population on Isle Royale.

Figure 2 (top). Researcher L. David Mech with a collection of moose jaws. Photo provided by George Desort. Figure 3 (bottom). Bob Linn at Isle Royale, 1956. Photo courtesy of Milt Stenlund.

Meanwhile, in a harbinger of wolf reintroduction to Yellowstone forty years later (Smith et al. 2003), with the arrival of wolves the controversy over an overabundance of moose quickly evaporated.

Aristotle's famous quip that all inquiry begins in wonder rings true for the origin of the Isle Royale wolf–moose project. The uncertainty surrounding the presence of wolves served as a catalyst for those interested in initiating serious research on the wolf and moose population. In 1958, Linn was

on hand when Allen and his graduate student Dave Mech first visited Isle Royale to begin an ambitious ten-year study to evaluate the role of wolf predation in the dynamics of the moose population.[2] Most immediately there was a need for a field base for Mech, who bounced around from one spot to another in 1958 and 1959. In 1960, Linn arranged for Mech to use the cabin at the Bangsund Fishery as a base for his summer fieldwork, following the death of fisherman Jack Bangsund in 1959. The Bangsund cabin has served a valuable research role ever since, long exceeding its tenure as a commercial fishery. Mech also needed a boat, and Linn donated his own wooden boat to the project (it did not last as long as the fishery cabin).

Allen had launched the wolf–moose project with funds from the National Geographic Society and the NSF, but as these funding sources cycled through to completion, additional sponsors were needed. By the late 1960s, Linn was in Washington, D.C., leading the science program of the NPS, and he began to provide a modest grant each year to support continuing research on wolves and moose at Isle Royale.

But the original ten-year duration of the study was over by 1968, and the one-time minister-turned-attorney and now powerful long-time director of the National Park Service, George Hartzog, instructed Linn to oversee its conclusion—in other words, to terminate it. As Allen recalled it in the early 1970s, Linn quietly ignored the directive, and in fact continued to provide annual grants from his science budget.[3]

By 1974 Allen had made no secret of his intention to retire the next year, and one of Linn's own science administrators in the NPS (who shall remain nameless) embarked on a secret bid to take over the project. He visited Purdue and had a pleasant chat with Allen, who came away mystified about the reason for the visit. Before the visitor left, Rolf Peterson showed him a recently tanned hide of a wolf that had been killed by other wolves on Isle Royale the previous winter. A few days later, Allen got a phone call from Linn, at that time still the chief scientist of the Park Service in Washington, who had discovered the scope of the takeover bid and alerted an incredulous Allen. The wolf skin that had been shared was being used as part of an attempt to discredit Peterson, Allen's obvious successor to the project, the claim being that Peterson possessed an endangered species without authorization. After some discussion Linn told Allen not to worry, he (Linn) would take care of the matter. The visiting NPS scientist and would-be wolf researcher was not heard from again. In 1975, as Allen retired, he turned the project over to Peterson who had by then secured an academic post and a new home for the wolf–moose project at Michigan Technological University (MTU) in Houghton, also the mainland headquarters of the park. Linn was already at MTU, having established a Cooperative Park Studies Unit there with himself as unit leader. Linn would soon retire from his NPS position, but not from his involvement with the Isle Royale wolf–moose project.

In 1981, newly inaugurated President Ronald Reagan appointed James Watt as secretary of the interior. Given Watt's record and beliefs, the environmental community was both outraged and horrified. In the face of a perceived threat, however, the appointment of Watt also served to coalesce the environmental community in powerful ways. For the post of assistant secretary for

fish, wildlife, and parks, Watt appointed G. Ray Arnett, a geologist from the petroleum industry who gained distinction in 1956 for the initial discovery of oil in Alaska (on a national wildlife refuge, no less—the Kenai National Moose Range) and who had previously been the director of the California Department of Fish and Game under Reagan when he was the state's governor.[4] It was not long before Arnett, an avowed wolf-hater, crossed paths with the wolf–moose research at Isle Royale. His signature was required on the annual contract between NPS and MTU that by then provided $30,000 to carry out the winter counts of wolves and moose. Such paperwork typically dragged on for weeks or months. As normal, the 1983 winter study began in January without the signed contract: Peterson, an NPS staffer, pilot Don Glaser, and student assistant Doug Smith all working on the island (Figure 4). Isle Royale Chief Ranger Stu Croll called one evening by radiophone with some "unpleasant news." Not only did Arnett refuse to authorize NPS funding, he demanded the wolf–moose project be immediately terminated. Croll explained that all personnel would have to leave the island, and he arranged to have the Forest Service supply airplane, a ski-equipped Beaver, pick everyone up at the first opportunity. Croll expressed sincere regret at seeing everything end in this manner. The Beaver soon arrived. The only person who left the island, however, was the NPS staffer. Croll agreed to look the other way as Peterson explained that he would be staying to complete the surveys, as intended, and Glaser and Smith would be staying as well.

