

Geoparks

The George Wright Forum

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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 Forum

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Images of the 33 members of the European Global Geoparks Network. Photos courtesy of the Fforest Fawr Geopark, Wales, United Kingdom.

SOCIETY NEWS, NOTES & MAIL

Enkerlin receives innovation award at WILD9

GWS member Ernesto Enkerlin Hoefflich is the most recent winner of the prestigious Kenton R. Miller Award for Innovation in Protected Area Sustainability. The award, administered by IUCN's World Commission on Protected Areas, was presented during the 9th World Wilderness Congress (WILD9) in Meridá, Mexico, last November. At the time of the award, Enkerlin was close to finishing his tenure as president of Mexico's national protected areas bureau, the Comisión Nacional de Áreas Naturales Protegidas.

Enkerlin was recognized for establishing Mexico's first wilderness protected area (IUCN category I wilderness area), and for innovations in policy, legislation, educational activities, public-private partnership arrangements, and local community cooperation. He and his team established the El Carmen Wilderness Area, which represents the first building block towards a transboundary protected area together with the USA's Big Bend National Park. Enkerlin's work has solidified Mexico's protected areas system, which now includes 158 natural areas that cover 11% of the nation's terrestrial surface.

Priznar, van Wagtenonk appointed to GWS Board

Frank J. Priznar, president and CEO of PRIZIM, Inc., a sustainability services firm, and Jan W. van Wagtenonk, who recently retired from a distinguished career as a park-focused fire ecologist, accepted appointments to the GWS Board of Directors in early January 2010. The two assumed their duties immediately.

Priznar founded PRIZIM (www.prizim-inc.com) in 1996. The nationally recognized company has helped clients reduce pollution, conserve energy, increase worker safety, and protect wildlife and natural areas. Priznar's professional and personal commitment to environmental stewardship has been recognized by several awards in business leadership.

Priznar said his invitation to join the Board of Directors at the George Wright Society was a wonderful surprise. "To be associated with the George Wright Society is an incredible honor. I look forward to helping the organization achieve its mission, which is now more critical than ever," Priznar said.

Van Wagtenonk trained in forestry and range management before earning a Ph.D. in wildland resource science with a specialty in fire ecology from the University of California at Berkeley. From 1972 through 1993 he was employed as a research scientist with the National Park Service at Yosemite National Park. From 1994 through 2008, van Wagtenonk was a research scientist with the U.S. Geological Survey at Yosemite. His areas of research have included prescriptions for burning in wildland ecosystems, recreational impacts in wilderness, the application of geographic information systems to resources management, and the role of fire in Sierra Nevada ecosystems.

He received the National Park Service Director's Award for Research in Natural resources in 1995, the U.S. Forest Service Chief Forester's Excellence in Wilderness Stewardship Research Award in 2002, the Department of the Interior Meritorious Service Award in 2003, and the George Melendez Wright Award from the GWS in 2005. "I am happy to accept the Society's invitation to join the Board," van Wagtenonk said. "I look forward to

being active in efforts to improve the use of scientific information in park management, and seeing that parks avail themselves of the best available peer-reviewed science.”

2010 GWS Board election: Call for nominations

This year, two Board seats are up for election. One is held by an incumbent who is eligible for re-election, and one is open, its current occupant being term-limited. We are now accepting nominations from GWS members who would like to be candidates in this year’s election. The term of office runs from January 1, 2011, through December 31, 2013. Nominations are open through July 1, 2010.

To be eligible, both the nominator and the potential candidate must be GWS members in good standing (it is permissible to nominate one’s self). Potential candidates must be willing to travel to in-person Board meetings, which usually occur once a year; take part in Board conference calls, which occur several times per year; help prepare for and carry out the biennial conferences; and serve on Board committees and do other work associated with the Society. Travel costs and per diem for Board meetings are paid for by the Society; otherwise there is no remuneration. Federal government employees who wish to serve on the Board must be prepared to comply with all applicable ethics requirements and laws; this may include, for example, obtaining permission from one’s supervisor, receiving ethics-related training, and/or obtaining a conflict of interest waiver.

The nomination procedure is as follows: members nominate candidates for possible inclusion on the ballot by sending the candidate’s name to the Board’s nominating committee. The committee then, in its discretion, determines the composition of the ballot from the field of potential candidates. Among the criteria the nominating committee considers when determining which potential candidates to include on the ballot are his/her skills and experience (and how those might complement the skills and experience of current Board members), the goal of adding and/or maintaining diverse viewpoints on the Board, and the goal of maintaining a balance between various resource perspectives on the Board. (It also is possible for members to place candidates directly on the ballot through petition; for details, contact the GWS office.)

To propose someone for possible candidacy, send his or her name and complete contact details to: Nominating Committee, George Wright Society, P.O. Box 65, Hancock, MI 49930-0065 USA, or via email to info@georgewright.org. All potential candidates will be contacted by the nominating committee to get background information before the final ballot is determined. Again, the deadline for nominations is July 1, 2010.

This is also an opportunity to remind members that the Board elections now take place on-line. We use your email address as the voting passcode, so this means we need a valid email address for you in our database or you won’t be able to take part. If you have recently changed your email, please let us know by sending a note to info@georgewright.org.

NPS creates Wright fellowships on climate change research

The National Park Service has created a George Melendez Wright Climate Change Fellowship “to support new and innovative research on climate change impacts to protected areas and to increase the use of scientific knowledge toward resource management.” Awards will

be made in the range of \$5,000 to \$20,000 per fellowship for research to be undertaken in calendar year 2010. Projects may consist of exploratory research that could lead to a larger project funded by other sources but must result in tangible outcomes that are aimed at informing resource decisions. Examples include projects addressing vulnerability and risk assessment, adaptation strategies, public perceptions and values, and impacts to cultural landscapes and ethnographic resources. While the GWS is not sponsoring the fellowship or currently assisting in its administration, we provided a review of the program announcement and support the goals of the fellowship.

Park Break Perspectives series debuts

In February 2010 the GWS launched Park Break Perspectives, a new series of on-line papers that offer fresh looks at perennial and emerging issues through the eyes of up-and-coming scholars. Park Break Perspectives puts the spotlight on research papers and essays written by graduate students participating in the Society's Park Break alternative spring break program. The papers were developed in consultation with faculty members, park scientists, and other park professionals. As of this writing, six papers have been published on our website. All Park Break Perspectives papers are published in PDF format and can be downloaded at <http://www.georgewright.org/perspectives>.

Machlis named AAAS Fellow

GWS member Gary Machlis, University of Idaho professor of conservation and science adviser to the director of the National Park Service, has been named as an American Association for the Advancement of Science Fellow. Election as a fellow is an honor bestowed upon AAAS members by their peers. Machlis was named an AAAS Fellow for "imaginatively combining research, policy, and practice as an academic scholar and federal administrator of programs in human ecosystems, international conservation, and socioeconomic change." Additionally, Machlis has worked to build international capacity for conservation science, including working on giant panda conservation in China, developing a scholarship program to fund graduate students throughout the Americas, and serving on the AAAS national committee for opportunities for women and minorities in science.

GWS2009 proceedings published

In March we published the proceedings volume from last year's GWS biennial conference in Portland. Ably edited by GWS member Samantha Weber, *Rethinking Protected Areas in a Changing World: Proceedings of the 2009 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites* contains over 60 papers from the conference that cover the whole spectrum of topics addressed at GWS2009. The 352-page paperback volume is priced at \$37.00, but GWS members get a 25% discount as a benefit of membership, so the price for members is \$27.25. These prices include shipping to addresses in the USA; additional shipping charges apply for addresses elsewhere. To view the table of contents and order on-line, go to <http://www.georgewright.org/proceedings2009>.

An Idea in Trouble: Thoughts about the Future of Traditional National Parks in the United States

William C. Tweed

Author's note: The national park concept grew initially out of attempts to preserve natural landscapes in the American West, and the national park idea, as originally defined, focused on perpetuating those landscapes. Out of this effort grew the early system of geographically large, scenic parks. In this essay, these are referred to as "traditional national parks." What follows focuses on the national park idea as it has evolved in reference to these founding units of the American national park system. The extensive list of cultural and recreational parks that constitute a major portion of the modern national park system presents a significantly different set of issues, and these questions are not addressed in this essay.

HISTORIANS POINT OUT THAT IDEAS, and the organizations associated with them, sometimes age and lose their relevance. Today, as the National Park Service (NPS) approaches the centennial of its establishment, the agency faces huge potential problems with its founding mission and subsequent land management policies. Senescence is not too strong a word to apply. The core national park idea, developed in the late 19th century, codified in 1916, and originally applied to the natural landscapes of the early Western parks, has been profoundly undermined by modern science. The heart of the national park promise, the "best idea America ever had," no longer works. The concept that a "fence of law" can be erected around a portion of an ecosystem and that the area contained within that hypothetical fence can be maintained forever "unimpaired for future generations," can no longer be defended.

Public discussion has begun about how the NPS centennial should be marked. Half a century ago, as the agency approached the golden anniversary of its founding, the Park Service envisioned and successfully found funding for an initiative known as "Mission 66." In those years, NPS managers saw the agency's problems as being mostly about not having adequate visitor facilities. Over the course of a decade, Mission 66 financed construction of numerous new visitor centers, campgrounds, bathrooms, maintenance yards, and ranger residences. What Mission 66 did not address was the need for the agency to reinvent itself intel-

lectually in order to catch up with evolving scientific thought. Fortunately, even as the mainstream management of the agency focused on facility improvement, a few far-sighted leaders in the Park Service and the Interior secretary's office commissioned the efforts that led to the Leopold and National Academy of Science reports (Leopold 1963; National Research Council 1963). The contents of these reports, even though resisted initially by many park managers, eventually led NPS into a new age of natural resources management. By adopting the doctrine that preserving natural processes would lead inevitably to "natural results" and thus perpetuate "unimpaired" resources, NPS natural resources management programs attempted to catch up with the biological sciences. This redefinition of *how* to achieve the national park dream on the ground allowed the unimpairment doctrine to remain firmly established as the agency's long-term goal. Indeed, the Leopold Report's famous reference to parks as "vignettes of primitive America" was, in its own way, an affirmation of the "unimpaired" standard.

Half a century later, the situation, the problem, and the opportunity appear much the same. Once again, science has moved on and left the Park Service behind. The cutting-edge management policies of the 1960s no longer ring true. Few ecologists still argue that "natural" processes will lead reliably to "natural" results in a world where anthropogenic climate change, pollution, and habitat fragmentation have changed the ecological operating rules. The need for a new definition of the national park idea is compelling.

Nate Stephenson, a research ecologist with the Western Ecological Research Center of the U.S. Geological Survey, has much to say on this subject (Stephenson, in press; Hobbs 2009). In presentations to park managers and in essays, Stephenson has described the traditional mission of the National Park Service as a "dinosaur" that must evolve. As an ecologist, Stephenson finds evidence nearly everywhere that destabilizing change in natural systems is accelerating quickly as a result of human activity. (Readers of *The George Wright Forum* will be familiar with these issues, and they will not be expanded upon here.)

Having thus concluded that full preservation of unimpaired natural systems has become impossible, Stephenson then turns his critical attention to the Park Service's fall-back policy of maintaining impaired systems in the "closest approximation of the natural condition" when they can no longer be sustain unimpaired (NPS 2006, section 4.1). Again, using his ecological knowledge, he points out potential problems with this goal. Artificially sustained ecological systems are likely, Stephenson predicts, to be inherently unstable.

Moving forward, Stephenson proposes a new approach to national park management. In this vision, the primary national park natural resource management goal of the 21st century would be to perpetuate as much of the remaining native biodiversity in our preserved wildlands as possible. Key to this new approach would be the concepts of resistance and resilience. Stephenson defines *resistance* as the "ability to resist stress" and *resilience* as the "ability to recover from stress."

Under a resistance/resilience strategy, national park managers would continue to do many of the things they do today, but in a fundamentally different context. Rather than moving forward under the 1916 assumption that everything can and must be saved, managers would act within a mindset that tells them that everything is at risk and that much will likely be lost. Work would continue to minimize intrusive threats such as chemical pollution, inva-

sive species, and disrupted fire regimes, but this work would be conducted within a context of accepting the inevitability of change. Such an approach would not assume stability in the ecological world, but instead would anticipate the unexpected. Monitoring, in this model, would inform a feedback loop intended to help managers preserve as much native biodiversity as possible. Wildland fires, for example, would be closely monitored to determine whether they lead to the perpetuation of native biodiversity or tend toward the reduction of ecosystems into landscapes dominated by a handful of disturbance-dependent (“weedy”) species. Proactive management elements that today would be clearly rejected, such as facilitating the migration of native species to new locales where they might survive in a changing climate regime, would become acceptable. The long-held dream of restoring damaged ecosystems to some pre-industrial condition would largely be abandoned as impossible.

Such an approach is sharply at odds with current National Park Service policy. In the most recent edition of the agency’s *Management Policies*, a key section still requires park managers to preserve *all* components and processes including “the natural abundance, diversity, and genetic and ecological integrity of the plant and animals species native to those ecosystems” (NPS 2006, section 4.1). The same paragraph forbids management to enhance individual species with the exception of listed threatened and endangered species. Stephenson sees such policies as laudable but doomed to fail in a world where human-caused ecosystem change has become both pervasive and inescapable.

Implied here is a degree of hands-on management of natural resources that rejects completely the 19th-century assumptions of the national park movement’s founders. That founding vision assumed that we could sustain the biological landscapes we value simply by preventing immediate damage and by leaving them alone. Mid-twentieth-century redefinitions modified this idea by adding the component of natural processes maintenance to the mix, but still posited that in the end, if properly protected, natural systems could perpetuate themselves within human-defined reservations. None of this now appears to be true.

Embedded here is a profound contradiction. The frankly interventionist management that Stephenson proposes would place natural resource management programs in direct conflict with *wildness* as a state of being. But note that “wildness,” as used here, conveys meanings that shift the word’s definition in a subtle but significant way. Traditionally, the NPS uses the adjective “natural” (and sometimes also the word “wildness”) to define an ideal state in which natural systems are both unmanaged by human actions and possessing ecological integrity. But what if these two values no longer travel reliably together, what if we must then begin to think about them separately? In this context, Stephenson, and some others, including the poet/natural philosopher Gary Snyder, have begun to use a new definition of “wildness” in place of “natural.” To Stephenson and Snyder “wildness” defines a biological system or landscape that proceeds in a manner that, while affected by humans, is nonetheless not directly managed (Snyder 1990).

Accepting this new definition of “wildness” as a goal implies accepting unmanaged change and its results. But what if the resulting changes move away from biodiversity? What if *wildness* in a world sorely wounded by global-scale human activity leads to ecological simplification and loss? Implied here is the fact that the twin goals of *biodiversity* and *wildness*

may not be compatible. On the ground, the tension between these two goals will be difficult to resolve. Finding a workable balance will require continuous resource monitoring, thoughtful analysis, and much on-the-ground experimentation. Critically, it will also require the development of new national park values and goals.

In the end, the menu of conceptual options for managing national park wildlands is surprisingly short. The strategy that Stephenson proposes might be summarized as “managing for change.” Its underlying logic assumes that the best path will be to study the processes of ecosystem and landscape change and then actively seek ways to preserve the things we value within this changing world.

But there are many professionals within the Park Service who recoil from this management prescription. They point out, citing much history, that attempts to manipulate ecosystems have seldom led to the desired results. How do we know, they ask, that we won’t just make a bad situation worse? Many in this school urge the Park Service to stick to a path of minimal intervention, to value *wildness*. Much will change, they admit, and things will be lost, but letting ecosystems find their own solutions will work out best on the long run. This school of thought defines a clear alternative path to “management for change” that centers instead on accepting *wildness* as the primary guiding premise. Under this approach, managers would step back from active management and allow natural systems to evolve toward new states. By definition, whatever resulted would be a success.

Both of these approaches accept the biological imperative of change, and from a scientific point of view either could be justified in a redefined national park setting. But there is something missing from this equation: any appreciation of the role of the traditional NPS mission in perpetuating public support for national parks. Visitors to Sequoia National Park, for example, come primarily to see the Big Trees. Will they still come if the Giant Forest loses its sequoias? And if they don’t come, then what will happen to the parks politically?

An obvious political answer would be a third natural resources management approach, a localized “ecosystem museum” strategy designed to perpetuate samples of key resources. Under this strategy, park managers would attempt to identify and sustain artificially key biological elements in national parks. Again, the Giant Forest of Sequoia National Park provides a useful setting for imagining how this might work. If managed as an ecosystem museum, the Giant Forest would be actively manipulated to sustain the continued presence of key stands of old-growth giant sequoia trees. This might involve supplemental irrigation, removal of invasive species, planting of species that fail to reproduce, and any number of other possible actions. In some ways, the grove would become an intensively managed botanical garden. Would this work? The answer, which comes as much from horticulture as from ecology, is “maybe,” but it is worth recalling that Stephenson warns us that such systems will be inherently unstable.

Significantly, as biologically flawed as an ecosystem museum may appear, it represents the logical outcome of current NPS policy when applied to the problems of the 21st century. As defined by the agency’s management policies, the prescribed NPS response to biological deterioration or collapse is restoration, which often looks much like artificial life support for ecosystems. Hawaii Volcanoes National Park provides an interesting example. In the mid-

dle years of the 20th century, the ecosystems that defined the park's tropical rainforests began to unravel. The natural systems of Hawaii had evolved many endemic life forms that prospered in the absence of competition. Once Hawaii lost its isolation, invasive plants and animals moved into these forests and established themselves at the expense of native organisms. The response of the NPS was to initiate an expensive program of ecosystem management that involved both continuous weeding of invasive plants and aggressive suppression of non-native fauna. This program, clearly an early example of ecosystem museum management, continues to this day.

It is easy to imagine Hawaii Volcanoes National Park's ecosystem museum as a model for many other critical national park features. In order to sustain public interest and support, the national parks may have no choice but to manage selected scenic resources in a manner that provides continuity and familiarity to the visiting public. Sometimes, as in the case of the Giant Forest of Sequoia National Park, this will take the form of sustaining key biological resources even if they are no longer able to survive without human intervention. Other NPS units with famous biologically based identities come to mind here, places like Redwood, Joshua Tree, and Saguaro national parks.

In other cases, the challenge may be not so much to establish an ecosystem museum as to preserve the general appearance of key scenic resources. Yosemite Valley, the High Sierra, Jackson Hole, the lake shores at Glacier, the Yellowstone Plateau, the Grand Canyon: even as these environments change biologically, the NPS may be forced for political reasons to manage them in a way that keeps them *feeling* familiar, a management strategy that would blend together something of wildness, management for change, and ecosystem museums into an entirely new mix. Perceptive readers will note that such an approach has deep historical roots in the Mather–Albright era of landscape management and a troubled history that has been documented by Richard West Sellars, among others (Sellars 1997).

Since 1916, national park managers have talked about the “dual mission” of the National Park Service, a mission that requires both preservation of resources and the facilitation of the appropriate enjoyment of those same resources. Now, even as the Park Service continues to wrestle with this venerable dichotomy, it faces a new dualism. This challenge requires the agency to develop the wisdom and the capacity to manage its resources for the long term in new and controversial ways while, at the same time, sustaining selected biological and landscape features that attract public support. A profound disconnect haunts this question. Attempting to preserve selected fragments of ecosystems may not work as a biological strategy; doing anything less, however, may fail as a political strategy.

Is the Park Service capable of sustaining wildness, managing to preserve diversity in a changing world, and also finding a way to sustain key resources artificially *in situ* in a manner that satisfies the needs of tourism? The question implies that the future management of the landscapes and ecosystems of our traditional national parks may have to be both more complex and more nuanced than anything seen to date. No single approach will meet all of society's needs. Conflicting needs may require that national parks be divided into management zones that allow the Park Service to pursue all three approaches at once but in different areas or even sometimes blended together. Supporting this imperfect but probably

inescapable compromise is the likelihood that a policy of non-intervention (*wildness*) will inevitably be tested on a massive scale. The reason is simple. Huge tracts will remain beyond the agency's physical and financial ability to manage. These landscapes will go where climate change and other environmental stresses take them. As a default strategy, *wildness* will almost certainly dominate the future of the parks.