So far, so good; but this committed the project to spending money it did not have. Enter Linn one more time. In a wonderfully roundabout manner, he saved the day. Linn contacted (probably through Durward Allen) Nathaniel Reed, one of Arnett's predecessors in the Nixon–Ford years, and Reed in turn contacted Amos Eno, vice-president of the National Audubon Society, who knew Arnett well enough to give him a call. Meanwhile, the Washington-based Defenders of Wildlife began to prepare testimony on yet another example of political interference, to be used in the congressional budget hearings for the Interior department. That proved unnecessary, as Eno persuaded Arnett that the wolf–moose project was not an appropriate vehicle for his agenda. A period of bureaucratic track covering followed, and Isle Royale National Park Superintendent Don Brown flew to Washington for a personal audience with Arnett. Brown reported that Arnett's office sported

Figure 4. Winter study pilot Don Glaser and researcher Doug Smith. Photo provided by George Desort.

walls lined with trophy mounts of animal heads and a wolf skin on the floor. After enduring the requisite chitchat with Arnett, Brown emerged with the original $30,000.

For Bob Linn, Isle Royale was quite simply the finest place on Earth. The final twenty-five years of professional activity found him establishing the George Wright Society, dedicated to research and education in parks and preserves around the world. But Linn always tried to be as close as possible to Isle Royale (which explains why the office of the George Wright Society is in Hancock, Michigan, a few city blocks from the mainland headquarters of Isle Royale National Park). The island was never far from his thoughts.

The challenge of long-term ecological research

While long-term research such as the Isle Royale wolf–moose project happens, it does not "just happen." In fact, it rarely happens at all. When it does, what are the conditions that allow for long-term research? The 1986 Institute of Ecosystem Studies study cited above indicates that, other than the enthusiasm of some individual, there really are no clear and specific conditions that describe or predict success (Strayer et al. 1986). We would suggest, however, there are three critical and underappreciated, but necessary, conditions: conditions so precarious that they explain why long-term research is so rare.

The first requirement of a successful long-term study is *interest*. Without the enduring interest of some researcher—a researcher with vision, a researcher willing to take a chance—no long-term study would happen. But this kind of interest is required for any study, long- or short-term. A successful long-term study such as the Isle Royale wolf–moose project requires a *lineage of interest.* The Isle Royale project has that. From Bob Linn to Durward Allen to Rolf Peterson to John Vucetich (Figure 5), individual scientists have taken a personal interest in this particular project; have made it the focus of their life's work.[5] But this sort of interest is exceptionally rare in science. Scientists do not typically spend their careers unpacking the mysteries of a single place or a single relationship, and academia does not typically reward or encourage scientists whose sense of place is so strong.

Ultimately, the interest of the researchers must also transfer to, and spark, the interest of the public—another tough audience, especially when the project is largely about an animal with which we have a troubled past (and present). Fortunately, the Isle Royale project has been quite successful in impressing both the scientific community and the public. From unusual findings—such as the impact scavengers like ravens have on wolf pack size (Vucetich et al. 2004), to the surprising role parasites such as winter ticks might play in the dynamics of the system (Vucetich and Peterson 2007)—to intentional and extensive public outreach,[6] the story of the wolf–moose project has captured a broad interest.

But interest, no matter how rich and nurtured, is not enough. Long-term studies end, and, according to the 1986 Institute of Ecosystem Studies paper, they end regardless of interest by scientists, regardless of interest by the public, and regardless of important scientific findings. They end because of other factors: "It is perhaps significant that none of the long-term studies that we studied were terminated voluntarily because the PI [principal investigator] felt that the study no longer justified the cost. Studies were stopped by funding difficul-

Figure 5. Researchers Rolf O. Peterson and John A. Vucetich. Photo courtesy of George Desort.

ties and retirement of the PI, but never for lack of important research questions" (Strayer et al. 1986:13).