EDUCATING THE PUBLIC TO ACCEPT CHANGE is perhaps the greatest challenge a government agency can face. For the National Park Service, the challenge is even greater since the agency has so long emphasized through its interpretation and public relations programs that its mission is to prevent change. This is a position the NPS must abandon. In this dynamic and increasingly unstable world, the NPS must begin talking about change as an inescapable part of the park world. Painful as it will be, the myth of “unimpaired for future generations” must be replaced with a more realistic vision.

Intensifying the challenge the Park Service faces as it attempts to engage the public in a new mission for national parks is the inescapable fact that the social role of nature-based parks in American society also has been changing. Park visitation, measured as a per capita function of national population, has been shrinking for nearly three decades (Pergrams and Zaradic 2007). Current trends suggest that the recreational role of national parks will continue to face difficult challenges. New and competing recreational worlds have blossomed. The virtual reality of the digital world offers much that attracts. One can be transported to another realm without having to travel or even sweat. Demographic change is critical as well, with growing segments of society having no tradition of national park use or even interest in nature within their experience. In many ways, traditional national park experiences are not competing well in the leisure-time market.

In a society where both public ideas and recreational lifestyles exist in a highly competitive marketing environment, national parks will only survive as significant institutions if they are appreciated and supported by an informed citizenry that understands their purpose and supports their management. Selling larger segments of society on the value of places where the long-advertised mission is no longer possible, where resources seem to be unraveling, where quality experiences require pre-acquired skills and knowledge to enjoy, and where significant blocks of time are required to recreate, will be anything but easy. Add the complication that this marketing must speak to people who have little or no tradition of national park use and little interest in nature, and the challenge becomes daunting. But there is no choice. In our society, ideas that do not compete well usually die.

In the autumn of 2009, the pre-eminent documentary filmmaker Ken Burns addressed this very question. In the twelve-hour-long PBS special, *The National Parks: America's Best Idea*, Burns and Dayton Duncan created a value-defined view of the national parks that sought to redefine the significance of the parks. Instead of focusing primarily on Mather's vision and its now doomed promises of “unimpaired forever,” Burns and Duncan sought to position the national parks as a key expression of American democracy. In carefully measured segments, they expounded their theme that publicly owned parks, set aside for the ben-

effit of all, are indeed our republic's best expression of its true nature. Carefully omitted was any suggestion that the traditional national parks, which were the predominant focus of the film, are based on an unattainable goal.



EMBEDDED WITHIN THE SAME SECTION OF THE NPS ORGANIC ACT as the famous language about conserving the parks “unimpaired for future generations” is another much less-quoted concept. The act also instructs the Park Service to “promote” national parks. As perceptive critics like Denis P. Galvin and Robin Winks have noted in this journal, this legal instruction has received very little attention over the years. In the context of 1916, “promoting” national parks reflected Stephen Mather’s view that parks needed to be widely used if they were to be loved and supported. In the 21st century a different meaning offers itself. Pondering this question, Galvin recently concluded: “There remains a need to promote the parks, not to bring people to them, but to promulgate the values they have come to represent” (Galvin 2007).

The values Galvin emphasizes here rise far above management policies. In a culture that accepts accelerating human consumption of the earth as a necessity and where the natural world means less and less to each succeeding generation, national parks remain the best place to share the knowledge that will allow us to sustain biodiversity on this planet. In this new century, where nothing natural or wild seems beyond the reach of humankind, the cultural values associated with the traditional national parks may ultimately be their most important feature. If “unimpaired for future generations” must be abandoned as the holy grail of NPS natural resource management, a new purpose and vision, and a new set of values, must be offered. Finding words to match the strength of those written nearly a century ago will not be easy, but a redefined and achievable vision for the management of the national park system’s traditional Western units in this new era might read as follows:

The purpose of said parks shall be to preserve wildness, and as much as possible of the rich biological and cultural heritage of this planet, in a manner that will allow for the sustained, respectful, and non-consumptive enjoyment of these resources by the present and future generations.

Traditional national parks, if they are to survive as viable public institutions, will have to adapt to the realities of a fundamentally different world. Survival, Darwin discerned a century and a half ago, is ultimately about the ability to adapt. The lesson remains apt. Can national parks evolve successfully in a world where nearly all of their founding assumptions have been proven wrong? The answer to this question will be found in the ability of park professionals to embrace new goals and philosophies while at the same time convincing the public that the redefined national parks have enduring social value.

References

Galvin, Denis P. 2007. The Organic Act—A user’s guide: Further thoughts on Winks’ “A contradictory mandate?” *The George Wright Forum* 24:3, 22–25.

- Hobbs, Richard J., David N. Cole, Laurie Yung, Erika S. Zavaleta, Gregory H. Aplet, F. Stuart Chapin III, Peter B. Landres, David J. Parsons, Nathan L. Stephenson, Peter S. White, David M. Graber, Eric S. Higgs, Constance I. Millar, John M. Randall, Kathy A. Tonnessen, and Stephen Woodley. 2009. Guiding concepts for park and wilderness stewardship in an era of global environmental change. *Frontiers in Ecology and the Environment e-View*. On-line at www.esajournals.org/doi/abs/10.1890/090089.
- Leopold, A. Starker, et al. 1963. Wildlife management in the national parks. In *Transactions of the Twenty-eighth North American Wildlife and Natural Resources Conference*. Washington, D.C.: Wildlife Management Institute. [Reprinted in Lary M. Dilsaver, *America's National Park System: The Critical Documents*. Lanham, Md.: Rowman and Littlefield, 1994.]
- National Research Council, National Academy of Sciences. 1963 *A Report by the Advisory Committee to the National Park Service on Research*. [Reprinted in Lary M. Dilsaver, *America's National Park System: The Critical Documents*. Lanham, Md.: Rowman and Littlefield, 1994.]
- NPS [National Park Service]. 2006. *Management Policies 2006*. Washington, D.C.: NPS.
- Pergams, Oliver R.W., and Patricia A. Zaradic. 2007. Evidence for a fundamental and pervasive shift away from nature-based recreation. *Proceedings of the National Academy of Sciences* 105, 2295–2300.
- Sellars, Richard West. 1997. *Preserving Nature in the National Parks: A History*. New Haven and London: Yale University Press.
- Snyder, Gary. 1990. *The Practice of the Wild*. New York: North Point Press.
- Stephenson, N.L., C.I. Millar, and D.N. Cole. In press. Shifting environmental foundations: The unprecedented and unpredictable future. In *Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change*, D.N. Cole and L. Yung, eds. Washington, D.C.: Island Press.

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GEOPARKS:

THINK OUTSIDE THE PARK

Heidi Bailey and Wesley Hill, guest editors

The UNESCO Global Network of National Geoparks

Patrick J. McKeever, Nickolas C. Zouros, and Margarete Patzak

Introduction

IN JUNE 2000 REPRESENTATIVES OF FOUR EUROPEAN TERRITORIES, which had separately been promoting geological conservation and sustainable development, came together in Greece to discuss their common socioeconomic problems and how to address these problems through the protection of geological heritage and the promotion of geological tourism. The result was the signing of an agreement declaring the creation of the European Geoparks Network. The purpose of this new label was to provide a network within which to share information and expertise, and to define common tools in addressing the above objectives.

The Global Geoparks Network

From its formal beginnings in June 2000, the European Geoparks Network grew rapidly. One of the key early successes for the network was the signing of an official agreement of collaboration with the Division of Earth Sciences of UNESCO (the United Nations Educational, Scientific, and Cultural Organization) in April 2001, which placed the new network under the auspices of UNESCO. Since then, UNESCO has played an important role in the development of the European Geoparks Network and has used the European model as the one to follow as they rolled out their Global Geoparks Network (GGN). As of August 2009, the GGN comprises 63 members in 19 nations, including 34 in Europe, 22 in China, 3 in Japan, and one each in Australia, Brazil, Iran, and Malaysia.

But what actually is a geopark? A geopark is not just a collection of geological sites, but is a territory with geological heritage of international significance *and* a sustainable territorial development strategy. Geological sites must be of international importance in terms of their scientific quality, rarity, aesthetic appeal, and education value. Sites cannot only be related to geology but also to archaeology, ecology, history, and culture. All these sites in the geopark must be linked in a network and constitute thematic parks with routes, trails, and rock sections that can benefit from protection and management measures.

Typical activities in a global geopark include the development of walking and cycling trails, the training of local people to act as guides, education courses, provision of informa-

tion signage, and the development of modern museums and visitor centers. The ultimate aim of a global geopark is to bring enhanced employment opportunities for the people who live there. These opportunities are now being realized across the expanding network and are being created in association with the conservation of geological heritage. However, this conservation is not of the restrictive type. Geoparks use a holistic approach to conservation where all aspects of natural and cultural heritage are valued, conserved, and promoted under the geopark label.

Geoconservation is implicitly expressed within the operational guidelines of the GGN through the strong statement that no destruction or sale of the geological value of a global geopark will be tolerated, except for scientific or educational purposes. Furthermore, a geopark has to develop and enhance methods and tools for the preservation and conservation of geological heritage, as well as to support and develop scientific research related to the various disciplines of the earth sciences. Education and training on the natural and geological environment comes as a direct consequence of conservation strategies and aims to promote knowledge and value of geological heritage, outlining the concept of geodiversity in the territory (Figure 1).

Sustainable development is considered as an essential practice for economic development in the territory and for the strengthening of the management structure and, therefore, for the geopark itself. Geological heritage is evaluated and considered from the inhabitants'

Figure 1. Sites such as Giant's Causeway in Northern Ireland demonstrate the geodiversity of the earth. Photo courtesy of Wesley Hill.



perspective, presence, and needs. The contribution of the geopark is thus seen through the enhancement and promotion of a certain image related to the geological heritage and the development of tourism with related actions. This should have a direct impact on the territory, influencing its inhabitants' living conditions and environment, leading to a revalidation of the values of the territory's heritage, and encouraging active participation in the territory's cultural revitalization.

Finally, and crucially, a global geopark has to work within the network for its further expansion and cohesion, collaborate with other geoparks and local enterprises for the achievement of its objectives, and create and promote new by-products linked with geological and cultural heritage. In practice this is mostly done through regional networks such as the European Geoparks Network or the Asia-Pacific Geoparks Network (which was founded in November 2007).

Regional cooperation: The European Geoparks Network

Regional cooperation is best exemplified by the European Geoparks Network, which has been operating for nine years (Figure 2). One of the stated aims of the European Geoparks Network is to exchange ideas and expertise on promoting geological awareness and sustainable development. It is with this aim in mind that the members come together twice per year. Once annually the network meets on its own, while on the second occasion the network meets a few days in advance of the annual meeting, which is open to everyone, members and non-members alike. These meetings promote the use of common tools such as the website (www.europeangeoparks.org), magazines, displays, and events, and also encourage members to develop exchanges or projects between smaller groups of geoparks (Figure 3).

Once a year all members participate in European Geoparks Week. This is a series of coordinated events (guided walks, talks, activities for children, etc.) that occur in the same week in every member of the network. The goal is to increase public awareness about earth science issues in general and build awareness of the European Geoparks Network and

Figure 2. In Europe, the term "geopark" is the official designation for 33 areas in 13 countries. Map courtesy of the European Geoparks Network.



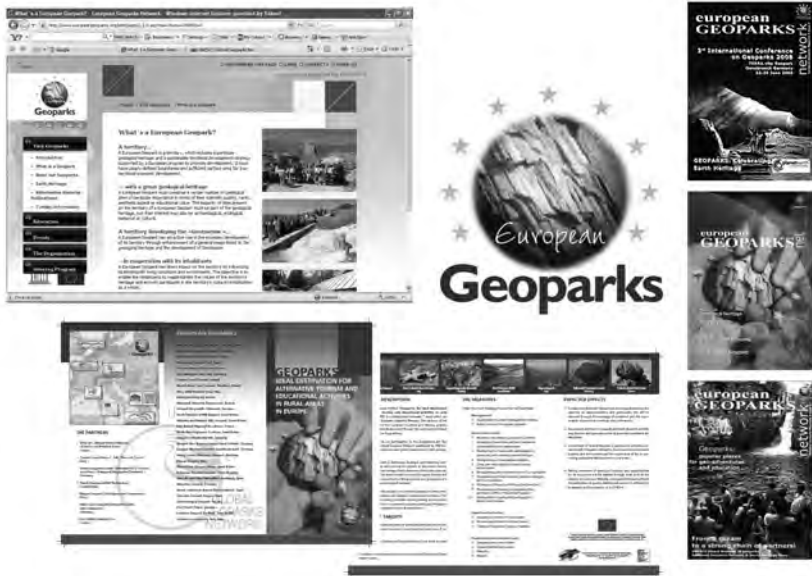


Figure 3. A geopark is a marketing and branding strategy centered on earth heritage. The European Geoparks Network uses a website, logo, brochure, and magazine to create a unified destination image for members of the network. Images courtesy of the European Geoparks Network website.

our great shared geological heritage. Not only is the public in one geopark informed about activities occurring there but they are made aware of the fact that they are part of a much wider series of events that will be happening across Europe.

Transnational networking and sharing of knowledge will mean new concepts, outputs, and results for further integration on spatial planning, transnational environmental problems, and development issues. The creation of quality standards for geoparks services and products is one of the key aims of the network. As part of this, an evaluation process has been established that will try to measure the level of quality in infrastructure, services, and sustainable management in each member of the network. The process will be repeated every four years to ensure that the level of quality remains of the highest order.

The network continues to expand, drawing in new expertise and knowledge from all parts of Europe. With the other global partners in the GGN, the members will continue to assist UNESCO in bringing the geopark concept to all parts of the world, especially to the developing world where sustainable tourism could lead to job creation in rural communities for the benefit of local people.

Socioeconomic development: The case of Marble Arch Caves

In the far northwest corner of Ireland are the Marble Arch Caves. The caves are located in County Fermanagh, which covers an area of 1,692 sq km and is home to 57,000 people, most of whom live in the county town of Enniskillen. The economy of Fermanagh is based on agriculture, mostly on beef, dairy, sheep, pigs, and some poultry products. Tourism too is important, with the county often referred to as Ireland’s lake district. However, tourism is

much less developed here than in, for example, the southwest of the country in counties Cork and Kerry, and much of the tourism potential of Fermanagh is yet to be realized.

The economy of Fermanagh, like the rest of the north of Ireland, was until recently blighted by political violence and instability. At the height of the unrest the local authority, Fermanagh District Council, made the strategic decision to develop the caves at Marble Arch into a tourist attraction. Recognizing the need for the caves to offer something special in order to attract visitors into the area, a policy of conservation and sustainable development was employed from the start. Opening in 1985, the caves have now received over 1,000,000 visitors with the annual average number of visitors running at around 75,000.

The council has also taken ownership of a vast swath of Cuilcagh Mountain immediately south of the caves and has instigated an award-winning conservation scheme on the large area of blanket bog here. But again, it is not a sterile type of conservation: education groups of all ages are encouraged to visit and new walking routes have opened up the area to a new generation of visitors. Today, the Marble Arch Caves Global Geopark—a member of the European Geoparks Network—is the main tourism hub in this part of Ireland. It employs over 50 local people during the tourism season (April–September) with a staff of 14 retained throughout the year.

The indirect benefit of the geopark is also large, with new accommodation providers opening for business and new restaurants opening in the nearby villages of Blacklion and Belcoo. Currently the benefits of the geopark are spreading and the geopark has expanded in area across much of west Fermanagh and across the Irish border into the neighboring county of Cavan.

Conclusion

The Global Geopark Network continues to expand as UNESCO brings the geopark concept to all parts of the world. Many new membership applications are pending and members from across the network are assisting these territories in their membership bids to ensure the overall high quality of services is maintained. The network is still young and the coming years will continue to be ones of great challenge.

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Lesvos Petrified Forest Geopark, Greece: Geoconservation, Geotourism, and Local Development

Nickolas C. Zouros

Guest editors' note: Lesvos Petrified Forest Geopark in Greece, one of the first geoparks in the world, already has one decade of successful operation. Lesvos Geopark operates according to a management plan that is aimed at improving the site's infrastructure, services, education, and promotional activities. The results of the implementation of the management plan have been a significant increase in the number of visitors, enrichment of program offerings and tourism services, and improvement of its operations. In addition, Lesvos Geopark contributes significantly to the local economy by creating new jobs and establishing close collaborations with local tourism enterprises.

Introduction

The island of Lesvos, situated in the northeast Aegean Sea, is the third largest island in Greece at 1,630 sq km. On its western side that one can find the Lesvos Petrified Forest Geopark, the very first Greek geopark, comprising large accumulations of exposed fossilized tree trunks. A protected natural monument, the Lesvos Petrified Forest consists of four major terrestrial and marine fossil sites lying on an area of 15,000 hectares with a buffer zone of 20,000 hectares. The formation of the petrified forest is directly related to the intense volcanic activity in Lesvos during early Miocene times.

The Natural History Museum of the Lesvos Petrified Forest was founded as a non-profit organization in 1994 to protect and efficiently manage the petrified forest. Systematic scientific research and excavations have been carried out over the last decade by the Natural History Museum in order to gain a better understanding of the geological evolution of the island and the origin of the petrified forest.

The main components of the operation of the geopark include scientific research; creation of a geosite inventory; protection, interpretation, and promotion of geosites; conservation of fossils; creation of visitor parks; establishment of a network of walking trails linking sites of interest with ecotourism infrastructures; development of environmental education programs on geosites; organization of scientific and cultural events; and promotion of geosites monuments.

The Lesvos Petrified Forest Geopark is a founding member of the European Geoparks Network (EGN) and one of the initial members of the Global Geoparks Network. Lesvos

Geopark has benefited from international collaboration and developed an infrastructure that is highly appreciated and valued by the local population, visitors, and politicians alike.

According to its latest evaluation carried out by international experts during the summer of 2007, “the European Geopark Lesvos Petrified Forest is a best practise example within the European Geoparks Network and [it] plays an important role in the sustainable economic development of the island, especially for the rural area of Western Lesvos.”

Lesvos Geopark management plan

The management plan is the main tool for the operation of the geopark and links geoconservation and promotion of natural and cultural heritage with the development of geotourism. During the last seven years the geopark has been following the provisions of its management plan and has implemented a range of activities aimed at the further improvement of its infrastructure, services, activities, and promotion. The results of the implementation of the management plan have been a significant increase in the number of visitors, the enrichment of its offerings and services to visitors, and improvement of its operations. The main activities implemented during this period are presented below.

Geosite identification and assessment A research study and field survey on Lesvos, carried out by the Natural History Museum of the Lesvos Petrified Forest and the Department of Geography of the University of the Aegean, has resulted in a better understanding of the geological evolution of the island and the origin of the petrified forest. Several geosites were identified, mapped, and assessed (Zouros 2005, 2007) using the following criteria: (1) scientific and educational value (integrity, rarity, representativeness, and exemplarity); (2) natural beauty and aesthetic value; (3) cultural interest; (4) geodiversity; (5) potential threats and protection needs (vulnerability and legal protection.); and (6) potential for use (recognizability, geographical distribution, accessibility, and potential for generating economic activities).

The results were published as a new geosite map of Lesvos Geopark. Apart from the fossil sites, geosites within the volcanic terrains of the geopark include the volcanic calderas, columnar lavas, the Petra volcanic necks, veins, domes, laccoliths, and impressive volcanic landscapes. Other geosites represent active and evolving geomorphologic landforms, including tectonically active fault scarps, geothermal fields, karst and caves, and coastal and fluvial landforms.

Enhancing the natural and cultural heritage A second component of the geopark’s management plan is the identification of the different natural and cultural resources of Lesvos Geopark, including flora and fauna (especially birds), wetlands, archaeological monuments, Early Christian basilicas, Byzantine monasteries, Venetian castles, picturesque villages and rural architecture, drystone constructions, and impressive landscapes (Figures 1 and 2). All these elements of interest were linked to geopark presentation and benefit from a unified system for protection and promotion.

Several ecological or cultural aspects of the petrified forest protected area were identified and studied in collaboration with the University of the Aegean, research institutes, and other scientists (e.g., birds, plants, wetlands, coastal and marine ecosystems, drystone constructions, and agricultural landscapes). The results of this research have been used for man-



Figure 1. Tours of historic buildings are a geopark highlight. Visitors discover the role of geology in preserving the history of a place. Photo by Heidi Bailey.

agement, educational, and promotional purposes.

Geosite protection and geoconservation Lesvos Petrified Forest Geopark applies certain management measures for the protection and conservation of the inventory of geosites present in the territory. These measures comprise: (1) regular maintenance (fencing, cleaning) and custodial services to protect geosites from abuse and vandalism; (2) geosite monitoring with necessary measures and protective installations against weathering and erosion; and (3) treatment of vulnerable geosites with annual conservation and protective measures (preparation, sealing).

A conservation team was formed and a laboratory for fossil conservation organized and equipped. Conservators treat dozens of petrified trees through the use of innovative techniques in an effort to face several challenges such as weather conditions (unstable temperatures and relative humidity can deteriorate the fossils exposed to the open air), as well as the actions of unaware visitors.

The most fragile fossils are covered by shelters that protect them from the rain. Stone walls also protect the fossils from water runoff while the fossil sites themselves are angled for proper drainage. In some cases, stone walls have been constructed to stabilize the ground and prevent natural erosion. These walls, along with wooden fences, also serve to protect the fossils from visitors.

Geosite interpretation panels provide information to geopark visitors on the importance of the geological and geomorphologic processes on the evolution of the region. Thus local people can also learn that certain “rocks” represent remnants of outstanding phenomena and



Figure 2. Villagers living within the Lesvos Petrified Forest Geopark in Greece. The European geoparks focus on the inclusion of local people and the celebration of diverse cultures. Photo by Heidi Bailey.

processes that demonstrate the geological history of their own terrain. In this way particular rock formations gain a new identity for the people and at the same time become objects to be respected and protected.

Geopark infrastructure and land management Lesvos Petrified Forest Geopark has developed a range of tourist facilities to serve its visitors. The Natural History Museum of the Lesvos Petrified Forest in Sigrí village is at the core of this infrastructure. This state-of-the-art museum has become a key factor in attracting visitors to this part of the island.

Museum exhibitions present the evolution of plant life on earth, the flora of the petrified forest with fossil remains of over 40 different species found and identified in the broader area

of western Lesvos, and the volcanic activity related to the formation of the petrified forest and the evolution of the Aegean area.

Within the petrified forest's protected area, the main fossil sites are fenced and safeguarded, and five visitor parks have been established, attracting thousands of visitors each year: Petrified Forest, Sigrí, Plaka, Nisiopi, and Skamiouda parks. Several other areas will become visitor parks during the next years, as the museum has already begun the necessary procedures.

Another main part of the infrastructure is the "Lava Paths" that lead visitors down the ancient paths of the pyroclastic flows from the main volcanoes to the petrified forest. Equipped with information panels that explain the various geosites, these footpaths link the existing visitor parks, wetlands, and sites of natural beauty and ecological value, as well as cultural monuments, picturesque villages, and other sites of interest throughout the geopark. Along the main roads crossing the Lesvos Geopark area, information panels and road signs direct visitors towards the petrified forest and demarcate the borders of the protected area. Walking trails start from different points along the main road.

The geopark has also established two information centers to inform visitors about the geotourism and educational activities in Lesvos. The first, in Mytilene, the capital of the island, includes a small exhibit. The second operates in the village of Eressos during the summer. There is also an information point in the Odysseas Elytis Airport of Mytilene.

Geotourism and promotional activities A broad range of activities accomplishes the task of attracting and informing visitors. Lectures and multimedia presentations at the museum are used to familiarize visitors with the geological processes related to the creation of the petrified forest, the diversity of fossil plants, and the geological evolution and natural heritage of the Aegean. Guided tours in the petrified forest's visitor parks, thematic guided walks, trekking, and various other recreational activities in the vicinity of geosites help raise public awareness about their value.

Furthermore, a series of scientific and cultural events is organized and hosted every year in the petrified forest to attract the attention of the broader public to this unique natural monument. The range of events includes scientific lectures, slide shows, documentary films, natural science-oriented temporary exhibitions, book presentations, art exhibits, music and dance events, and theatrical plays. Through these events, the geopark draws large audiences of people who may have little or no interest in natural heritage, thus creating new opportunities for sensitizing the public.

The geopark also organizes several thematic events to celebrate special events or international days (i.e., Museums International Day, Day of Monuments, Earth Day, Day of the Environment, European Heritage days, European Geoparks Week, and Earth Fest). Temporary exhibitions on the Lesvos petrified forest circulating through the larger cities and museums in Greece and abroad contribute significantly to the promotional work of Lesvos Petrified Forest Geopark.

International and national scientific conferences and meetings are also hosted in the museum's conference center. Such events bring scientists from all over the world to the geopark, helping to raise the petrified forest's profile in the academic community and to promote the use of its infrastructure for the hosting of other academic and educational activities (e.g.,

research groups, educational visits, student fieldwork). As a result, several universities have started to organize student visits and fieldwork in the geopark.

The promotion of the petrified forest occurs through print and television media. New excavation findings have attracted the attention of local and national media to this exceptional natural monument. A number of articles in national newspapers and magazines as well as radio and TV programs have referred to the petrified forest, the new excavation findings, and the importance of the monument. Research results have been presented in numerous scientific meetings in Greece and abroad, and several multimedia presentations on the Lesvos Petrified Forest have been organized in Athens, Thessaloniki, Crete, and in the main towns of Lesvos. The geopark has also produced a series of scientific and popular publications for visitors such as coffee-table books, field guides, magazines, conference proceedings, brochures, leaflets, and posters.

Educational activities and tools Educational activities lie at the core of the geopark's operations. Environmental education programs organized for elementary and high school students at the petrified forest cover a broad range of activities such as geosite recognition, fossil excavation and conservation, nature observation, and bird watching. School visits are organized during spring and autumn, outside the main tourist period, thus contributing to the local economy through the development of educational geotourism.

Educational activities for local schools help raise the awareness of the local inhabitants as to the importance of our natural monuments and the conservation of the earth's heritage. Extended educational programs, with school groups coming from other parts of Greece and abroad, introduce young students to the "secrets" of scientific research and geoconservation.

A variety of educational tools have been created for the needs of the environmental education programs (such as museum kits, an educational CD, booklets, student booklets) for all levels of education. The two museum kits focus on plant fossils and volcanic rocks. The geopark also supports university field camps dedicated to various scientific disciplines (geomorphology, geology, paleontology, geography, vulcanology, environmental science, museology, conservation, etc.). Several universities from various European countries and the USA have organized visits and educational activities using the geopark.

In 2000, the Vocational Training Center of the Natural History Museum of the Lesvos Petrified Forest was founded to train young unemployed people in the techniques of conservation, excavation, and preservation of fossils, as well as in visitor reception and geopark promotion. By 2007 five courses had been delivered and 108 young people living in the area of the geopark were trained. Thirty-four of these trainees found employment in the geopark. During the spring of 2007 a three-month course entitled "Techniques of Protection and Conservation of Fossils" was delivered in collaboration with Bergstraße-Odenwald, a European and global geopark.

Supporting local business, sustaining local communities An important component of the Lesvos Geopark management plan is the support of the local economy. The geopark has created links with local tourist enterprises, restaurants, and small hotels in order to provide the necessary infrastructure to meet the needs of the increasing number of park visitors. The majority of visits to the geopark occur during the summer (July–September), but the aim is to extend the visiting period to the spring and autumn.

In the village of Sigri, the number of bed and breakfast accommodations has doubled over the last few years in order to meet the increasing demand. More importantly, visitors have increased the duration of their visits to the geopark area. As a result, the majority of the new enterprises established in Western Lesvos are connected with the activities of Lesvos Geopark.

The geopark also supports the making of local handicrafts such as the production of fossil casts and souvenirs by local enterprises. These items are on sale in the museum shop along with a variety of other locally made products (Figure 3). Lesvos has a long tradition in pottery and woodcarving and the geopark promotes these products to its visitors.

Lesvos Geopark also collaborates closely with women's agrotourism cooperatives and local organic food producers to offer its visitors the opportunity to taste and buy local food products (e.g., pasta, organic olive oil, wine, ouzo, liquors, traditional sweets, and marmalades; Figure 4). The catering for all geopark events (conferences, meetings) is supplied by the women's cooperatives using the local traditional recipes. Their products are also sold in the museum snack bar.

Every summer the geopark organizes an agrotourism festival (attended by 28,000 visitors in 2007), which promotes high-quality local products, food, and drinks prepared by the women's cooperatives. The agrotourism festival includes a variety of presentations, events, and happenings as well as an exhibition of local products. The event brings local producers

Figure 3. Visitor centers and museums within a geopark sell local products to tourists. These products play an important role in sharing the story of a place. Photo by Heidi Bailey.





Figure 4. At a winery located inside the Lesvos Petrified Forest Geopark in Greece, the owner explains to visitors how minerals like gypsum influence the flavor of wine. Photo by Katarzyna Kozina.

and potential customers together. In this way, geopark visitors experience not only the rich natural heritage of the area and sites of high ecological and aesthetic value, but also the culture, tradition, and local production of the region. The women of the agrotourism cooperative found that this festival provided them with an excellent opportunity to promote their products, and their success led to the creation of similar cooperatives in other villages.

Lesvos Geopark contributes significantly to territorial development by directly and indirectly creating new jobs. Since 1995, people have been finding employment within its activities, such as the twenty-five seasonal positions (eight months per year) and eight permanent positions. This is in addition to the five existing positions in the Petrified Forest Park. But what is even more important for the employment in the area is the number of other opportunities that have been created in tourist enterprises, small hotels, guest houses, restaurants, and other enterprises connected with the increase of tourism to the geopark area. Several other local artisans, such as makers of handicrafts and ceramic fossil casts, carpenters, and blacksmiths, are permanent collaborators with the geopark.

Implementation, monitoring, and review To protect vulnerable geosites, Lesvos Geopark has developed a geosite monitoring system that includes custodial services to prevent abuse and vandalism, and intermittent monitoring that provides all the necessary measures and protective installations against weathering and erosion.

The monitoring system is based on the creation of a sophisticated geosite database that

contains a complete descriptive record of each geosite and all conservation measures currently being taken. The basic elements of this database are geosite location, identification, classification, description, age, land ownership, and cleaning and conservation measures.

Monitoring and review of geopark operations and services takes place regularly while an evaluation process established by the EGN and the Global Geoparks Network is done every four years. This procedure is carried out by independent auditors and takes into account geopark management with a focus on geotourism, educational and promotional activities, and improvements to infrastructure and services.

Conclusion

Geoparks address the strong need for effective management of important geosites and sustainable development of rural areas through the development of geotourism, which enhances the value of the earth heritage, its landscapes and geological formations—key witnesses to the history of life. The geoparks initiative adds a new dimension to the 1972 World Heritage Convention by highlighting the potential for interaction between socioeconomic and cultural development and conservation of the natural environment.

Lesvos Petrified Forest Geopark integrates the range of resources found in its broader region, including the existing geological tourist attractions (Petrified Forest Park, the museum, Sigri Park, and Plaka Park), the various interpreted geosites, unique landscapes, wetlands, sites of natural beauty and ecological value, as well as cultural monuments, picturesque villages, traditional gastronomy, and local products.

A broad range of activities combine the main components for the operation of Lesvos Geopark, including scientific research; creation of the geosite inventory and map; protection, interpretation, and promotion of geosites; conservation of fossils; creation of visitor parks; establishment of a network of walking trails linking geosites to ecotourism facilities; development of environmental education programs on geosites; organization of scientific and cultural events; and promotion of geosite monuments.

The results achieved by Lesvos Geopark demonstrates the potential of all geoparks across Europe to be powerful new tools for holistic nature conservation and sustainable rural development through geotourism.

References

- Eder, W., and M. Patzak. 2004. Geoparks—geological attractions: A tool for public education, recreation and sustainable economic development. *Episodes* 27:3, 162–164.
- Gray, M. 2004. *Geodiversity: Valuing and Conserving Abiotic Nature*. Chichester, U.K.: J. Wiley & Sons.
- Martini, G., ed. 1993. *Actes du Premier Symposium International sur la Protection au Patrimoine Géologique* [Proceedings of the First Symposium on Earth Heritage Conservation], Digne, France, 11–16 June 1991. *Mémoires de la Société Géologique de France, numéro spécial* 165.
- Reynard, E., and M. Panizza. 2005. Geomorphosites: Définition, évaluation, et cartographie. Une introduction. *Géomorphologie: Relief, Processus, Environnement* 3, 177–180.

- Zouros, N. 2004 The European Geoparks Network: Geological heritage protection and local development. *Episodes* 27:3, 165–171.
- . 2005. Assessment, protection and promotion of geomorphological and geological sites in the Aegean area, Greece. *Géomorphologie: Relief, Processus, Environnement* 3, 227–234.
- . 2007. Geomorphosite assessment and management in protected areas of Greece. Case study of the Lesvos island coastal geomorphosites. *Geographica Helvetica* 62:3,169–180.
- Zouros, N., G. Martini, M.L. Frey, eds. 2003. *Proceedings of the 2nd European Geoparks Network Meeting*, Lesvos 3–7 October 2001.

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Economic Effects of Geotourism in Geopark TERRA.vita, Northern Germany

Joachim W. Härtling and Irene Meier

Guest editors' note: In order to gain the necessary political and public support, geoparks have to demonstrate how they contribute to the socioeconomic development of their particular region. In addition to the other important tasks of nature protection, conservation of geologic heritage, and promotion of tourism, education, and research, geoparks have to evaluate the regional economic effects which are stimulated or increased through their activities. The results of the study presented in this paper demonstrate the considerable economic input through the activities of Geopark TERRA.vita, although no cause-effect relationship could be established due to the complex economic and political situation of the geopark.

Introduction

THE EVALUATION OF THE ECONOMIC EFFECTS OF SPECIFIC PROJECTS and/or institutions has gained considerable importance in sustainable regional development. Potential social, cultural, or ecological effects are usually not deemed sufficient reason for the political or financial support of private enterprise and/or government organizations. The demonstration of positive economic effects is an excellent option to increase public support.

Therefore, geoparks have to evaluate the economic effects of the parks themselves and of the activities stimulated or promoted by the parks. Direct effects are revenue/return, income or employment, that are directly generated by tourism in the geoparks and their immediate surroundings (e.g., lodging, dining). Depending on the quality of the database for a particular geopark, these direct effects can usually be calculated with a certain degree of confidence. Indirect effects are much more difficult to quantify, since they are estimated as a logical consequence of certain activities of the geopark or its infrastructure (Job et al. 2006).

Economic valuation of protected areas such as national parks has a long tradition, particularly in North America (WCPA 2002). Due to their homogeneity and clearly defined structure, the direct economic effects of national parks can be calculated fairly easily (e.g., entrance fees, charges for clearly defined visitor services, etc.). Geoparks—which in Europe are closely related to the nature park model—have a very different protection status than do national parks. This, along with the wide variety of goals of geoparks (education, nature protection, protection of the geologic heritage, research), as well as the close association between the cultural and natural heritage in nature parks, means that geoparks are usually much more heterogeneous than national parks. They are usually also much more heavily populated and without clearly defined borders and gateways. Therefore, the economic evaluation of nature parks/geoparks is much more difficult.

To date, no formalized method for the evaluation of the economic effects of geoparks exists (Dwyer et al. 2004; Job and Metzler 2005). In the following study of the economic effects of Geopark TERRA.vita in northern Germany (Figure 1), we propose a threefold approach that can serve as a tool box for various types of geoparks: (1) general statistical information provides a general idea of the importance of tourism in the area in which the geopark is situated, (2) added value analysis on the supply (offer) and/or the demand side provides specific information on first- and second-order expenditures of the tourists, and (3) specific data can be obtained through the sales and services of the park itself. Different combinations of these three levels should provide sufficient information even in a construct as complex as a geopark. Thus, the goal of this study is to evaluate the economic effects generated or stimulated by Geopark TERRA.vita using the triadic approach mentioned above.

Geopark TERRA.vita

The nature park Nördlicher Teutoburger Wald, Wiehengebirge, Osnabrücker Land e.V. was created in 1962 as a protected area according to section 27 of the Federal Nature Conservation Act (abbreviated as “BNatSchG” in German). In Germany, nature parks are defined as large areas with a high diversity of species and ecosystems, which are characterized by manifold land use. These areas are to be developed and maintained in a homogeneous manner. The protection status within nature parks varies: most parts of a nature park consist of nature preserves (defined in section 26 of the BNatSchG) with a limited protection status, while some areas possess the highest possible protection status as nature protection areas according to section 23 of the BNatSchG.

In 2001, the Nördlicher Teutoburger Wald, Wiehengebirge, Osnabrücker Land e.V. Nature Park was accredited as the Geopark TERRA.vita and became a member of the European Geoparks Network. In 2004, TERRA.vita became a founding member of the UNESCO Global Geoparks Network. During the same year, the geopark was credited with the Viabone license, a much-sought-after label standing for the highest quality standards.

TERRA.vita is situated in a transition zone between the hilly-to-mountainous country of the central part of Germany (Deutsches Mittelgebirge) and the Northern German Lowlands. In an area of 1,220 sq km

Figure 1. Location of Geopark TERRA.vita.



it encompasses three landscapes: Teutoburger Wald (Teutoburger Forest), Wiehengebirge (Wiehen Hills), and Ankumer Höhen (Ankum Highlands). While the first two landscapes are characterized by the low mountain country of Mesozoic age, the Ankumer Höhen represent a terminal Ice Age moraine from the Saale glaciation.

The image of the geopark is primarily defined by its geological history, but also by the natural and cultural heritage connected with it. The geologic heritage is characterized by a small-scale sequence of rocks from the Late Paleozoic at Ibbenbühren, Hüggel, and Piesberg (primarily anthracite coal and quartzites of carboniferous age) through a complete sequence of Mesozoic deposits (Triassic, Jurassic and Cretaceous sediments) to the Pleistocene and Holocene sediments. Thus, visitors to TERRA.vita can easily walk or bike through 300 million years of the earth's history within a day. Associated with the geological history are some special features of the geopark: Dinosaur tracks at Barkhausen (Bad Essen), sinter terraces at Dissen, and the sandstone sculptures near Ibbenbühren ("Hockendes Weib").

The geological resources also provide the background for a long history of mining. Anthracite coal is still mined at Ibbenbühren, quartzite from the Piesberg (Osnabrück) is used for crushed rock, sandstone and limestone have been used as building stone for centuries, and the clayey component of the basal moraines supports a considerable brick and tile industry. To explain the geological history and the utilization of these resources to the general public, old mining buildings, shafts, quarries, etc. are used as exhibits. Another important aspect related to the geological past is the presence of health spas and baths in the Teutoburger Wald (Bad Iburg, Bad Rotherfelde, Bad Laer) and the Wiehengebirge (Bad Essen). Particularly, the brines from Jurassic deposits support a developing health and wellness industry.

The area around the city of Osnabrück has been settled since the first Neolithic people changed from hunting and gathering tribes to an agricultural society around 5500 BC. Since then, the archaeological evidence shows a continuous development through the Bronze and Iron Ages, the Migration Period, and the Middle Ages until today. The most spectacular historic sites in the area are the La Tene settlement Schippenburg near Venne, the site of the Varus Battle of 9 AD between three Roman legions and several Germanic tribes under Arminius at Kalkriese, the original site of the founding of Osnabrück by Charles the Great around 800 AD, and the Rathaus of Osnabrück, where the peace treaty at the end of the Thirty Years' War was signed in 1648. Another site of particular interest for tourists is the Kaiser Wilhelm Memorial at Minden. These key sites are used to show the cultural heritage of the area with events of national or even European importance.

The program of TERRA.vita is based on the particular geological, natural, and cultural heritage mentioned above as well as the potential of the landscape for recreational activities at the transition zone from the hilly-to-mountainous country to the Northern German Lowlands. Thus, hiking and bicycle touring, which show the natural and cultural heritage to best advantage, are the main activities promoted by the geopark. In addition to access to 2,300 km of hiking trails and 1,500 km of cycling paths along points of particular interest or scenic beauty (known as "TERRA.trails"), park rangers offer a varied program of guided tours with specific topics. The program is supported by a series of museums within the park, with the Schölerberg Natural Science Museum in Osnabrück, including TERRA.vita's information center ("TERRA.vision") as its focal point.