The second necessary condition for a successful long-term study is *money*. Scientific research is an expensive endeavor. Long-term research is "expensive *multiplied by* long-term." The case of the Isle Royale wolf–moose project, however, is interesting because its annual budget is only a fraction of that of many other ecological studies. And yet the contributions of the Isle Royale project are comparable to those of other significant research projects. Despite its relatively high return, however, the Isle Royale project remains financially limited. If funded at a higher level, the Isle Royale project would undoubtedly produce even more valuable knowledge and interest.

But money is fickle. The $30,000 that the National Park Service originally committed to the project in 1976 has remained essentially unchanged—though inflation calculators indicate that its worth in 2007 was roughly $8,085, or less than one-third its original value. Federal sources of funding can change (that is, "shrink") given the fancy of an administration not interested in scientific research generally, or more interested in funding other projects. Because of limited funding, the Isle Royale project can pursue answers to but a small handful of the fascinating and important questions that bubble up year after year. Of course, the real tragedy of underfunded long-term science is for society. Given that critical knowledge and insight about living sustainably (a long-term proposition) comes at least in part from long-term studies, and given the current necessity of understanding what sustainable living might look like, we might well be underfunding the very science that

we need most in today's world. In short, because of the financial strains on long-term projects, we should never assume that because a project has lasted for fifty years that it will last fifty more—or even for one more!

Third, successful long-term study requires the ability to weather the periodic threat of zealous ideologies and the tyrannical administrators who sometimes evoke them. As we saw above, there have been at least two close calls for the Isle Royale project on these grounds. In addition to the attempted post-Allen NPS "takeover" of the project that was, by all appearances, simply a raw abuse of power, G. Ray Arnett expressed a willingness to quash serious scientific research in the name of a ideology suggesting wolves are some sort of evil incarnate (making the work of wolf research somehow devilish). However, a different set of ideologies—one suggesting either that predators such as wolves have an effect on ecosystems (Ripple and Beschta 2005; Hebblewhite et al. 2005) or one that assumes that predators are critical components of healthy ecosystems (Leopold 1949:129–133), coupled with the recent "greening" of a variety of the world's religions (Taylor 2005), for instance—might mean that work focused on predation is also work serving to care for the creation.

More recently, unsophisticated ideologies about the nature of wilderness can and have interfered with environmental research in this project and elsewhere (Callicott and Nelson 1998; Nelson and Callicott 2008). But is this really a threat to the project? It is not uncommon to meet an NPS employee who projects his or her personal interpretation of "wilderness" onto research projects, or who feels that the public is *too* interested in research on Isle Royale's wolves and moose. The final chapter of Peterson 1995 chronicles how a difference in wilderness ideology between researchers and the NPS might have allowed the wolves of Isle Royale to die out, and the project to end, during the 1990s. The Isle Royale project is not alone in this way. Other long-term research projects have failed, or their continuation has been threatened, by tyrannical administrations and ideologies that are opposed to certain kinds of knowledge about the environment (Fraidenburg 2007).

We have all learned that ideological righteousness coupled with power knows no limits and is seldom subject to negotiation. Of course, ideology coupled with intellectual honesty allows for reconciliation. Reconciliation here might be found in an understanding of what ideologies are, how they determine our thoughts and actions, and a recognition that other ideologies can also be motivated by, and result in, the care and protection of nature.

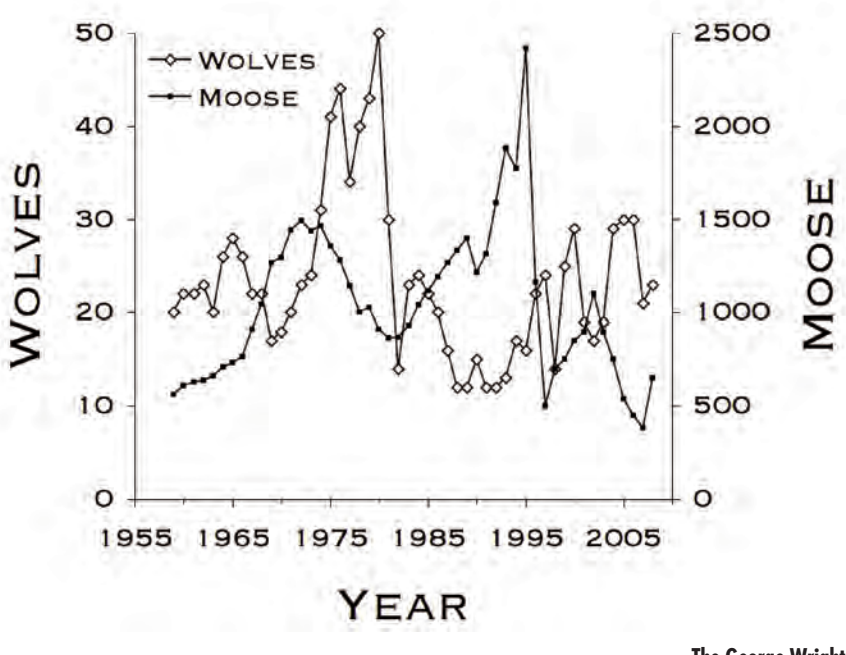
When considering the challenges to long-term research, both with wolves and moose on Isle Royale and elsewhere, there are two sorts of tragedies lurking: one pragmatic and one ethical. First, the value of long-term research is simply not duplicable elsewhere with shorter-term projects. Additionally, long-term ecological research seems an absolutely vital component of understanding those long-term processes that might help secure our continued long-term existence and the well-being of the planet. However, because of the reasons suggested above, and perhaps many others, long-term research is under great pressure, subject to diminishing support, and inappropriately devalued (Keeling 2008). As was noted back in 1981 on the pages of this very journal: "As land use intensifies and

research funding dries up, we face a regression in ecological inquiry at the very time we need it most" (Peterson 1981). Nearly thirty years later this is truer than ever.

Second, there is an ethical tragedy prompted by a paucity of long-term ecological research. Aldo Leopold (1949:203) suggests that "all ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts." If Leopold is correct, if we extend moral consideration only to those within our perceived community and the community as such—that is, if the development of a "sense of place" is a critical part of the development of a rich environmental ethic—then, although environmental scientists are important for the defense of natural places, many or most of the best scientists do not manifest this strong sense of place; the kind of sense that holds one's interest for an entire lifetime. Moreover, given the desire of contemporary environmental ethics to be consistent with, and informed by, the images of nature represented by ecology, and given that a fifty-year image of wolf–moose relationships is wildly different from that which we would have assumed if the project had been halted after only five years (see Figure 6), the longevity of the project informs environmental ethics in important ways. The Isle Royale wolf–moose project, then, takes on an unanticipated, yet important, moral significance.

Regionally, Isle Royale is known for fishing and boating. Nationally, Isle Royale is a wilderness-backpacking destination. However, on the international scene, Isle Royale is known for essentially one thing (which is one more than many places): its long-term study of the wolf–moose predator–prey system. But such a project is at the

Figure 6. Fifty years (1959–2008) of wolf and moose fluctuations on Isle Royale National Park, Lake Superior, USA.



mercy of many burdens: creative, financial, ideological, to name only a few. Hence, in addition to being precious (from the Latin *pretiosus*, meaning "costly, valuable") it is also precarious (from the Latin *precarius*, meaning "obtained by asking or praying"). And anything possessing these qualities should not be taken for granted.

The findings and applications: What knowledge have we gained?

> There is a widespread perception among scientists involved in long-term studies that long-term studies often produce important serendipitous findings.
>
> — *Strayer et al. 1986:21*

Two great concerns for wolf managers are "How much human-caused mortality can a viable wolf population sustain?" and "How do wolves affect the prey populations that humans also want to hunt?" Though humans do not exploit wolves or moose on Isle Royale, the wolf–moose project of Isle Royale has provided important insight on both questions.

Isle Royale is the only place where humans have monitored, for any serious length of time, the mortality rates of a wolf population not exposed to human causes of death (Figure 7). This kind of knowledge is valuable for managers aiming to promote wolf viability and maintain human-caused mortality at appropriately low levels. Ironically, knowledge about natural rates of wolf mortality is also valuable for the efficient reduction or even overexploitation of wolf populations.

One of the primary reasons humans despotize wolf populations is because too many humans perceive that wolves threaten our ability to enjoy the highest possible rates of hunting—hunting for deer, elk, moose, and caribou, the species upon which wolves' survival depend. Consequently, "How do wolves affect prey?" is considered by many a critical management question. Over the years, the Isle Royale wolf–moose project has continued to contribute important understanding on this topic. In the early years of the project, we

Figure 7. A lone wolf traverses a shoreline at Isle Royale National Park. Photo courtesy of George Desort, Rolf O. Peterson, and John A. Vucetich. Source: www.isleroyalewolf.org.

discovered that wolves are selective predators, tending to focus their predation on moose that are young, old, or sick (Peterson 1977). Subsequently, we learned that wolves tend to kill more when winters are severe and when moose are abundant (Post et al. 1999; Post et al. 2002; Vucetich et al. 2002). These discoveries suggested wolves are the proximate, but not ultimate, cause of most moose deaths (Vucetich and Peterson 2004b). That is, wolves seemed to have relatively little impact on moose abundance.