Administration of the geopark is complex, due to the fact that it is situated partly in the state of Niedersachsen (Lower Saxony) and partly in Nordrhein-Westfalen (North Rhine-Westphalia). This means that six administrative units from two Bundesländer (states) participate in managing the geopark, supported by their respective regional development, nature protection, and tourism agencies. Other partners of the geopark are environmental associations, environmental education centers, schools, and the University of Osnabrück. The seat of the geopark is at the Department of the Environment of the Osnabrück District.

The population density, the rather fragmented layout, the diverse landscapes and land uses, as well as the complex administrative situation, have to be considered when planning an evaluation of the economic effects of the geopark. An evaluation in such a complex environment is not comparable with that of a rather homogeneous national park and, thus, a more complex methodology has to be used in the analysis.

Methods

General statistics of the area The official data on the economic effects of tourism in the area of the geopark are of limited use (Niedersächsisches Landesamt für Statistik 2007):

- The official data are collected along the political boundaries, that is, on a federal, territorial or communal level. Since the territory of TERRA.vita stretches across the political boundaries, only the communal level provides information with an adequate spatial resolution.
- Information on a communal level is limited with regard to tourism. Usually, only information on lodging with more than eight beds is provided, whereas no information is available about lodging with less than eight beds, or on dining or daily expenditures.
- The information is also limited with regard to the cause-effect relationships of this study, since no differentiation is made between economic effect of the geopark or other tourist attractions.

Therefore, the official data and additional studies carried out in the general area of the geopark (KTWE 2000; Niedersächsisches Institut für Wirtschaftsforschung 2005; Härtling 2006; IHK 2007; Sparkassenverband Niedersachsen 2007) could only be used as a comparative database.

Added value analysis An added value analysis is the method of choice when evaluating the specific economic impact of the geopark (for a discussion of other methods in impact analysis see Fletcher 1989 or Job et al. 2005). Ideally, the added value of specific endeavors is estimated by comparing the results from tourist counts and surveys (demand) with analyses of tourist-oriented services offered on a company-by-company basis (offer). The results of both the offer and the demand side can be compared, providing a more secure result from a relatively small sample. However, surveys of the offer side (e.g., dining, lodging) can only be effectively carried out in well-defined, relatively small areas (Härtling 2006). Due to the size and heterogeneity of TERRA.vita, an added value analysis on the demand side provides the more efficient tool to assess the economic importance of the geopark. Also, counts and

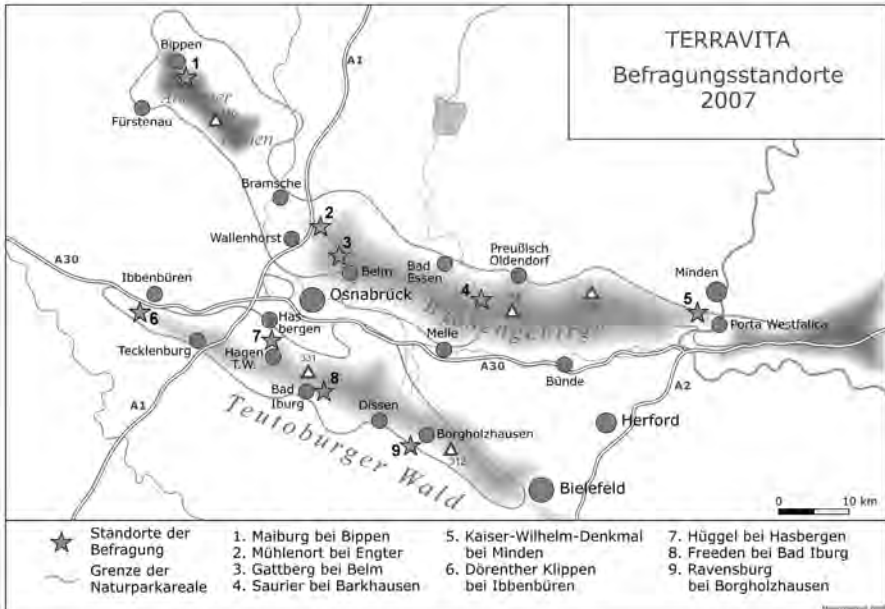
surveys of the tourists in the area can provide additional information, which can be useful for the management of the park.

In Germany, the method developed by Job et al. (2005; 2006) from the Department of Economic Geography in Munich serves as a blueprint for added value analyses in tourism. Due to the specifics of geoparks mentioned above, the method had to be adapted to TERRA.vita. Thus, counts and surveys with long, standardized interviews were carried out at nine sampling sites in the geopark while flash interviews were discarded. The interview sites (Figure 2) were chosen according to the following criteria:

- All three landscapes of the geopark should be represented according to their size and tourism potential.
- All administrative units should be represented according to their size.
- All sites should be of particular interest for tourists engaged in the activities promoted by the geopark.

Counts and surveys were carried out from 8 a.m. to 8 p.m. during the main tourist season (1 April–31 October 2007). This time span includes the Easter, summer, and fall holidays of Lower Saxony and represents the high season for the activities primarily promoted by the geopark (hiking, bicycling). The days for the counts and surveys were chosen for their representativity for the tourist season (weekdays, weekends, holidays). Based on the experience of previous studies, the results were then extrapolated to the entire year 2007 by adding 20% of the compiled data (Härtling 2006; Niedersächsisches Landesamt für Statistik 2006).

Figure 2. Sampling sites within Geopark TERRA.vita (marked with stars).



The standardized interviews consisted of an introduction with the reason for the survey, the affiliation and the assurance of anonymity as well as the formal data (interviewer, date, time, weather, additional observations). Only parts one and six of the interview deal with tourist expenditures, while the other parts refer to socioeconomic information related to other issues in parks management (for further information see Härtling and Meier 2008). In part one, the tourists are asked about the number of overnight stays (day-trippers vs. overnight tourists), the types of lodging utilized, and general costs for lodging and dining (categories only). In part six, the question was “How much money did you spend during your stay/your holidays?” and answers were broken down according to the following categories: lodging (overnight tourists only), restaurants, food shopping, general shopping, sports/leisure/cultural events, travel, visitors’ taxes, spa/medical, conferences/meetings, and additional services.

The comparison of information from parts one and six serves as a quality control for the statements of the tourists. It is important to note that in part one tourists are asked for general information in defined categories, while in part six exact quantitative data are required.

According to the method of Job et al. (2005; 2006), the numbers of tourists were extrapolated for day-trippers and for overnight tourists for the entire season. Then, the tourist numbers are multiplied by the total daily expenditure to determine the gross revenue. By reducing the gross revenue by the VAT (value-added tax) we gain an estimate of the net revenue. Since no data on the regional added value exist, those of comparative studies (IHK 2007) were used to calculate the first- and second-order economic effects by multiplying the net revenue by 0.55. This is very conservative and could, in reality, be as high as 0.70 (DWIF 2002; Tourismusverband Nordsee 2009). The employment effects can then be calculated by dividing the economic effects by the average income.

Direct effects through goods and services The direct economic effects from the sales of goods and services by the geopark are minimal: for guided tours, tourists are asked to give a small donation to the geopark. This small amount of money usually just covers the expenses of the park rangers, who work on a voluntary basis. There are also very few items (such as books, maps, and tour guides) sold at the Schölerberg Museum that can be related directly to the activities of the geopark. Thus, in contrast to the findings from national parks, this level of analysis can be discarded at TERRA.vita.

Results and discussion

A total of 10,415 tourists were counted at the nine sampling sites during the twelve survey days (Figure 3). Most tourists were walking or hiking, while only about 10% of those questioned were bicycling. During weekends, the numbers were between 20–30% higher than during weekdays. As expected, the highest numbers were counted on Sundays. During the period 26–29 July 2007 July the counts were significantly lower, which was most probably due to bad weather: the weekend days (the 28th and 29th) were very cool and it rained continually.

Figure 3 also shows the considerable locational differences in the counts. While almost 40% of the tourists were recorded at the Kaiser Wilhelm Memorial at Minden, followed by the Dörenther Klippen (26%), the Ravensburg (12%), the Großen Freeden (11%) and the

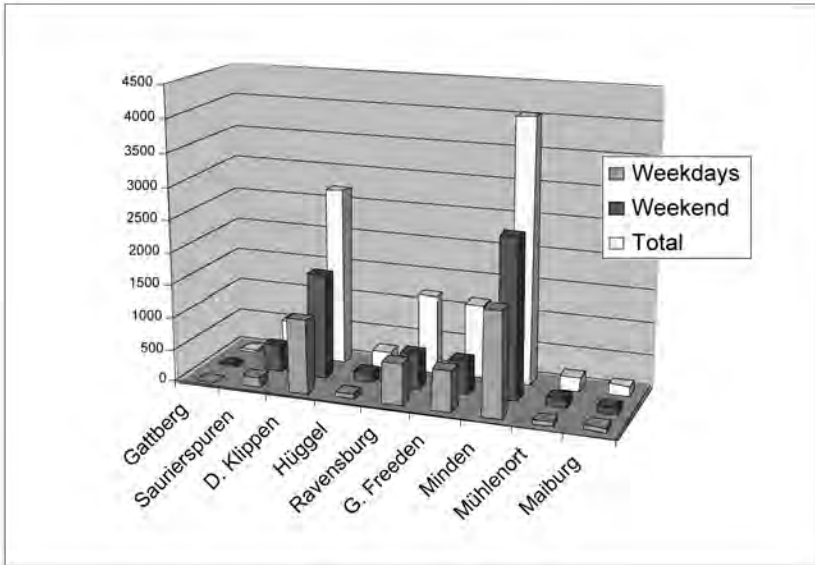


Figure 3. Number of tourists counted at the nine sampling sites in Geopark TERRA.vita.

Saurierspuren (dinosaur tracks) at Barkhausen (6%), with the other four sites being well below 2.5%. Due to illness, no counts and interviews could be carried out at Minden from 26 to 29 July. Therefore, the dominance of the site at Minden is actually much higher than is depicted in Figure 3.

A total of 636 tourists participated in the standardized interview. The locational differences (Figure 4) are staggering: 50% of the interviews were carried out at the Dörenther Klippen and the Kaiser Wilhelm Memorial, with the other seven sites showed much lower absolute numbers. At the Maiburg and Gattberg sites, only four and five tourists, respectively, were interviewed. Of particular interest is the proportion of counts to interviews: At the Hüggel site, 30% of the counted tourists were also interviewed, while the proportion was 5–10% at most sites and only 3% at the Kaiser Wilhelm Memorial in Minden. The overall proportion is only at 6% of the entire sample (10% was the proportion aimed for).

Very few tourists were either willing or able to provide specific information on their expenditures as asked in part 6 of the questionnaire. Thus, the categorized numbers in question 1.5 were used to calculate the costs for lodging in hotels with more than 8 beds and the so-called grey lodging market (because no official statistical information is registered) of hotels, spas, apartments, etc. with less than 8 beds. On average, tourists spend 45.5 Euros (€) per day in these types of lodging, while lodging in youth hostels, campsites, or with relatives/friends was estimated at €19.6 per overnight stay.

The expenditure for lodging is considerably lower than that estimated in some other studies in this part of Northern Germany (IHK 2007; KTWE 2000; Table 1). This is in part due to the fact, that our study does not include high-priced tourism options such as city-

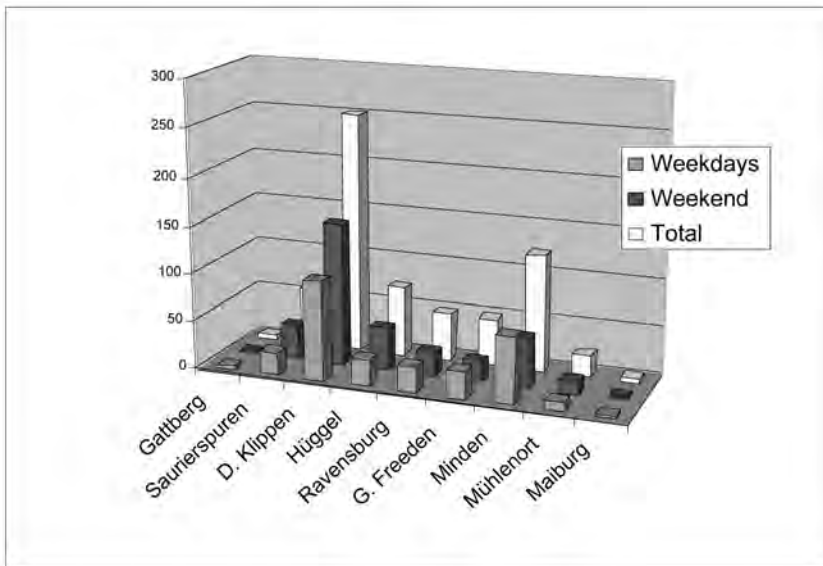


Figure 4. Number of tourists interviewed at nine sampling sites in Geopark TERRA.vita.

	This study	Regional study Osnabrück/Emsland (IHK 2007)	Hasetal (Härtling 2007)	Emsland (KTWE 2000)
Hotels (> 8 beds)	€45.5	€89.9	€41.5	€56.6
Hotels (< 8 beds)	€45.5	€47.7	€41.5	€40.1
Youth hostels / camping / relatives	€19.6	€19.6	n/a	€19.1
Daily expenditure	€36.1	€26.8	€24.1	€19.4

Table 1. Comparison of expenditures from studies of other tourist sites in northwestern Germany.

based, conference-related, or spa-focused tourism. The tourists interviewed came to the geopark primarily for activities such as hiking and bicycling, which do not require high-quality lodging. This is supported by the results of a similar study in a rural setting in the Hasetal, where activities in nature are promoted (Härtling 2006). The costs for lodging in youth hostels, campsites or with relatives/friends was comparable to those estimated in other studies in the area. The average for all types of lodging is calculated at €38.5.

In contrast, the daily expenditures (part 6 of the questionnaire: food, services, travel, etc.) are considerably higher than that in all other studies. This can, in part, also be explained by the motivation for coming to the geopark: tourists spend more money on bike rental, maps, tourist information, travels between hikes, and so on. Also, while the tourists spend relatively little money on lodging, good food at the end of a long strenuous day seems to be of major importance to them.

To calculate the gross revenue generated by tourists at the nine sites, the counts were extrapolated for the entire tourist season and differentiated between day-trippers and

overnight tourists. Thus, 100,000 tourists with at least one overnight stay and 134,000 day-trippers were estimated for the season of 2007 (numbers rounded to the nearest thousand). The counts are then multiplied by the daily expenditure to calculate gross revenue (Table 2). Thus, approximately €12.3 million in gross revenue was generated at the nine sites, resulting in a net revenue of €10.7

million and direct and indirect regional economic effects of close to €6 million. As mentioned earlier, the added value multiplier of 0.55% is very conservative. In fact, the first- and second-order effects could be as high as €7.5 million. Divided by the average income, we gain a number on the employment effects: approximately 300 FTEs (full-time job equivalents) are generated by the tourist activities at the nine sites analyzed in Geopark TERRA.vita. These FTEs equate to approximately 900 actual jobs generated or promoted by the geopark.

Summary

This study of the numbers and expenditure behavior of tourists at nine sites in the Geopark TERRA.vita shows that the activities generated or promoted by the geopark lead to considerable economic effects in the region. However, this general statement has to be modified:

- The data represent only the nine sites where the counts and interviews were carried out. The data are based on such a great site diversity that they cannot be extrapolated for the entire geopark. However, due to the number of attractions in the geopark, it can be safely assumed that the numbers could be several times those given for the analyzed sites.
- It is not possible to prove direct cause-and-effect relationships between the activities of the geopark and tourist expenditure. Most dining and lodging facilities were already in place before the creation of the geopark. However, since only tourists engaged in activities promoted by the geopark were counted and interviewed, it can be safely assumed that the activities of the geopark contribute to the economic development of the region.
- The tourist profiles show that leisure and sports activities are the main reasons for coming to the geopark. Tourists spend relatively little money on lodging, but considerable amounts on dining and additional services.
- The triadic approach offers a tool box that can be useful for the economic evaluation of a geopark. In the case of TERRA.vita, only level two offered reliable data. Currently, further studies are being carried out to determine the usefulness of information from levels one and three.

References

DWIF [Deutsches Wirtschaftswissenschaftliches Institut für Fremdenverkehr], ed. 2002. *Ausgaben der Übernachtungsgäste in Deutschland (=Schriftenreihe des DWIF 49)*. Munich: DWIF.

Total counts	234,000
Day trippers	€134,000 (x €36.10)
Tourists	€100,000 (x €74.60)
Gross revenue	€12,300,000
Net revenue	€10,700,000
Economic effect	€5,885,000
Employment effects	300 FTEs

Table 2. Calculation of the economic effects in the Geopark TERRA.vita. Numbers are rounded to the nearest thousand.

- Dwyer, L., and P. Forsyth, eds. 2007. *International Handbook on the Economics of Tourism*. Amsterdam: Elsevier.
- Dwyer, L., P. Forsyth, and R. Spurr. 2004. Evaluating tourism's economic effects: New and old approaches. *Tourism Management* 25:3, 307–317.
- Fletcher, J. 1989. Input-output analysis and tourism impact studies. *Annals of Tourism Research* 16:4, 514–529.
- Härtling, J.W. 2006. Die wirtschaftliche Bedeutung des Tourismus im “Erholungsgebiet Hasetal.” Unpublished report. Osnabrück, Germany: N.p.
- Härtling, J.W., and I. Meier. 2008. Die wirtschaftliche Bedeutung des Tourismus im “Naturpark Nördlicher Teutoburger Wald, Wiehengebirge, Osnabrücker Land e.V. (TERRA:vita).” Unpublished reports (2 parts). Osnabrück, Germany: N.p.
- Heintel, M., and N. Weixlbaumer. 2009. Die regionalökonomische Bedeutung des österreichischen Naturparktourismus. [The importance of Austrian nature parks for regional economies and tourism.] *Natur und Landschaft* 84:7, 315–321.
- IHK [Industrie- und Handelskammer Osnabrück-Emsland], ed. 2007. *Wirtschaftsfaktor Tourismus. Übernachtungen, Tagesreiseverkehr, Umsatzvolumen in der Region Osnabrück-Emsland*. IHK-Schriftenreihe no. 61. Osnabrück, Germany: IHK.
- Job, H., and D. Metzler. 2005. Regionalökonomische Effekte von Großschutzgebieten. [Impacts of large-scale protected areas on regional economies.] *Natur und Landschaft* 80:11, 465–471.
- Job, H., B. Harrer, D. Metzler, and D. Hajizadeh-Alamdary. 2005. *Ökonomische Effekte von Großschutzgebieten. Untersuchung der Bedeutung von Großschutzgebieten für den Tourismus und die wirtschaftliche Entwicklung der Region*. Bundesamt für Naturschutz (BfN) Skripten no. 135. Bonn: BfN.
- Job, H., B. Harrer, D. Metzler, and D. Hajizadeh-Alamdary. 2006. *Ökonomische Effekte von Großschutzgebieten. Leitfaden zur Erfassung der regionalwirtschaftlichen Wirkungen des Tourismus in Großschutzgebieten*. Bundesamt für Naturschutz (BfN) Skripten no. 151. Bonn: BfN.
- KTWE [Kompetenzzentrum Tourismus Weser-Ems]. 2000. *Wirtschaftsfaktor Tourismus in Weser-Ems*. Bad Zwischenahn, Germany: KTWE.
- Mose, I., ed. 2007. *Protected Areas and Regional Development in Europe*. Aldershot, U.K.: Ashgate.
- Niedersächsisches Institut für Wirtschaftsforschung. 2005. *Regionalbericht Norddeutschland*. Hannover: Niedersächsisches Institut für Wirtschaftsforschung.
- Sparkassenverband Niedersachsen. 2007. *Tourismusbarometer—Jahresbericht 2007*. Hannover: Sparkassenverband Niedersachsen.
- TERRA.vita. ed. 2007. *Lust auf Natur*. [Desire for Nature: Information and Tips for All Sites in the Nature Park]. Osnabrück, Germany: Naturpark TERRA.vita.
- Tourismusverband Nordsee, ed. 2008. *Touristisches Zukunftskonzept Nordsee 2015*. Jever, Germany: Tourismusverband Nordsee.
- WCPA [World Commission on Protected Areas] 2002. *Economic Values of Protected Areas: Guidelines for Protected Areas Managers*. Gland, Switzerland, and Cambridge, U.K.: IUCN.

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Geoparks: Creating a Vision for North America

Richard Calnan, Sally R. Brady, and Wesley Hill

Guest editors' note: At the 2009 George Wright Society Biennial Conference on Parks, Protected Areas and Cultural Sites, a panel of international experts on geoheritage presented the geoparks concept and led a discussion of how and where geoparks may be applied within the North American community of protected areas. This article presents a summary of the panel discussion. The panelists were: Robert Missotten, chief, Global Earth Observation Section, UNESCO, Paris; Tim Badman, special advisor, World Heritage Program on Protected Areas, International Union for Conservation of Nature (IUCN), Gland, Switzerland; Wesley Hill, International Secretariat, Geological Society of America, Boulder, Colorado; and Lindsay McClelland, National Park Service, Geologic Resources Division, Washington, D.C.

Introduction

THE GLOBAL GEOPARKS NETWORK (GGN) IS AN ALLIANCE of 58 parks in 18 countries, assisted by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), that provides opportunities for geotourism, interprets geological heritage, assists local economies, supports research and understanding of geological processes, and connects people to the landscape.

As defined by UNESCO, “a Geopark is an area with a geological heritage of significance, with a coherent and strong management structure and where a sustainable economic development strategy is in place . . . geological heritage and geological knowledge is shared with the broad public and linked with broader aspects of the natural and cultural environment, which are often closely related or determined to geology and landscape.”

UNESCO established the GGN in 2004 to provide an elevated global platform for cooperation among geological heritage sites. The 58 members of the GGN are located in Australia, Austria, Brazil, China, Croatia, Czech Republic, France, Germany, Greece, Ireland, Italy, Iran, Malaysia, Norway, Portugal, Romania, Spain, and the United Kingdom. North America does not contain any geoparks.

UNESCO geoparks initiative (presentation by Robert Missotten)

The World Heritage program and the Man and the Biosphere (MAB) program are internationally administered by UNESCO through a convention and a statutory framework, respectively. As of 2008, the World Heritage List contained 878 sites, 7% of which are primarily geological or morphological in nature. There are 531 biosphere reserves in 105 countries. The reserves serve as environmental research and monitoring sites.

The GGN is more bottom-up than the top-down approach of the World Heritage and the MAB initiatives. The GGN has three components: conservation, sustainable development/tourism, and education. UNESCO's role in the GGN is to provide a platform for regional and international cooperation, set standards and policy advice, give visibility and global recognition, and lend UNESCO's label of excellence. UNESCO serves in an advisory role with international experts who evaluate a geopark once a nomination is submitted. Geoparks are admitted to the GGN on the decision of the International UNESCO Geopark Conference, held every two years.

The cost associated with setting up a geopark varies. The planning and application costs are different between countries because of the expertise available, the size of the project, and the partnerships involved. The costs of preparation and running a geopark also vary and can be divided among evaluation costs, member participation costs in GGN activities and meetings, site management costs handled by local organizers, and revalidation costs every four years. These costs may be paid by foundation grants, government funds, and private investors.

Most geoparks are based around an existing park or protected area. Visits to parks once they became members of the GGN have increased by as much as 25% in some countries. Other benefits of joining the GGN include jurisdiction and participation at the local level, socioeconomic stimulus to local economy, and improved awareness by decision-makers, media, public, teachers, and young people about geologic heritage and conservation.

The World Heritage Convention and geological heritage (presentation by Tim Badman)

The World Heritage Convention was established in 1972 and is amongst the most widely accepted international conservation treaties. The convention provides for the protection of those cultural and natural sites deemed to be of outstanding universal value. As of 2008, there were 878 sites on the list: 679 are cultural, 174 are natural, and 25 are a mixture of the two. In North America, there are a total of 62 sites, of which 39 are cultural and 23 are natural. The convention is governed by an elected committee of 21 nations that reviews nominations by member countries to the World Heritage List and designates World Heritage sites. As of the time of this presentation, the U.S. and Canada are on the committee (their terms end in 2009).

To be on the World Heritage List, sites must be of outstanding universal value and meet at least one of ten selection criteria. There are two sets of criteria that the committee applies: one for cultural sites and another for natural sites. The earth science criterion (no. viii) recognizes places that are "outstanding examples representing major stages of earth's history, including record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features."

The World Heritage List has 74 properties that have been inscribed primarily under this criterion. A framework for the application of the earth science criterion has been established under the following 13 themes: tectonic and structural features; volcanoes/volcanic systems; mountain systems; stratigraphic sites; fossil sites; fluvial/lacustrine and deltaic sys-

tems; caves and karst systems; coastal systems; reefs, atolls, and oceanic islands; glaciers and ice caps; ice ages; arid and semi-arid desert systems; and meteorite impact sites. World Heritage sites can be part of a larger geopark.

Alternative mechanisms to complement World Heritage listings are necessary. The convention is highly selective and can only recognize a limited number of the most important global sites that are of outstanding universal value (“the best of the best”). Geoparks should be seen as a viable and effective mechanism to complement World Heritage listings and to recognize internationally important sites.

The geoparks initiative is still in its early days and experience is being gained in the concept. IUCN is fully supportive of its continued development. There needs to be clarity about the geoparks concept and the standards of both value and management expected of a UNESCO geopark. Also, regional networks are needed to complement the arrangements in Europe and China and to ensure a greater geographical spread of geoparks. Full local community involvement in geoparks is critical.

GSA perspective on UNESCO geoparks initiative (presentation by Wesley Hill)

The Geological Society of America’s (GSA’s) interest in geoparks is related to the following three components: conservation of our most significant geological features and sites, education of the visiting public and support of research, and promotion of geotourism to increase public interest in our geoheritage. Geoparks provide an international structure to link designated national geoheritage sites around the world under a common global umbrella. By participating in the geoparks initiative, U.S.–designated sites would be brought into the established family of global geoparks. This could provide increased opportunities for networking with site managers from around the world and provide global recognition and prestige for a U.S. geopark site.

The benefits of geopark sites include opportunities to highlight geoscience research and information to local residents, policy-makers, media representatives, and local schools; wider recognition of and a higher profile for the site; a public education spotlight on geoscience topics including volcanoes, earthquakes, tectonics, minerals, caves, and paleontology; and promotion of the site’s geological heritage and its role in the history of the local area. Geoparks provide the opportunity to increase geotourism in the area, exposing the public to a wide range of geoscience topics.

The International Union of Geological Sciences (IUGS) is one of the largest scientific organizations in the world with approximately 120 member countries. The IUGS partners with UNESCO on global geological programs and supports the UNESCO geoparks initiative. UNESCO provides endorsement of geoparks and a global networking platform, and does not have management control of any type over geopark sites. Ownership and site management lies completely with the host nation, host authorities, and local management bodies. No United Nations conventions apply to geoparks. UNESCO’s role can be best described as a type of quality branding.

The GSA, which is a member of the scientific geologic community, is interested in partnering with land managers, scientists, tourism industries, and educators to see increased

exposure and education for the geosciences through the Geoparks initiative. However, GSA cannot go about this alone and needs support to help develop the program in the U.S. In order to initiate the program in the U.S., the following is needed: interest and feedback from field sites, official approval of a U.S. geoparks program from the U.S. National Commission for UNESCO, development of a U.S. geoparks committee or working group, development of U.S. geopark guidelines, marketing of the program to interested sites, management of the application process, and funding to coordinate the U.S. committee.

GSA's possible role would be to provide assistance in developing a U.S. geoparks program strategy; help organize and participate in a U.S. geoparks working group or committee made up of land management agencies, representatives of the tourism industry, geoscientists, educators, etc.; provide assistance in managing the geoparks application process; and potentially provide support from GSA members who are geologists.

GSA has proposed that the best way to move forward in the U.S. is to budget from the top a grant program to sites that are successfully awarded geopark status. If a site is awarded geoparks status, grant funds could be given to projects such as building partnerships, developing a geoscience education and interpretive plan, or developing exhibits that focus on the geoheritage of the site. The geoparks program is not on a large scale like World Heritage, which puts forward multiple sites in one year for consideration. Each participating country only puts forward to UNESCO one to two sites every other year.

Geoparks and the National Park Service (presentation by Lindsay McClelland)

The National Park Service (NPS) is currently assessing its possible participation in a U.S. geoparks program. The agency is coordinating the effort through its Geologic Resources Division and Office of International Affairs. Briefings have taken place at the associate director's level, and NPS is working with the GSA and the U.S. Geological Survey (USGS).

NPS managers have expressed concerns about geoparks, including: the need for geoparks if NPS is already participating in the World Heritage program; the amount of work entailed, including administrative burden required for the process; possible adverse public opinion; actual benefits of geoparks designation; and demonstration of socioeconomic impacts, such as increased visitation.

Most of the World Heritage sites in the U.S. are iconic parks that are well known to the public and have high visitation. The sites generally include the entire park or are contained within the park. Examples include: Yellowstone, Everglades, Grand Canyon, Hawaii Volcanoes, Great Smoky Mountains, and others. Potential U.S. World Heritage nominations, for as long as the next decade, will be from the 2008 Tentative List, which contains mostly cultural sites but also includes two geology-focused parks (White Sands and Petrified Forest) and the Papahānaumokuākea Marine National Monument.

There may be opportunities where a geopark can complement a World Heritage site. For instance, currently many sites with great geologic significance are larger than a single park. Also, NPS may manage only a small part of the geologically significant area and other multiple-use agencies such as the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) often manage much of the remaining geologic area. The World Heritage

Convention has strict protection standards that are a poor fit with multiple-use agencies. The geoparks concept is a better fit with sites that have multiple managers, will accept certain economic uses, and does not require demonstration of global significance.

The next steps for the NPS are to work with GSA to draft U.S. geoparks criteria; assess park interest based on these draft criteria; seek information on geoparks program benefits from other nations; coordinate with other agencies such as USGS, BLM, and USFS; clarify the role of GSA and the geologic community; brief the NPS directorate and Department of the Interior officials; seek interest and support from other organizations such as the Association of American State Geologists; and prepare a multi-agency proposal for the U.S. National Commission on UNESCO and the State Department's international organizations bureau.

Given the small number of nominations that will go forward for selection, setting the criteria may be critical to determine who will apply. NPS is working with GSA on developing a set of U.S. guidelines. GSA has volunteered to host a national geoparks working group—with USGS, BLM, NPS, USFS, state geologists, and the tourism industry—to look at applications and determine which ones to forward to UNESCO for selection.

Comments by attendees

A number of comments were offered by those attending the GWS2009 session:

- Non-traditional management approaches may work for geoparks. For instance, one agency may manage a geologically significant area but then other, multiple-use agencies may manage the broader remaining geologic area.
- There may be opposition to the term “geoparks” in the U.S. by some land management agencies.
- Some of the sites, which are designated as U.S. national monuments, would be good candidates for geoparks designation, as would areas of historic mineral extraction that have the involvement of local mining communities. This could increase visitation and raise visibility for these areas.
- NPS already has a huge management structure in place and may not be able to contribute large amounts of money on an annual basis that is outside of the regular budget.
- The point of increased visitation may be a double-edged sword and may lead to problems with site management. Overuse and visitation is a problem at some national park units and nominations of these sites could potentially create greater visitation and management issues. We need to keep this in mind as we develop the process.

Conclusion

The purpose of this panel session was to introduce the new concept of geoparks to land managers in North America. Geoparks have been warmly received by communities and national governments around the world. The panel members agree that both the United States and the growing geoparks network would benefit from U.S. participation in the program. The benefits of membership in the Global Geoparks Network include increases in economic development through tourism, awareness of the earth sciences, and appreciation for the role of geology in forming our environment. The panel organizers hope that one long-

term benefit will be the stimulation of interest from students who will become the scientists and political leaders of tomorrow.

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Protection of Geological Heritage: A North American Perspective on Geoparks

Godfrey S. Nowlan, Peter Bobrowsky, and John Clague

Introduction

THE FIRST INTERNATIONAL CONFERENCE ON GEOPARKS was held in Beijing, China, in June 2004. At that conference we were immersed in the UNESCO (United Nations Educational, Scientific, and Cultural Organization) concept of geoparks for the first time. As North Americans, we take for granted national, provincial, and state parks, which are scattered throughout the continent and provide recreational and educational opportunities. The concept of parks is a long-standing one in North America, whereas the UNESCO concept of geoparks is relatively new. In this paper we compare the two kinds of parks and explore the value of both as sites of geoscience experience and education.

North American parks

Parks have been an integral part of North American life for more than a hundred years. The first national park in the United States, Yellowstone, was established in March 1872. This marked the first occasion when public lands were set aside and administered by the federal government for the purpose of preservation, recreation, and education. The government of Canada likewise has set aside national parks and national park reserves for a variety of special purposes, including recreational use and preservation of wilderness. In 1885, it established the country's first national park, at Banff, Alberta.

The long history of parks in North America has given rise to a tradition of family camping holidays that are part recreation and part education. Over the last hundred years millions of North American children have developed their first taste of the natural environment from a visit to a national or provincial park. As a result, parks have become major centers of environmental, scientific, and cultural education.

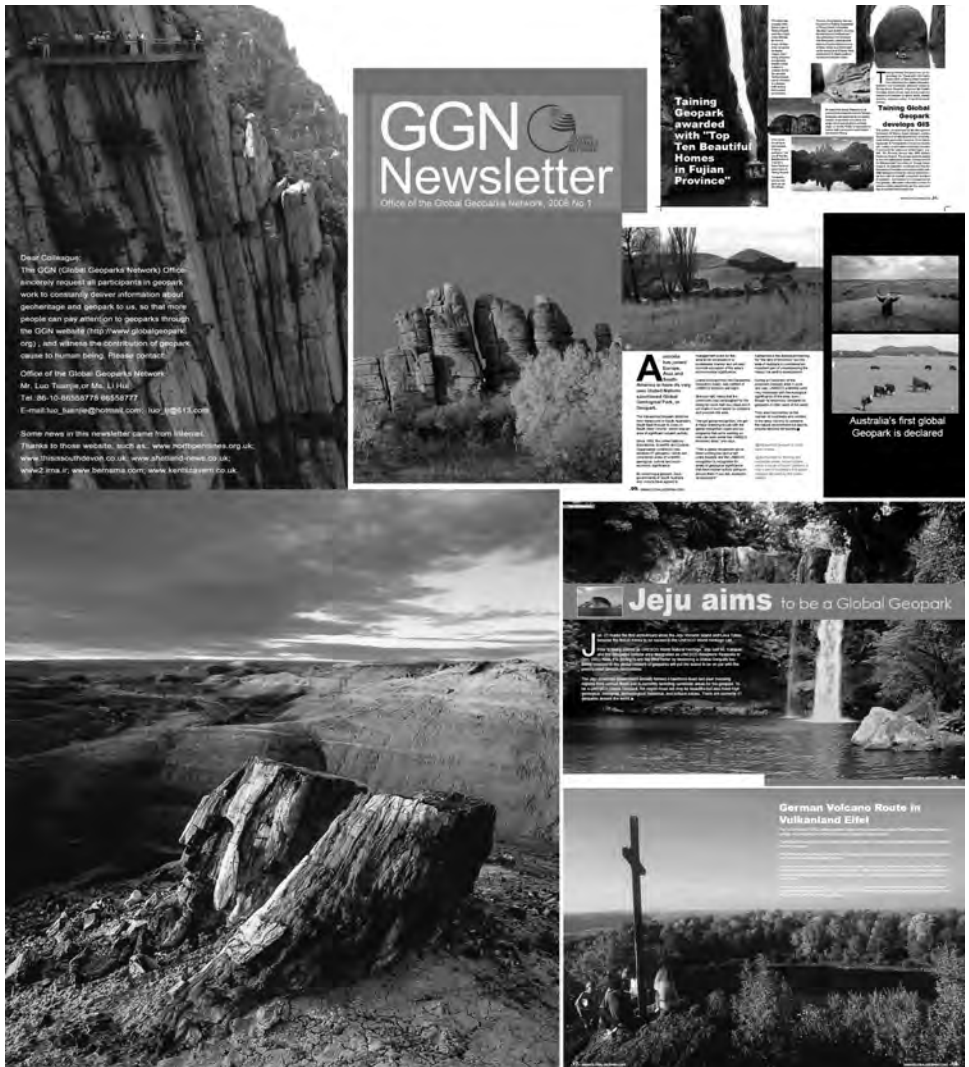
The UNESCO concept of geoparks

The concept of a geopark, as outlined in the operational guidelines published by UNESCO in 2002, is to serve the three goals of conserving a healthy environment, educating in the earth sciences, and fostering sustainable, local economic development. The ultimate goal of UNESCO's geoparks program is to provide for a better understanding of geological heritage and wise use of the earth.

A geopark is a geographically defined area containing one or more geoheritage sites selected on the basis of scientific importance, rarity, or scenic quality, or its relation to geological history, events, and processes. An added impetus of the geopark concept is to connect with local archaeological, ecological, historical, or cultural values.

One of the great strengths of geoparks is that they are all linked under one international program sponsored by UNESCO. A visitor to one geopark will be made aware of all other such sites in the world, akin to the recognition afforded to World Heritage sites (Figure 1). Another strength of the geoparks concept is that it fosters socioeconomic development in a region. The guidelines stipulate that this development must be culturally and environmentally sustainable, while encouraging local businesses and cottage industries and, ultimately, the creation of new jobs, including in geotourism. The intent is to improve living conditions and the rural environment and, in doing so, strengthen the connection of people to their land.

Figure 1. Global Geopark Network publications provide local sites with international recognition and publicity. Images are courtesy of the Global Geoparks Network website (www.globalgeopark.org).



Conservation of sites of geological interest is a core value of the geoparks program. Obviously this aspect of geoparks needs to be evaluated in the context of national and regional government regulations and in consultation with an appropriate national or regional geological survey. Once a geopark is established, it is managed by an agency or group that is responsible for the conservation of the area, including any physical maintenance.

A basic tenet of the geoparks program is to provide educational opportunities for visitors. The educational scope is broadly defined and includes not only scientific explanations of geological features but also education on broader environmental issues and sustainable development. A key element of an application for geopark status is the pedagogical program that is planned for the park and target groups.

Perhaps the most interesting aspect of geoparks is that their administration involves a broad cross-section of the community. Public authorities, local organizations, private interests, and research and educational bodies all have a say in the design and running of the park. The intent is to stimulate discussion and encourage partnerships between the different groups involved, thus developing a sense of community and empowering the local population.

In the following section we will compare the geopark system with the system of parks that has long existed in North America.

Comparison of park concepts

Parks in North America have been established to protect the natural environment or historical heritage from development. When Europeans first arrived in North America, they saw almost completely undeveloped and unspoiled lands. Parts of this undeveloped land were initially protected as parks. As development has moved to more remote areas, such as the Canadian Arctic and Alaska, the establishment of new parks has continued. In many other parts of the world, where population density has been much higher over a much longer period of time, little or no land remained undeveloped, thus there was no opportunity to protect it. This simple fact is, in essence, the difference between park development in North America and elsewhere.

The availability of undeveloped land for protection means that the philosophy of North American parks is partly different from that of geoparks. Parks in North America are areas of complete protection with only small areas set aside for development. The protection is strong and complete, and any activity to be undertaken in the park is subject to scrutiny and permitting. In this philosophical environment, the socioeconomic development that has taken place was a by-product of the process rather than something inherently favored by it. In some cases, development has reached such an extent that there is now strong debate about allowing it to continue. In Canada in particular, the amount of development that is taking place at the townsite of Banff, Alberta, which is part of the Rocky Mountain Parks World Heritage Site, is being vigorously debated. By contrast, sustainable socioeconomic development is encouraged in geoparks in Europe and China and is considered in the way the park is developed. This is a highly significant difference and allows development of parks in concert with socioeconomic concerns in the region.

A second fundamental philosophical difference is that the entire local community is

engaged in the development of a geopark. Local administration, business, educational, and research organizations all play a role. When a new national park is established in Canada, people may be moved out of the area because the philosophy is to return the area to its natural state and not to consider human interaction with the land.