Then, quite by accident, we made an observation giving a very different impression. In the early 1980s, wolves declined catastrophically due to a disease. Shortly afterward, moose increased to an incredibly high abundance (McLaren and Peterson 1994), only to crash shortly thereafter due to the combined effects of a severe winter, a tick outbreak, and a catastrophic food shortage. Most recently, we learned that of all the factors affecting short-term fluctuations in moose abundance, wolves are the least important (Vucetich and Peterson 2004b). Climatic factors (such as summer heat and winter severity) are much more important. Most importantly, most of the fluctuations in moose abundance are attributable to factors that we have yet to identify (Figure 8). These observations highlight limitations of our knowledge about how wolves affect moose on Isle Royale, despite their being well studied. To some, this limitation suggests that our ability to control many wildlife populations is less precise and reliable than commonly thought. To these people, the suggestion is not unjustified pessimism, but a reasonable conclusion to draw from fifty years of research (Vucetich and Peterson, in press).

Though we are grateful for the opportunity to have made these contributions to science, there are two ironies about better

Figure 8. A moose feeds on moss at Isle Royale National Park. Photo courtesy of George Desort.

understanding of "how wolves affect prey." First, expecting an ecologist to study "how predators affect prey" for the purpose of knowing more about how to control them may be like expecting an astronomer to study how the stars move for the purpose of better controlling their movement. Learning to better live with and appreciate how nature is unpredictable and uncontrollable may deserve more attention than being fixated with controlling nature. The second irony is that "how wolves affect prey abundance" is important for justifying two management interests that are, to say the least, oddly juxtaposed. The justification of wolf control—killing wolves to maximize hunting of ungulates such as deer, moose, or elk—requires demonstrating that wolves have a profound effect on prey. However, the justification that wolf predation is a critical component of healthy ecosystems also seems to require demonstrating that wolves have a profound effect on prey. Adding to the confusion, many argue that wolf populations should be recovered or left unexploited because wolves have little impact on prey abundance. Again, the Isle Royale project contributed significantly to these scientific discoveries, but how they influence management remains an open question. The influence remains undetermined because we have yet to decide whether, where, how, or why wolves should (or should not) be hunted in the continental United States, and the question of how wolves affect ungulate prey abundance is seen as hugely important in decisions about this ethical debate.

The Isle Royale wolf–moose project seems also to have contributed knowledge of quite a different kind. To understand what we mean by "different kinds of knowledge," first ask yourself what is the *purpose* of science. Is it primarily to control nature for the "easing of man's estate," as the famous philosopher Francis Bacon suggested more than 400 years ago? Or, is it primarily to generate wonderment about the natural world—the kind of wonderment that can transform and enlighten our understanding about how we ought to relate to the natural world (a view roughly held by the famous 20th-century philosopher of science Karl Popper)?[7] If the latter is the greater purpose of science, the Isle Royale wolf–moose project has, we hope, contributed valuable knowledge. Moreover, given a variety of surprising and unexplained results that have been observed from this relatively simple set of relationships, the Isle Royale project represents a warning about the futility and arrogance of placing too much value on science for the purpose of predicting and controlling ecosystems.

The Isle Royale wolf–moose project began fifty years ago, during the darkest hour for wolves in North America. The mass slaughter perpetrated against wolves required our vilifying them. The subsequent and quite phenomenal improvement in conditions for wolves required an antidote for our vilification. That antidote was knowledge. In the early years, the project gave people reason to replace destructive myths with real knowledge that portrayed wolves as they are: predators, a natural part of ecosystems, not villains. For example, the Isle Royale wolf–moose project helped people see that wolves are not gluttonous, wasteful killers. Instead, most wolves die young, and they die of starvation or by fighting for food. And, what wolves do not eat, scavenger species—foxes, ravens, and other resident bird species—depend on for their survival. Ultimately, the Isle Royale

wolf–moose project created an awareness that has contributed to a sea change in attitudes, allowing for wolves to begin their recovery.