A third difference between North American parks and the geoparks system is that all geoparks are interconnected, each providing reference to the others. In North America, parks have separate and different origins, which depend on the level of government that supports them. They range from the better-known national parks, to provincial and state parks, and municipal parks. There are many different categories of parks and recreation areas, and the degree of protection afforded each is different. Some, like national parks, have strong preservation and conservation focuses, whereas others allow limited forestry and oil and gas development, as well as recreation. Both North American parks and geoparks play similar roles in terms of their mandate to protect geoheritage and to educate the public. Interpretive signs and tours are hallmarks of both kinds of parks.

Scope for geoparks in North America

North America is well endowed with parks of all sorts, but we believe there is scope for geoparks in the United States and Canada. Most existing parks in North America are located in areas of exceptional natural beauty or significant historical heritage. There are, however, many other places with significant geoheritage located far from the normal tourist haunts. Many of these areas are economically depressed. The decline of the rural economy in recent years has meant the depopulation of many small towns. Such areas could benefit enormously from the establishment of geoparks. Examples include places with exceptional fossils, rocks or minerals, areas with a rich history of mining or energy development that is now complete, and remote communities in northern regions. Establishment of a geopark could increase tourism to the area and help to reverse a declining economy.

A significant advantage of geoparks over traditional North American parks is that the primary motive for establishing them is an aspect of geoscience. The park thus serves primarily as a vehicle for geoscience education. By contrast, many North American parks that are located in areas of interesting geology focus more on the ecology and biology of the area than on the geology.

Parks and geoscience education

Whatever its origin, a park presents an opportunity to educate the public if it contains significant geoheritage (Figure 2). North American parks allow for communicating many geoscience issues to the public. But how much high-quality communication occurs? And what are the messages that are communicated to park visitors? Most park educational programs focus on ecology and biology, and, on average, much less attention is paid to geology. On the other hand, geoparks are dedicated to the interpretation of geology, albeit with recognition of the ecological and cultural values in the area. The average visitor to a North American park has little understanding of earth sciences because it is not widely or consistently taught in schools. Much to the amusement of the rest of the world, we still struggle with the teaching of evolution in many areas.



Figure 2. The hallmark of a global geopark is excellence in geoconservation, sustainable tourism development, and education of the public. Photos of the Mount Lushan World Geopark in China are courtesy of the Global Geoparks Network website (www.globalgeopark.org).

One of the difficulties in communicating geoscience issues is that geology tends to get lots of negative news. Perhaps a volcanic eruption or earthquake has devastated an area and caused substantial loss of life, or maybe there has been a catastrophic flood, a landslide has blocked an important highway, or an oil spill has polluted the ocean. None of these stories provides a positive image of geology. The challenge is to provide necessary background information to people so that they come to understand earth processes better. It is important to show that earth processes, like the seasons, affect our everyday life.

A second key issue to explain to the public is the degree to which people rely on earth resources in their everyday lives. The lack of understanding of the relationship between well-being and natural resources is particularly acute in developed countries, especially among the inhabitants of large cities. Rural people, who are closer to the land, have a better intuitive understanding of our relationship to resources and the earth. Ironically, parks are commonly places where resource extraction or other land disturbance is prohibited. This, in itself, leads those with an interest in the environment to develop a negative attitude to resource industries, but the fact is that all humans rely on the extraction of resources.

We need to pass on the message that earth resources are precious and should be used wisely, and to show that they are localized such that natural processes, not human choice, dictate locations of gravel pits, mines, and oil wells. We must indicate that earth's resources are limited and should be conserved and recycled wherever possible. We should state that in many parts of the world earth resources are too cheap for us to value them properly. For example, car fuel has been so inexpensive in North America that people have bought larger and heavier cars than in the past. Now, with rising fuel prices, people are beginning to understand how much energy they use.

A teacher can play the game of “find the resources” with schoolchildren, in which the challenge is to find something in the classroom that is not made from a resource that came from the earth. In this game it is easy to demonstrate that everything in the classroom comes from the earth. This is the type of activity that should be conducted with families in parks so that they get a better understanding of their reliance on earth materials and learn to respect all aspects of the issue, from exploration to exploitation to clean-up.

What better place to begin this process of education than at parks of all sorts? Geoparks have an advantage over traditional North American parks in that their philosophy of preservation includes human interaction with the earth. Indeed, some geoparks, e.g., the Copper Coast in southeastern Ireland, are based on the historical extraction of minerals from the area.

At least three groups of people can be educated through parks. First, there are the politicians who make decisions on the preservation of park land. It is very important that geoscientists provide information to politicians so that they can make better, more informed decisions. In Canada, we work the legislatures and try to connect with politicians in their electoral districts. In the United States, geoscientists have taken politicians on field trips. Such trips provide an opportunity to cultivate productive working relationships between scientists and decision-makers. The second group is the general public, which is the largest group of park visitors and yet perhaps the most difficult to educate. It is difficult to reach everyone in such a diverse group, thus it is probably best to focus on the third group, children, who are, after all, the planet's most important natural resource.

Parks are wonderful places to provide hands-on activities for children, providing experiences that they will remember through their adult years. There is a long tradition of park interpreters providing programs for families in North American parks but, sadly, these are much more limited than they used to be. Many park interpreters are formidable musical or dramatic performers that amuse and educate at the same time. Parks are also wonderful locations for teaching teachers, which is perhaps the most cost-effective and least time-consuming way of getting important geoscience messages out to the public. Each teacher who understands something about the earth can pass that information on to his students. If they are passionate about what they teach, they will leave an indelible mark on the generation under their instruction.

In all the educational activities that take place in parks we must let people know that earth scientists do sophisticated work to locate resources, understand earth processes, and develop plans for the environmentally responsible and sustainable development. Our profession needs more respect on the world stage.

Interpretation of the earth through parks of all types can result in a number of societal benefits. These include a better-informed electorate that is more sympathetic to science, better-informed decision-makers, people who live in greater harmony with the earth and use earth resources wisely, and children that grow up to be more attuned to the earth, its resources, and processes.

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The Future of North American Geoparks

Heidi Bailey and Wesley Hill

Introduction

GEOPARKS HAVE PROVEN TO BE HIGHLY SUCCESSFUL IN OTHER PARTS OF THE WORLD, particularly in Europe and China. The greatest strength of the geopark initiative is the attention it brings to earth heritage resources and the resulting socioeconomic development that occurs in rural areas. The future of the North American geoparks has yet to be decided. Because the geopark idea differs from other park concepts in North America, land managers and the public will likely have many questions about the program. This article addresses some of these questions and is intended to help further the discussion about the future of North American geoparks.

What would be the structure of a North American geopark?

A geopark is a destination identity similar in concept to a national heritage area. Geoparks are defined by the underlying geology of the landscape and transcend the boundaries of parks and other protected areas. A geopark operates as a partnership of people and land managers working to promote earth heritage through education and sustainable tourism.

A North American geopark will not be a new category of protected area. The land remains entirely in the hands of local people and existing land management systems. Local, state, or national governments retain control of the public lands within a geopark. Private land remains in the hands of private owners. When an area is designated a geopark, it is managed through a bottom-up partnership approach.

Does a geopark only focus on geology?

A geopark is not just another geology park. A geopark encompasses a large geographical setting that includes not just geological sites, but also natural areas and cultural regions. The literal translation of “geo” is “earth,” and geoparks could also be described as earth-parks. They are areas where the earth’s processes have significantly affected ecosystems and human development.

How does a geopark differ from a World Heritage site?

The geoparks initiative differs from other United Nations Educational, Scientific, and Cultural Organization (UNESCO) programs such as the World Heritage and Man and the Biosphere programs. Countries wishing to join the geoparks initiative do not sign an official convention of any type, nor are sites required to participate. Furthermore, UNESCO does

not have any management jurisdiction over geoparks but serves strictly in the role of providing quality control for the international guidelines and designation criteria.

The majority of World Heritage sites are localities designated for their historical or cultural value. Geoparks typically embrace larger regions and might even include a World Heritage site within its boundaries. The reason for developing a separate initiative for geoparks is that many geoheritage sites of exceptional value do not meet the selection criteria for the World Heritage List.

What are the goals of the geopark initiative?

The geoparks program addresses several issues. First, people in rural areas often suffer from economic losses when traditional industries decline. This creates a need for alternative economic development strategies. Second, locals and visitors alike do not recognize the impact of geological heritage on the existence of ecosystems and the development of cultures. This creates a need for educational programs that employ inventive communication techniques.

Third, geological landforms are often ignored or appreciated only for their shape or aesthetic appeal. The names and histories of geological objects may be limited to colloquialisms and myths. Without an understanding of the science behind geodiversity, many people do not see the importance of geoconservation. People accustomed to protecting living plants and animals may be uninspired by inanimate rocks.

Figure 1. The U.S. contains numerous geological sites of international significance, such as Florissant Fossil Beds National Monument in Colorado. Many of these sites are not primary tourist destinations and can benefit from inclusion in a geopark. Photo by Heidi Bailey.



Why should North America be interested in the geoparks initiative?

Geoparks have the potential to spur economic development while conserving and promoting geological heritage sites. The U.S. contains many landscapes of national and international significance. Many of these sites are not primary tourist destinations (Figure 1). The geoparks initiative provides an opportunity for the U.S. to capitalize on this rich heritage to stimulate tourism in depressed areas.

The U.S. is experiencing an economic downturn. Fuel prices are fluctuating and the cost of living is higher. People will be seeking travel experiences closer to home and they will be attracted to something new. In addition, the growing popularity of geoparks around the world will make sites in the U.S. a draw for international visitors.

The geoparks initiative offers a way to revitalize small towns and jump-start the tourism industry in undervalued areas. And since a geopark is not a type of public land, it does not require a new agency or a large amount of funding to manage it. A geopark is a strategy for marketing and branding a region's existing programs and infrastructure. The goal is to create a new destination identity while promoting geoheritage education and conservation.

What will it cost?

The European Union (E.U.) has invested a significant amount of funds in the European geoparks program. However, the U.S. should not base cost estimates on the European model. The E.U. has needed to purchase land, construct trails, and refurbish buildings to use as visitor centers to jump-start their program. The U.S. is already blessed with an established system of protected areas, trails, and visitor centers.

A U.S. geopark system would enhance programs and infrastructure that are already in place. Costs would include assembling a geopark partnership and management plan, joint marketing and promotional materials, hosting a two-person evaluation team to approve the site as a geopark, sending a representative to meetings or conferences, and periodic reporting.

Who will manage the geoparks program?

In the U.S., the Geological Society of America has volunteered to assist with forming a national geoparks working group of agencies, geologists, nongovernmental organizations, educators, and the tourism industry. This working group would coordinate efforts with UNESCO and oversee the U.S. application process.

How will sites apply to become a geopark?

A geopark is created through a bottom-up, grassroots initiative. The people living in an area decide if they want to take on this challenge for the benefit of their communities. A geopark can be established by a volunteer coordination team made up of citizens, managers of public lands, businesses, universities, tourism enterprises, conservation groups, and scientific organizations. This team would create an identity for the area as an internationally significant geoheritage site. This team may already exist in the form of a scenic byway partnership or tourism association.

These local stakeholders work together to define a geopark's boundaries, create a desti-

nation identity, enhance educational programs, link sites to a menu of tourist experiences, and form a network of sustainable visitor services. Once this is in place, a site may choose to apply for membership in the Global Geoparks Network. Representatives of the Geological Society of America and the National Park Service are currently working on a set of guidelines that will outline the membership requirements and set forth application procedures.

What are the benefits?

One benefit is the international prestige that comes with earning UNESCO global geopark status. People living in economically depressed areas profit when tourists and governments recognize the value of these places. This creates an incentive for young people to build a future in their local areas due to increased employment prospects.

A second benefit is the exchange of ideas and resources. Geoparks have the opportunity to join in collaborations with sister sites around the world. For instance, the Vulkaneifel Geopark in Germany and the Hexigten Geopark in China formed a partnership to share research findings, management practices, and training programs.

A third benefit is the protection of geological sites, natural areas, and cultural traditions. When people are made aware of the beauty and fragility of the earth's resources, preservation and conservation programs thrive.

What are the challenges?

Due to differences in land management policies, North America faces a number of challenges in adapting the European model to create a geoparks network. Money for the European Geoparks Network was provided by the European Union in the form of regional development grants. In North America, financial support for protected areas is usually scarce and creative funding methods would need to be developed. It may be difficult to garner political support as public officials are faced with budget cutbacks and other urgent issues.

A second challenge is that communities may initially resist the geopark idea due to preconceptions about the term "park." In the U.S., people strongly identify the term "park" with city, county, state, and national parks. Thus, the term "geopark" may not be appealing to people representing agencies and interests outside of the park system. In addition, people may fear that establishment of a geopark will lead to issues of eminent domain and restrictions on land use.

Why would North America want to be involved with this UNESCO initiative?

The overall goal is to recognize and protect our outstanding geological heritage sites while also creating a new identity for a region as an internationally significant site. The Global Geoparks Network is a cooperative initiative and membership is entirely voluntary. Sites apply for geopark status to gain recognition and support from UNESCO, but other than setting membership guidelines, UNESCO does not have a role in management. Acceptance into the Global Geoparks Network is an accolade that fosters local, regional, and national pride in the host country. Local people benefit from the prestige of achieving geopark status and the mark of quality indicated by the Global Geoparks Network brand.

What are some examples of programs that existing geoparks offer?

Many European geoparks offer programs to promote earth conservation, education, and tourism. Among the most popular are:

- **GeoCulture** The most innovative aspect of a geopark is the focus on culture. Geoparks sell local products, train local guides, and encourage local communities to provide services. Geoparks focus on the relationship of geology to cultural elements, such as the distinctive flavors of regionally produced wine. Trips to castles, monasteries, and other historic buildings are a highlight. Geoparks also celebrate musicians, writers, and artists whose work is inspired by the landscape.
- **GeoRoutes** European geoparks are areas that encompass large landscapes with a shared geological heritage. Visitors are encouraged to explore these landscapes by following routes that link various geological sites. GeoRoutes offer driving tours or walking/cycling trails that focus on the geology and unique landforms of a region. The routes provide an opportunity to promote sustainable tourism in towns located within a geopark.
- **GeoRecreation** Geoparks offer outdoor recreation activities that allow participants to actively celebrate earth heritage by engaging in geology-oriented adventures. Geoparks add a thematic element to ordinary recreational activities such as hiking, mountain biking, kayaking, rafting, rock climbing, horseback riding, and even paragliding. These activities are often referred to as GeoAdventures and may be offered by local tourist providers.
- **GeoKids** Geoparks offer programs for kids with activities related to geology and landscape. For example, older children are involved in geoparks through the Rock Detectives program and younger children are engaged by cartoon characters that go on adventures (Figure 2). These characters introduce geology in storybooks and puppet shows and are quickly becoming important mascots for members of the European Geoparks Network.

What are the greatest strengths of the geopark initiative?

The most appealing aspect of the geopark concept is the inclusion of people as an integral part of the equation. Local history—including extraction and exploitation of geological resources—is respected as part of a region’s heritage. In addition, living culture is embraced along with the natural environment. Too often preservation and conservation programs exclude the needs of the people living in the local area. A geopark seeks to balance both.

The strength of the geopark initiative is in its ability to foster socioeconomic development by drawing international attention to a region. The theme of a geopark is *Celebrating Earth Heritage—Sustaining Local Communities*. Businesses within a geopark integrate their products into the geological heritage of an area. Geoparks create tangible economic benefits for residents by promoting these local products and services.

Why would geoparks be attractive to tourists?

To create a high level of interest as a tourism destination, geoparks intermingle earth science

Figure 2. Young children join characters such as Willi Basalt and Fiora Eocene on geologic adventures through the geoparks. Images courtesy of Marie-Luise Frey.



themes with cultural and natural themes. For instance, wine tasting tours offer a glimpse into the effect of minerals on the flavor of wine. A nature center program reveals how the habitat of a favorite animal is directly influenced by the shapes of landforms. An art exhibit demonstrates the ways that elements of the landscape are reflected in different artistic periods. Geoparks are attractive to tourists because of their focus on the relationship between people and the landscape.

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Are the U.S. and Canada moving toward a system of geoparks?

In 2005, researchers from the U.S. toured several Chinese earth heritage sites to see if members of the Global Geoparks Network differed from other geological parks in China. The researchers found that “sites designated as World Geoparks were vastly superior in terms of protecting geological heritage, balancing economic and tourism development, and educating the public” (Partin, Robinson, and Meade, 2006:16).

In 2007, a meeting at the U.S. State Department Office of UNESCO Affairs first brought together representatives of the Geological Society of America, the National Park Service, and the Bureau of Land Management to discuss the geopark initiative. The core working group met again in 2008 and in 2009 the George Wright Society hosted a panel discussion on geoparks at its biennial conference.

Currently, the U.S. is in the process of gaining further information, garnering support, and drafting program guidelines. As a U.S. geoparks program will look slightly different from other national systems, several U.S. government agencies and scientific organizations are researching and discussing the benefits of inclusion in the global initiative.

Representatives from Canada attended the First International Conference on Geoparks that was held in Beijing in 2004. Since that time, Canada has been engaged in a similar process of gaining further information and garnering support.

What types of sites would apply?

Geoparks are large regions unified by the outstanding geology of the landscape. An example of a region that might apply for geopark status is the Gold Belt Tour National Scenic Byway in Colorado. The area encompasses world-famous fossil sites, the remnants of extinct volcanoes, a gold mining district, crystalline basement rocks, layered sedimentary rocks, uplifted mountains and ridges, and deeply eroded canyons.

Sites of geological interest such as the Gold Belt Byway attract only a small portion of the tourist population visiting the surrounding area. By creating a new identity that links the geology to the cultural and ecological attractions in an area, the region has an opportunity to

attract a larger amount of tourists. In addition, visitors to geoparks around the world will be made aware of the site.

What are the application requirements?

Although U.S. and Canadian guidelines have not yet been developed, the requirements will likely be similar to UNESCO's. A summary of the international guidelines follows.

Setting and size A geopark must have well-defined boundaries and encompass a large enough area to sustain local economic development. Geological sites may include rocks representative of historic earth processes, mineral resources, fossils, individual landforms, or entire landscapes. Sites with a relationship to geology and landscape themes may also be included. These include places of ecological, archaeological, historical, or cultural significance.

Management A geopark is managed by a partnership entity such as a scenic and historic byway association. Core areas within a geopark are managed as parks, forests, wilderness areas, wildlife refuges, or other existing public land designations. Sites within a geopark must have management and interpretive plans to protect the resources and to make geological features accessible to the public.

Economic development Geoparks partner with local people to encourage culturally and environmentally sensitive tourism. Members of a geopark promote local products and sponsor cultural events centered on earth heritage. Geoparks have the potential to create new jobs by stimulating the growth of small businesses and training local people as guides or other service providers.

Education Members of a geopark must offer educational programs to universities, school children, and the public. Geoparks provide field trips to students and create resource materials for teachers. Sites within a geopark communicate earth science concepts to the public through interpretive centers, tours, trails, and media.

Protection and conservation The people and governments of a nation protect geological resources in accordance with existing traditions and legislative requirements. Quarrying or mining sites are operated according to existing national or international regulations. Geoparks work with local craftspeople to create casts, imprints, and other products to discourage the collecting and unsustainable trade of geological objects.

Reporting and periodic review Members of the Global Geoparks Network provide updates about the ongoing work of the geopark in order for UNESCO to publish educational and tourism information about the site. In addition, each site receives a review every four years to ensure the geopark is continuing to fulfill membership guidelines.

Conclusion

The United States is viewed internationally as a leader in site protection and park management. Thus, UNESCO and the Global Geoparks Network are eager for the U.S. to join this global conservation initiative. It is important to note that while the UNESCO World Heritage program is governed by a binding international treaty, the geoparks initiative is not. If the U.S. approves a geoparks program, participation at the local level is entirely voluntary

and private property rights are honored. The next step for the U.S. is to initiate discussion with sites that are interested in the program and to develop a set of guidelines.

References

- Frey, M-L, K. Schafer, G. Buchel, and M. Patzak. 2006. Geoparks—A regional, European and global policy. In *Geotourism: Sustainability, Impacts and Management*, D. Newsome and R. Dowling, eds. Oxford, U.K.: Butterworth-Heinemann, 95–117.
- McKeever, P.J., and N. Zouros. 2005. Geoparks: Celebrating earth heritage, sustaining local communities. *Episodes* 28:4, 274–278.
- Partin, C., S. Robinson, and B. Meade. 2006. Geological heritage in Chinese parks: Balancing protection and development. *FOCUS on Geography* 49:3, 10–16.
- UNESCO [United Nations Educational, Scientific, and Cultural Organization]. 2008. *Guidelines and Criteria for National Geoparks Seeking UNESCO's Assistance to Join the Global Geoparks Network*. Beijing: UNESCO.

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Reaching Conservation-oriented goals: Perspectives from the 2008 Park Break Program at Delaware Water Gap National Recreation Area

Carena J. van Riper and Michelle P. Dela Cruz

MANAGEMENT OF THE NATIONAL PARK SYSTEM is replete with complex challenges. Teaching the next generation of park scientists, managers, and conservation professionals about the intricate interrelationships between natural and human systems is of great importance. The future of protected area management is particularly dependent on the opportunities provided to young scholars to learn about park administration, conservation policy, and the research process, especially given increasing demands for natural resources, diversifying visitor populations, and demographic shifts in the work force. To address this challenge, in 2008 the George Wright Society organized a field seminar program in cooperation with the National Park Service (NPS), U.S. Geological Survey (USGS), Texas A&M University, Colorado State University, and the Student Conservation Association. This program, titled “Park Break,” enabled a select number of graduate students to engage in conversations with park managers, conservation and recreation scientists, administrators, and other professionals through field and classroom activities in national park settings.

In 2008, the inaugural year of Park Break, we were fortunate to be part of a group that went to Delaware Water Gap National Recreation Area, one of four host parks. The session at Delaware Water Gap was designed around the theme of conservation policy in natural resources and visitor management. A variety of invited experts from local, regional, and national levels exchanged perspectives with eight national and international graduate students, exploring past NPS policies, major challenges facing the parks, and key tenets of the political system that influence park decision-making.

Structure and design

This article, from the perspective of two Delaware Water Gap Park Break fellows, uses conservation policy as a lens to examine six components of park management that fall within the context of ecological systems and visitor experiences: (1) sensitive ecological resources, (2) non-native and invasive species, (3) water resources, (4) outdoor recreation, (5) environmental interpretation and education, and (6) cultural resources. To explore these six components, we utilized the knowledge gained in our preparation for the 2008 Park Break program, our on-site experiences, and conversations shared with park managers, local stakeholders, and guest speakers.

We begin this essay with background information on both the underlying policies that

help govern management decisions in the NPS and the context of the Delaware Water Gap National Recreation Area. In the following section, we discuss the six components mentioned above. More specifically, we explain how Delaware Water Gap has integrated these aspects of management into decisions about natural, cultural, and historical resources. Finally, we present lessons that we learned throughout the Park Break program. We hope that our description of the strategies and approaches applied at Delaware Water Gap will help park managers more effectively address common challenges associated with protecting the integrity of the national park system.

National Park Service policy

Management policies provide a framework to help guide decisions about public resources that fall under the purview of NPS. Decisions about park management are grounded in a complicated yet artfully constructed mandate, the Organic Act of 1916. This act directs NPS to “promote and regulate the use of ... national parks, monuments, and reservations ... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same ... as will leave them unimpaired for the enjoyment of future generations” (16 USC 1). The agency is thus challenged with an inherently contradictory charge to preserve the America’s most precious natural resources and maintain the quality of the visitor experience (Winks 1997).

All NPS administrators must, in addition to the 1916 Organic Act, take into consideration a complex mix of other directives and a hierarchy of laws, regulations, and policies that help govern management of park natural resources and visitor experiences. In addition to federal mandates such as the Organic Act, appropriate use of resources at the individual park level are determined by the legislation set forth in each park’s enabling statutes. Various designations of NPS units (e.g., national recreation area, national historical park, national seashore) help managers to prioritize their efforts, in that policies concerning preservation versus visitor access often differ. For example, a national recreation area emphasizes the visitor experience and, as such, may face challenges in terms of public relations. In a national park, the answer for many questions regarding activities and consumptive uses of natural resources is “you cannot do that here.” In national recreation areas however, the answer, more often than not, is “yes but” and the “but” is where all of the controversy arises (John Donahue, personal communication, June 9, 2008).

Delaware Water Gap National Recreation Area

Delaware Water Gap National Recreation Area is located in Pennsylvania and New Jersey, in close proximity to several large population centers in the eastern United States, including New York City and Philadelphia. Embedded in the metropolitan area that runs from Washington, D.C., to Boston, Delaware Water Gap is the tenth-most-frequently-visited U.S. national park. One of the driving considerations to designate Delaware Water Gap as an NPS unit in 1965 was preserving the scenic and resource values of the Delaware River. The Middle Delaware Scenic and Recreational River was designated thereafter in 1978. The river spans 331 miles, 40 of which are included in the national wild and scenic rivers system within Delaware Water Gap (Wild and Scenic Rivers Act Amendments 1978).

As with many other NPS units, the history establishing Delaware Water Gap was controversial. In 1955, a major flood occurred in the Delaware River Valley and the U.S. Army Corps of Engineers responded with a proposal to construct the Tocks Island Dam. The intent of this project was to provide flood control, create a water supply and recreation area, and generate hydroelectric power (Albert 2005). The resulting reservoir would have flooded nearly 60,000 acres that were partially occupied by private landowners. Congress authorized the proposed dam in 1962 but abandoned the project due to problems with geology, high cost during the Vietnam War, and a local grassroots movement that opposed construction (Shukaitus 2007). In 1965, Congress established Delaware Water Gap in place of the Tocks Island Dam and recreation area, leaving the Delaware River as the last major undammed river in the eastern United States.

Environmental components of management

Sensitive ecological resources In our discussions with managers and other guest speakers during and after the 2008 Park Break program, a number of environmentally relevant components of management emerged, the first of which related to sensitive ecological resources. The National Park Service is charged to protect native flora and fauna, restore former native populations extirpated by human activity, and minimize anthropogenic impacts to individual animals, populations, and ecosystems (NPS 2006). Given the susceptibility of rare and/or fragile species, this aspect of NPS management is particularly important to ensure that natural resources are unimpaired for future generations.

To manage for this first component, Delaware Water Gap decision-makers have identified areas in the park that require special attention and taken steps to minimize unnecessary biophysical impacts, despite the challenges (e.g., temporary closures for visitors) associated with maintaining sensitive resources. The Delaware Water Gap park staff has been engaged in managing wetlands and protecting state-listed species such as timber rattlesnakes (*Crotalus horridus*), wood turtles (*Glyptemys insculpta*), and Jefferson salamanders (*Ambystoma jeffersonianum*). Managers have also monitored habitats such as river bedrock, cactus barrens, and shale cliff outcrops. A number of federally protected species are also monitored, including bald eagles (*Haliaeetus leucocephalus*), peregrine falcons (*Falco peregrinus*), bog turtles (*Clemmys muhlenbergii*), and Indiana bats (*Myotis sodalis*). Human activity is prohibited and/or redirected to minimize disturbance near nest sites and other areas used by rare, threatened, or endangered species. Several examples include restrictions on hang-gliding near known timber rattlesnake habitat, swimming near wood turtle habitat, and road traffic during the seasonal migration of salamanders.

Park managers at Delaware Water Gap are also taking an active role in managing a hemlock-dominated forest that is declining due to infestations of two non-native insects: the hemlock woolly adelgid (*Adelges tsugae*) and elongate hemlock scale (*Fiorinia externa*). Upon establishing permanent forest monitoring plots to track infestation levels and hemlock health, empirical research attributed the loss of hemlocks to insect infestation. From 1993–2006, 28% of hemlock trees in the monitoring plots died, with a predicted 80% mortality by 2022 (Evans and Shreiner 2008). Management responses to this issue have included releasing biocontrol agents, applying insecticides to thousands of individual trees and herbicides

to suppress invasions of non-native plants, constructing deer fences, and initiating reforestation projects.

Non-native and invasive species The second component of environmental management at Delaware Water Gap that we would like to highlight relates to non-native and invasive species. One definition of exotics species is “those species that occupy or could occupy park lands directly or indirectly as the result of deliberate or accidental human activities” (NPS 2006). Exotic species should be prioritized within a management plan, because of their ability to displace native plants, reduce biodiversity, and alter ecosystem functions (Vitousek et al. 1997; Stohlgren et al. 1999). One potential solution that park managers might consider to combat the spread of non-native species includes identifying indicators of stress, such as loss of species and increased numbers of threatened or exotics species (Jarvis 2007).

The spread of invasive and non-native species has been identified as a particularly relevant component of management at Delaware Water Gap given its linear shape and limited land base. The park’s resource management and science division at is going to great lengths to eradicate invasive species and has taken a landscape-level approach to minimize the probability of introducing non-native plants. The park’s efforts to create contiguous open space more amenable to harboring endemic flora and fauna is challenging because the Pennsylvania side of the Delaware Water Gap is largely dominated by private land. However, park managers have engendered public and political support through collaborations with permittees and lessees to clear invasive species from cultivated lands that exist in areas designated for agriculture. By including the cost of acquiring property from willing sellers in the planning process, the park has connected tracts of open space and created buffer zones to more effectively manage for non-native plant invasion.

Water resources The final component of environmental management that we found to be relevant at Delaware Water Gap related to water resources. Maintaining high standards for surface- and groundwater in NPS units is important for both aquatic and terrestrial ecosystems, especially given the limited hydrological resources available to most U.S. population centers (Pimental et al. 1997; Vörösmarty et. al 2000). NPS is mandated to protect park waters in accordance with local, state, and federal regulations such as the Clean Water Act; work with governmental bodies to obtain the highest standards; and cooperate with other agencies to maintain and restore water resources (NPS 2006).

Managers at Delaware Water Gap have consistently prioritized high water-quality standards and have been monitoring the Delaware River since the late 1970s. Through public outreach and education, both legislators and the public have acknowledged the benefits derived from maintaining high water-quality standards that affect public health, quality of life, and recreational opportunities such as boating, swimming and fishing. As a “bottom of the watershed” park that includes 40 miles of a designated scenic and recreational river under the Wild and Scenic River Act, this resource plays an integral role in the conservation of a host of species. For example, the dwarf wedgemussel (*Alasmidonta heterodon*) is a federally endangered species that is highly sensitive to flow regulation of the river.

Park managers at Delaware Water Gap have demonstrated that maintenance of exceptionally good water quality can be accomplished through sustained monitoring and partner-

ships with outside entities such as the Delaware River Basin Commission (DRBC) and the USGS. The DRBC and USGS have worked closely with park managers to monitor water quality and use the resulting data to create regulatory standards that prevent unnecessary degradation. In 1992, the DRBC officially designated the Delaware River and its tributaries within and surrounding Delaware Water Gap as outstanding basin waters and subsequently instituted special protection regulations to prohibit declines in existing water quality. Public health standards through state and federal regulations on public drinking water have also influenced water quality at the park, because the upstream river corridor that feeds into the park is diverted to provide drinking water for New York City.

Social components of management

Outdoor recreation In our discussions with managers and other professionals who presented at the 2008 Delaware Water Gap Park Beak session, outdoor recreation was emphasized as a central component to management of park visitor experiences. Providing opportunities for the greatest number of people to enjoy park resources in perpetuity, while limiting unnecessary environmental impacts, are key ingredients in conservation policy that should be prioritized in management agendas. In particular, supporting recreation science can help determine how much change should be allowed to take place within the resource (e.g., environmental conditions), social (e.g., visitor crowding), and management (e.g., interpretive signage) dimensions of opportunities for visitors (Manning 2007).

Park managers at Delaware Water Gap have strategically planned for appropriate levels of use and development by anticipating the levels of impact associated with recreational activities and settings. For example, Delaware Water Gap managers have constructed a well-planned trail system that provides access to visitors, clearly directs traffic to discourage off-trail use, and avoids creating unnecessary social trails at popular, high-use areas in the park. In addition, special use permits and fees have been implemented to limit resource impact, allow for monitoring of sensitive resources, and fund services and/or maintenance of facilities. The park has also responded to over-utilization of resources at popular destinations such as points along the Delaware River used for swimming, canoeing (e.g., Bushkill-Dingmans Ferry, Milford, Smithfield Beach in Monroe County), and waterfall trails. In areas where user fees are collected, temporary closures have been instituted when capacity levels are reached.

Environmental interpretation and education Environmental education and interpretation are important components of visitor management in NPS. Environmental interpretation can be defined as the communication of ideas that express certain qualities and clarify meanings of a given area while building relationships between people and the environment (Ham 1992). Interpretation is used by NPS to educate the public about park resources and provide justification for actions such as temporary closures (Marion and Reid 2007). The agency also employs interpretation to conceptualize themes focused on political and historical significance, and convey the values associated with the agency's mission (NPS 2006).

At Delaware Water Gap, we found that a variety of interpretive devices have been utilized to communicate NPS ideals, including guided tours, community education, signs, and exhibits. For example, the Pocono Environmental Education Center, a private non-profit

organization, has worked with the park to provide environmental and cultural education for park visitors to become more familiar with natural resources in and around Delaware Water Gap. The center attracts a variety of youth and other members of the public from local and regional areas and aims to encourage conservation ethics through environmental interpretation. Additionally, historical re-enactments are available to the public at the home of Gifford Pinchot, the first chief of the U.S. Forest Service. The majority of Park Break meetings were held at this locale, and all participants in the program were able to view interpretive demonstrations of Pinchot's life.

Cultural resources The final component of visitor management that we would like to highlight relates to the preservation and interpretation of cultural and historical resources. NPS is challenged to remain in compliance with federal laws protecting cultural resources, while maintaining accurate representations of the communities that identify with and surround the park areas. More specifically, the agency is mandated to understand, document, and evaluate cultural resources; integrate cultural resources management and communication with researchers into planning strategies; and protect and provide opportunities for public enjoyment of cultural resources (NPS 2006).

Historical and cultural resources, such as structures and related properties either owned or managed by NPS, play an important role in the scope of management at Delaware Water Gap. There are 550 buildings under the jurisdiction of the park that contribute to the cultural landscape, 39 of which have been identified as historic and/or significant. This collection is approximately the thirteenth largest in the national park system. While the park recognizes that the commemorative histories associated with these buildings are valued by the public, there have been budgetary constraints and limits on personnel to repair and maintain these facilities.

Cultural resources management at Delaware Water Gap is a sensitive topic among community members, in part due to the history that unfolded during the formation of the park. The Army Corps of Engineers acquired much of the land to establish Delaware Water Gap using eminent domain, and some local community members have consequently directed negative attitudes toward the government (Shukaitus 2007). Because community members who were displaced by plans to build the Tock's Island Dam have expressed the desire to protect and maintain historic buildings, Delaware Water Gap management has taken steps to form partnerships within the community and sustain these special places. For example, one historic area managed by Delaware Water Gap, Millbrook Village, illustrates the lifestyle of the surrounding community during the 19th century. This site comprises approximately 25 original and reconstructed buildings that come alive through interpretation by park staff and volunteers. Visitors can witness and participate in period demonstrations of crafts and skills, in which volunteers of the Millbrook Village Society proudly highlight the stories of local history.

Lessons learned

In the 2008 Park Break program, we learned a number of lessons concerning the management approach taken at Delaware Water Gap. Overall, we believe the park has been largely successful in protecting the integrity of the natural environment while providing high-quality

ty visitor experiences. We found three efforts employed at the park to be particularly effective in overcoming the challenges associated with applications of conservation policy: (1) inventorying and monitoring park conditions, (2) communication of NPS ideals among park staff members and public constituencies, and (3) strategic management actions (see Table 1).

Conclusions

We would like to highlight Delaware Water Gap’s strong focus on building collaborations because we feel this has been instrumental in helping the park achieve its conservation-oriented goals. Park administrators have taken into consideration the challenges associated with managing relatively limited and narrow tracts of land. Through collaborative efforts, buffer zones and wildlife corridors have been created—an initiative directed personally by the park superintendent. Inventorying and monitoring of water quality, stream fish and macroinvertebrates, and amphibian populations have been undertaken in partnership with USGS scientists, and opportunities for environmental education have been offered through cooperation ventures with the Pocono Environmental Education Center, local community members at Millbrook village, and U.S. Forest Service employees. At the national and state levels, Delaware Water Gap management has forged mutually beneficial relationships with the National Parks Conservation Association, Trust for Public Lands, The Nature Conservancy,

Table 1. Summary of lessons learned at Delaware Water Gap National Recreation Area during the 2008 Park Break program.

Lessons Learned	Applications to park and protected area management
Inventorying and monitoring park conditions	<ul style="list-style-type: none"> - Complete thorough management inventories and relevant monitoring to set regulatory standards, document invasive species and identify at-risk ecosystems - Designate areas of low and high use, monitor access points, and support research on visitor preferences for management - Conduct “cutting-edge” research that links inventories and monitoring directly to management decisions - Establish anti-degradation water quality standards ▪ Focus efforts on particularly susceptible resources and institute more stringent practices during important periods
Communication of NPS ideals among park staff and public constituencies	<ul style="list-style-type: none"> ▪ Communicate reasons for management actions through environmental interpretation and education ▪ Share information with other decision-makers and researchers ▪ Hold workshops for public constituencies to foster a conservation ethic, connect community with historic and cultural resources, and highlight the benefits potentially derived from park resources ▪ Instill a common vision among park staff that builds and maintains leadership
Strategic management actions	<ul style="list-style-type: none"> ▪ Be proactive and set regulatory standards to prevent impairment of park resources before problems arise ▪ Identify areas of concern to potentially compensate funding constraints ▪ Rely on empirical support for guidance on decisions ▪ Build positive relationships with public, private, and nonprofit organizations to create wildlife corridors and connect protected areas through land acquisition ▪ Take a landscape level approach to science and management

and Pennsylvania Department of Conservation and Protection. The park's dedication to collaborative management has also helped spread the NPS mission and teach today's youth important lessons about natural resources management, as reflected by its involvement in the Park Break program, which has fostered a sense of stewardship among the leaders of tomorrow.

While Delaware Water Gap management has been largely successful from our perspective, we believe that the park could more effectively further the NPS mission with a stronger focus on a recreation science program that would allow them to better understand the biophysical and experiential impacts associated with visitor use (Cole 2006). For example, adopting Visitor Experience Resource Protection (VERP) or Limits of Acceptable Change (LAC) frameworks would help to establish a baseline understanding of visitor preferences for management, monitor conditions over time, and ensure the continuance of high-quality experiences. An updated general management plan would contribute to the park's ability to accomplish this end by identifying aspects of management that could be strengthened. While these recommendations may bring to light a few challenges still to be addressed at Delaware Water Gap, our intention is to demonstrate how the park may further integrate the strategies outlined in the essay into management priorities for resource stewardship and visitor experiences.

As 2008 Park Break fellows, we found that Delaware Water Gap National Recreation Area is reaching toward its conservation-oriented goals through successful inventorying and monitoring of park resources, communication of NPS ideals among park staff and public constituencies, and strategic management actions. Six components of management emerged in our experiences surrounding Park Break, and the strategies applied at the park provided valuable insights into the complexities associated with park management. We have presented the methods employed at Delaware Water Gap to encourage critical thinking about common challenges and common solutions in NPS management.

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References

- Albert, R.C. 2005. *Damming the Delaware: The Rise and Fall of Tocks Island Dam*. University Park, Pa.: Pennsylvania State University Press.
- Cole, D. 2006. Visitor and recreation impact monitoring: Is it lost in the gulf between science and management? *The George Wright Forum* 23:2, 11–16.
- Evans, R., and J. Shreiner. 2008. Research, monitoring, and management of eastern hemlock forests at Delaware Water Gap National Recreation Area. In *Fourth Symposium on Hemlock Woolly Adelgid in the Eastern United States*, B. Onken and R. Reardon, eds. FHTET-2008-01. Morgantown, W.Va.: U.S. Department of Agriculture–Forest Service, 70–80.