More recently, as mentioned above, we discovered a special relationship between wolves and ravens (Vucetich et al. 2004). Specifically, a critical advantage of group living is that wolves lose substantially less food to scavengers such as ravens. Ravens may be an important reason why wolves live in packs—a trait otherwise uncommon among carnivores. This discovery grabbed much press attention. But why? This knowledge is certainly not valuable for controlling anything in nature. Rather, the work is appreciated, we believe, because it highlights a beautifully unexpected and intricate ecological connection. Our work also grabbed press attention when we described how wolves and moose are affected by moose ticks, which in turn are influenced by climate. Connections like these are important because they can generate wonderment, awe, and respect.

Over the years, our sense and awareness of Isle Royale's complexity and unpredictable nature has continued to grow and deepen. We know the most important events in the history of Isle Royale wolves and moose are severe winters, disease, and tick outbreaks. These events are essentially unpredictable. Moreover, every five-year period in the wolf–moose chronology seems to differ from every other five-year period—and this seems true even after fifty years of observation (see Figure 6). Going further, the first twenty-five-year period of the project was profoundly different from the second. We have every reason to expect the next fifty years will differ substantially from the first, but, strangely, we are in no position to say how (Vucetich et al., in press). These and related observations suggest the futility of trying to reliably predict nature's responses to our intense exploitation.

The Isle Royale wolf–moose project has generated many scientific facts about wolves and moose. In doing so, the project has also developed and shared with others a deep sense of place about Isle Royale's ecology. From this, we believe, comes a knowledge that generates wonderment—the exact kind of knowledge we may most need at this moment in time.

Ed. note: An earlier version of sections of this essay appears under three separate titles by these authors in the summer 2008 edition of *International Wolf*.

Endnotes

1. "[W]e pay close to $300,000.00 each biennium in bounty payments, a large portion of which is for timber wolves. The fact that this money is wasted as a game management measure does not alter the fact that it is hard cash" (Kimball letter to Fredine, July 27, 1956, copy in R.O.P. files).
2. The organizing meeting included Fredine, Linn, Allen, Mech, Douglas Pimlott (University of Toronto), Milt Stenlund (Minnesota Department of Conservation), Laurits Krefting (U.S. Fish and Wildlife Service), and John Lewis (superintendent, Isle Royale National Park).
3. Years later, when asked about this matter, Linn denied it had ever happened. But that

was his manner of defusing controversy, which he had no stomach for—at least that is our interpretation. NPS historian Richard West Sellars agrees, and told R.O.P. by phone in 2006 that Allen's report on the actions of Hartzog and Linn was probably accurate.

4. Arnett would resign from this post on November 23, 1984 citing "a strong desire to pursue business and conservation initiatives that have opened to me in this area [presumably in Washington DC] and in California." Arnett would then go on to become the Executive Vice President of the National Rifle Association in 1985 (though in 1986 he would be dismissed for, among other things, "personnel decisions on the basis of his personal interest rather than the interests of the Association.") See Golden (1984) for an interesting glimpse of Arnett as Assistant Secretary.
5. Strayer et al. point out how critical the focus of the scientist (and, ultimately, of a string of scientists) is: "S.C. Kendeigh's 27-year-long studies of bird populations … ended when he retired in 1976, and Francis Evans believes that no one will take over studies of the Evans old-field when his work ends" (1986:5). According to Earl Werner (Werner 2008), current director of the George Reserve where the old-field site was located, "Indeed, Francis' fear did come true. While others have worked on the old-field site nobody has followed up with the sort of data collection that Francis was doing." Evans' fifty-year study lasted from 1948 to 1997. Evans died in 2002.
6. Isle Royale researchers maintain an interactive website that gets over 17,000 hits per year, descriptions of the work and findings appear in hundreds of media outlets annually, and researchers personally present the work to more than 5,000 scientists and members of the public annually.
7. This later purpose of scientific inquiry is also consistent with the concept of traditional ecological knowledge. Pierotti and Wildcat (2000), for example, commenting on the purpose of ecological science from an American Indian perspective, when asked "What good is the work that you do?", write: "This question contains the hidden assumption that if what we do does not directly benefit human beings in some way it is without value. We often answer that our work teaches us more about the other members of our community and how to live with them, but most people of Western heritage appear confused by this answer, and do not understand this point. In contrast, if we give this answer to Native American elders, they are completely satisfied, for they understand implicitly what we are trying to accomplish, and its significance to humans."

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