- Ham, S.H. 1992. *Environmental Interpretation: A Practical Guide for People with Big ideas and Small Budgets*. Golden, Colo.: North American Press.
- Jarvis, J. 2007. An inarticulate truth: Communicating the science of global climate change. *The George Wright Forum* 24:1, 82–90.
- Manning, R. 2007. *Parks and Carrying Capacity: Commons without Tragedy*. Washington, D.C.: Island Press.
- Marion, J.L., and S.E. Reid. 2007. Minimising visitor impacts to protected areas: The efficacy of low impact education programmes. *Journal of Sustainable Tourism* 15:1, 5–27.
- National Park Service. 2006. *Management Policies 2006*. Washington, D.C.: National Park Service.
- Pimentel D., J. Houser, E. Preiss, O. White, H. Fang, L. Mesnick, T. Barsky, S. Tariche, J. Schreck, and S. Alpert. 1997. Water resources: Agriculture, the environment, and society. *BioScience* 47, 97–106.
- Shukaitus, N.M. 2007. *Lasting Legacies of the Lower Minisink*. East Stroudsburg, Pa.: The author.
- Stohlgren, T.J., D. Binkley, G.W. Chong, M.A. Kalkhan, L.D. Schell, K.A. Bull, Y. Otsuki, G. Newman, M. Bashkin, and Y. Son. 1999. Exotic plant species invade hot spots of native plant diversity. *Ecological Monographs* 69:1, 25–46.
- Vitousek, P.M., C.M. D'Antonio, L.L. Loope, M. Rejmanek, and R. Westbrooks. 1997. Introduced species: A significant component of human-caused global change. *New Zealand Journal of Ecology* 21, 1–16.
- Vörösmarty, C.J., P. Green, J. Salisbury, and R.B. Lammers. 2000. Global water resources: Vulnerability from climate change and population growth. *Science* 289, 284–288.
- Winks, R. 1996. The National Park Service Act of 1916: A contradictory mandate? *Denver University Law Review* 74:3, 575–624.

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Keeping Up with the Mountain: The Challenge and Prospect of an Adjusted Management Paradigm

Sarah Stehn

Background

SOCIETAL COMPREHENSION OF CLIMATE CHANGE has come a long way in the past ten years. As media coverage increases, politicians, scientists, managers, and average citizens now openly discuss how future scenarios may alter their day-to-day lives. While details about the severity of climate change come into view (e.g., IPCC 2007), protected area managers in particular have begun to recognize that changing climatic conditions will require alteration of even their most commonplace management strategies now and into the future (Peterson et al. 2003; Welch 2005; Baron et al. 2008). Management policies will require more flexibility and an increased focus on supporting tenets of ecological resilience rather than maintaining current conditions (Baron et al. 2008). Established, but non-traditional strategies, such as adaptive management, which incorporate trial-and-error learning with management practice (Holling 1978), and scenario-based planning, which involves envisioning and preparing for a variety of possible scenarios (Peterson et al. 2003) will need to take precedence over reactive management strategies. Additionally, since previous practice will no longer be a suitable guide for current management policy, a continued commitment to science-based management will be necessary (Baron et al. 2008).

Elevation and climatic gradients in mountainous areas make them especially vulnerable to climate change as hydrologic patterns in snow-dominated systems are already exhibiting drastic modification (Dyer and Mote 2006). Predicted by some as the harbinger of climate change, increased frequency and intensity of regional storm events (IPCC 2007) has challenged the current structure and response of county and municipal emergency, utility, and wastewater management systems in the United States. Although generally not considered centers of human life or property, federally owned lands are one of America's greatest resources, and given their common proximity to, or enclosure of dramatic natural features, certain areas have experienced striking modification of glacial or hydrological cycles at least partially attributable to climate change, causing unexpected damage to the nation's cultural and natural resource base. As protected area managers work to repair infrastructure damage from past events, and curtail damage from future events, the need for re-evaluation of management goals and procedures specific to each federal unit has become apparent.

Mount Rainier National Park (MRNP), in Washington state, is one federal land unit that has already made strides toward an adjusted management paradigm. Damage by recent unprecedented storm events has humbled National Park Service (NPS) personnel, forcing them to develop creative new solutions to the same problems they had previously success-

fully managed year after year, but which now are increasing in intensity and frequency. Although somewhat limited by the current funding structure, a growing number of employees are committed to making changes, not just for the weather and climate of today, but toward a more sustainable and adaptable management regime.

Management cannot be static

Charged with protecting natural and cultural resources within boundaries that were often set without ecological considerations in mind, protected area managers are well aware of the fact that they must consider forces acting outside of their jurisdiction (Nordstrom et al. 1990; Pringle 2000). For example, many protected areas have partnered with local gardening groups to educate people about the benefits of native plant landscaping instead of using exotic species that may escape into nearby public lands and negatively impact native habitats. In addition to these spatial considerations (e.g., exotic species introduction from outside management boundaries), managers should also have some awareness about how temporal considerations may affect their management strategies, especially in light of projected future climates. Just as scientists from many disciplines have come to view the earth, its habitats and processes, as non-static, protected area managers should also come to view their management strategies as dynamic to allow for in-step adaptation as required by the landscapes and features they protect.

Glacial melting and retreat influenced by a warming climate has been well documented over the past century in MRNP (Veatch 1969; Burbank 1982) and is an excellent example of the acceleration of a natural process that has created an unpredictable and complicated management scenario that will not be resolved by a static management strategy. Rapid glacial retreat has increased sediment available to the five major rivers and their tributaries that drain the Mount Rainier watershed. Debris-rich stagnant glacial ice left behind by retreating glaciers is an important source of sediment for debris flows (Walder and Driedger 1994)—fast-moving flows of saturated, unconsolidated debris resembling wet concrete. Since 2000, the retreating Van Trump glacier on the south side of Mount Rainier has produced multiple catastrophic debris flows that have led to riverbed aggradation. The bed of the Nisqually River, draining the Van Trump glacier, has risen as much as six feet in a single debris flow event as a result of this aggradation (Halmon et al. 2006), which now allows high-flows of debris to spread out of the riverbed and into surrounding forest, causing drastic and unpredictable damage to both natural resources and park infrastructure. The increased potential for catastrophic damage and the increased frequency of debris flows and floods in MRNP has required park personnel to begin to realign their management strategies. MRNP personnel are working on a solution to these difficult problems because park operations depend on it. The storm and flood events of November 2006, for example, required a six-month closure of the entire park to repair road and culvert damage and ensure visitor safety (NPS 2008). Park personnel have found that a status quo strategy is no match for management concerns of this extent.

Collaborations are key

One of the ways in which holders of the current management paradigm have attempted to

deal with unexpected challenges, such as those described above, is through increased collaborations. Recognized as not just an ecological challenge but as a cultural and intellectual one, the scope of climate change and its effects requires developing a shared vision among multiple agencies and regional groups (Baron et al. 2009). With the addition of partners to a management strategy or plan, the potential for active contributions from different perspectives will generally increase, thereby lowering the possibility of maintaining a static management regime. If collaborators are open-minded, the addition of partners from outside the normal realm of operation will especially contribute to new management directions.

The National Park Service prides itself on its efforts toward increased collaborations, and countless projects have been completed nationwide that highlight the importance of partnerships in sustaining the NPS mission (Kempthorne 2007). Although paradigm shifts are always difficult, moving away from traditional reactive management strategies will require special attention to collaborators and their role in the process. However, decreased funding in recent years has altered relationships among collaborators in some areas. Previously, collaborations may have consisted of one agency seeking monetary contributions from other groups to complete its trophy project that would purportedly provide benefit to all groups as a whole. Now, more frequently, agencies and other groups in crisis mode pool their money and resources together to complete the minimum required project. In the following sections, I will look at examples of recent collaborations in MRNP, exploring one set of collaborations that appears to limit potential shifts in management strategies, and one that seems to have fostered them. By examining both scenarios, individual managers may be able to draw attention to and thus harness the positive aspects of collaboration even in perceivably difficult situations.

Fixing what isn't broken: Challenges in preparing for the "new" inevitable

With all collaborations, communication and the development of a shared goal are very important. Collaborators must state their goals clearly and allow discussion of objectives to build consensus among participants (Margerum 2008). In cases where collaborations are by necessity, either because of funding limitations as mentioned above or due to jurisdictional constraints, such as with state or federal highways that may provide access within protected areas, a common goal may be quite difficult to attain. Even when collaborators are in agreement, current funding structures may limit their ability to financially support the action.

Returning to MRNP, where flood and debris flow damage has reached new levels, park personnel have proposed a series of hedging strategies to reduce perceived flood damage potential in a shift towards a more proactive management strategy. Hedging strategies are best employed when you have a limited ability to control variables affecting the resource (Peterson et al. 2003), and in this case would include permanent log jams and other stream betterments. Hedging strategies are proactive measures taken in response to perceived threats. Such strategies have been proposed in MRNP to reduce the potential for catastrophic flooding rather than waiting for the flood to happen and repeatedly cleaning up after it.

The problem is that this type of management action, a forward-thinking solution beyond the status quo, may be difficult to garner support for. Collaborators or other park personnel may view the action as unnecessary, too precautionary, or fixing something that

isn't broken. However, as can be expected with all climate-related changes, managing processes so that they fluctuate only within the historic range of variability is no longer appropriate (Baron et al. 2009) and this type of action, project by project, is exactly where the paradigm begins to shift. Any progress made to allow for extreme events will most certainly be a good investment. However, even though hedging strategies such as those proposed at MRNP are likely to save money and resources over the long run, in the short term they may cost more than the traditional reactive management action, and in fact may not qualify for funding from some sources. For instance, much of the flood and debris-flow damage in MRNP impacts state roads, and state and federal highway commissions are a major funding source and retain jurisdiction on road repairs in many cases. Betterments to road surfaces, culverts, and bridges may be an appropriate hedging strategy in the case of increased repeated floods, but only certain types of improvements qualify for federal funding (USDOT 2005). Additionally, procedures for allocation of funding from upper-level agency offices may not be compatible with needed funding amounts or timing of disbursement that could be necessary for the adjusted management action.

To avoid repeated conflicts and frustration related to attempts at an adjusted management paradigm, a culture of trust between NPS personnel and supporting agencies will be required to implement these non-traditional but increasingly necessary practices (Baron et al. 2009). At MRNP, there has been serious realization and discussion of this challenge, and park personnel recognize that any new management project that does happen should be considered an educational opportunity to encourage other agencies and collaborators to work through the challenges. As a part of the NPS Centennial Challenge (an initiative that offers funding to prepare parks for another century of operation and management), leading other agencies in environmental stewardship and sustainability is a stated goal of the NPS (Kempthorne 2007), so the challenge should be well received. Moreover, because the development and strengthening of regional partnerships will increase in importance due to the multiple scales at which species and processes respond to climate change (Baron et al. 2008), progress toward this point made now will certainly be helpful in inevitable future endeavors.

Volcano preparedness: Success at preparing for the “old” inevitable

The ironic thing about the recent flooding events is that, although MRNP is a headwater park containing multiple glaciers that are likely susceptible to even slight changes in climate, Mount Rainier itself is first and foremost an active volcano, and management preparedness for volcanic hazards is significant. Excellent research projects, monitoring plans, educational programs, and multi-partner collaborations are currently in place to improve the safety of nearby communities in the event of an eruption—one that may not occur for another thousand years. Meanwhile, the next big flood that comes down the Nisqually River may take out the historic Longmire area, the headquarters and base of operations for much of MRNP.

This is not to suggest that a volcanic event endangering the lives of 80,000 people living in Mount Rainier's lahar zones (the river valleys that would drain volcanic induced mudslides) is necessarily comparable to a debris flow with the potential to damage MRNP's natural and cultural resources. However, it is an interesting case of how scale and perception can influence management paradigms and how multi-partner collaborations over time can work

to foster paradigm shifts. Volcanic events are drastic, quick, and could affect millions of people; thus, they maintain a high public profile. Flooding events are common and to some extent expected in most river systems, whether it be a 10-, 50-, or 100-year flood; thus most communities have developed some sort of emergency plan to deal with the consequences. It is the middle category of events, one step below “not in my lifetime” eruptive or non-eruptive volcanic events, and one step above decadal or multi-decadal flooding, that has sent managers scrambling for solutions and instigated thoughts toward more proactive management approaches at MRNP. Although these locally significant floods and debris flows may not qualify as regional disasters, managers may be able to glean hints for adaptation from larger-scale plans for volcanic hazards.

The *Mount Rainier Volcanic Hazards Plan* was originally published in 1999 and currently is undergoing revision (PCDEM 2008). The first step of developing such a plan was establishing a working group that included representatives from as many affected entities as possible. Working groups serve in many capacities to start discussions necessary for development of specific common goals instrumental in successful and productive collaborations. Publication of the *Mount Rainier Volcanic Hazards Plan*, and others like it, have sparked major increases in public education, the identification and recruitment of additional interested collaborators, and a rise in public awareness and political support, thereby setting a higher bar for future dedicated multidisciplinary efforts. The plan includes sections defining the problem, establishing response scenarios, preparing mitigation strategies, and preparing for community recovery after the event. Although the changing hydrological patterns at Mount Rainier present events of different temporal and spatial scales, managers could take a similar approach to planning for them. Significant attention should be paid to the exhibited usefulness of collaborations, such as the establishment of a working group, which can specifically identify current problems and progress toward a common goal and a future adapted management strategy in whatever capacity possible.

The role of individual managers

The situation at Mount Rainier is just one example of changing conditions requiring adjusted management strategies. Many other protected areas are also experiencing climate-related changes that have overwhelmed previous management policies and required quick thinking to continue operations. In Rocky Mountain National Park for example, severe droughts have weakened conifers (van Mantgem and Stephenson 2007), leaving trees more susceptible to increasingly severe insect outbreaks (Hicks et al. 2006), and large swaths of dead trees now increase fire and windfall hazards, threatening existing structures, facilities, and campsites. NPS personnel have rushed to manage the hazard, routinely having to close campgrounds for hazard tree mitigation (NPS 2009a). However, climate change is by no means the only culprit in the need for an adjusted management paradigm. Shifts in the political and social atmosphere also require consideration towards their potential effect on management practices. For example, shifts in visitor numbers or demographics may make current visitor protection plans inefficient or obsolete, and the increased use of technologies such as computers, cell phones, and video games has already set the standard for how young visitors may expect to engage with park resources.

The good news is that NPS has already shown adaptability to changing paradigms, coming from both inside and outside the agency. Management policies have evolved in response to both newly available knowledge and altered social and political desires. There has been a substantial evolution of management philosophy since NPS's 1916 founding (Baron et al. 2009). For instance, the wildlife feeding, wildlife culling, and strict fire suppression activities that dominated NPS policy for decades are now replaced by more moderate policies backed by current scientific research. Not too far from MRNP, park personnel and numerous collaborators at Olympic National Park are undertaking the largest dam removal in America to date to return salmon to the Elwha River (NPS 2009b). Previously considered a compatible use, the dams are now recognized as a failure to meet the mandates of the park's enabling legislation.

These successful efforts and many others that have encouraged and allowed for previous adjustment of management paradigms are driven by individuals such as George Melendez Wright, who is credited with first bringing scientific research into the realm of park management (Sellars 2000). Wright's work provided new perspective that challenged traditional assumptions and practices, and although it took decades for his vision to be realized fully, and he encountered much resistance, each step he made was significant for the progress of the NPS as a whole (Duncan 2009). This sort of creativity and resolve is what the NPS needs from individuals to make the broad changes necessary to continue to protect and preserve our national parks, and, in the case of MRNP, keep them open to allow for a safe visitor experience.

Conclusion

Climate change effects are becoming easier to visualize on the landscape as research and monitoring continue to take place in protected areas worldwide. Although some climate-related changes are slow and nearly imperceptible on a day-to-day scale, in other areas, such as MRNP, the changes may contribute to a drastic alteration of ecosystem processes or functions that require immediate management action. These locations are leading the charge in adjustment of current management paradigms. Moving toward a more quickly adaptable management regime that consistently considers proactive strategies instead of reactive ones may be necessary for continued resource protection in these particularly susceptible protected areas. Although existing and potential management-related collaborations can present challenges for adapting tried-and-true management strategies, benefits of such collaborations far outweigh the difficulties, and will become increasingly important as climate change progresses. Because it is on the individual level that much regional collaboration occurs, day-to-day interactions between park personnel and collaborators should be laced with gentle educative opportunities that flow both ways to try to reach common understandings (Welch 2005). In this way, trust and a common management goal can be reached so that slowly, if not surely, participating collaborators will be working toward the same type of change, greatly increasing the effectiveness and scope of current management strategies by building a more adaptable and proactive management paradigm suitable for tomorrow's rapidly changing landscapes.

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References

- Baron, J.S., S.H. Julius, J.M. West, L.A. Joyce, G. Blate, C.H. Peterson, M. Palmer, B.D. Keller, P. Kareiva, M. Scott, and B. Griffith. 2008. Some guidelines for helping natural resources adapt to climate change. *IHDP Update* (February), 46–52.
- Baron, J.S., L. Gunderson, C.D. Allen, E. Fleishman, D.H. McKenzie, L.A. Meyerson, J. Oropeza, and N. Stephenson. 2009. Options for national parks and reserves for adapting to climate change. *Environmental Management* 44:6, 1033–1042.
- Burbank, D.W. 1981. A chronology of late Holocene glacier fluctuations on Mount Rainier, Washington. *Arctic and Alpine Research* 13, 369–386.
- Duncan, D. 2009. George Melendez Wright and the national park idea. *The George Wright Forum* 26:1, 4–13.
- Dyer, J.L., and T.L. Mote. 2006. Spatial variability and patterns of snow depth over North America. *Geophysical Research Letters* 33, L16503: doi:10.1029/2006GL027258.
- Holling, C.S. 1978. *Adaptive Environmental Assessment and Management*. Caldwell, N.J.: Blackburn Press.
- Halmon, S., P. Kennard, S. Beason, E. Beaulieu, and L. Mitchell. 2006. River bed elevation changes and increasing flood hazards in the Nisqually River at Mount Rainier National Park, Washington. Paper presented at the American Geophysical Union Fall Meeting 2006.
- Hicke, J.A., J.A. Logan, J. Powell, and D.S. Ojima. 2006. Changing temperatures influence suitability for modeled mountain pine beetle (*Dendroctonus ponderosae*) outbreaks in the western United States. *Journal of Geophysical Research* 111, G02019: doi:10.1029/2005JG000101.
- IPCC [Intergovernmental Panel on Climate Change]. 2007. *Climate Change 2007—The Physical Science Basis: Summary for Policy Makers*. Cambridge, U.K.: Cambridge University Press.
- Kempthorne, D. 2007. *The Future of America's National Parks: A Report to the President of the United States*. On-line at www.nps.gov/2016/. (Accessed March 22, 2009.)
- Margerum, R.D. 2008. A typology of collaboration efforts in environmental management. *Environmental Management* 41:4, 487–500.
- Nordstrom, K.F., N.L. Jackson, and J.P. Tiefenbacher. 1990. Threats to beach resources and park boundaries caused by shoreline migration in an urban estuarine park. *Environmental Management* 14:2, 195–202.
- NPS [National Park Service]. 2008. *Mt. Rainier National Park, November 2006 Flooding*. On-line at www.nps.gov/mora/parknews/november-2006-flooding.htm. (Accessed May 18, 2009.)
- . 2009a. *Rocky Mountain National Park, Changes at Glacier Basin, February 20,*

2009. On-line at www.nps.gov/romo/parknews/pr_02-20-09_glacier_basin.htm. (Accessed June 2, 2009.)
- . 2009b. *Olympic National Park, Elwha Ecosystem Restoration*. On-line at www.nps.gov/olym/naturescience/elwha-ecosystem-restoration.htm. (Accessed May 20, 2009.)
- PCDEM [Pierce County Department of Emergency Management]. 2008. *Mount Rainier Volcanic Hazards Plan, Working Draft, October 2008*. On-line at www.co.pierce.wa.us/pc/Abtus/ourorg/dem/EMDiv/Mt%20Rainier%20VHRP.htm. (Accessed June 2, 2009.)
- Peterson, G.D., G.S. Cumming, and S.R. Carpenter. 2003. Scenario planning: A tool for conservation in an uncertain world. *Conservation Biology* 17, 358–366.
- Pringle, C.M. 2000. Threats to U.S. public lands from cumulative hydrologic alterations outside of their boundaries. *Ecological Applications* 10:4, 971–989.
- Sellers, R.W. 2000. The significance of George Wright. *The George Wright Forum* 17:4, 45–49.
- Walder, J.S., and C.L. Driedger. 1994. Rapid geomorphic change caused by glacial outburst floods and debris flows along Tahoma Creek, Mount Rainier, Washington, U.S.A. *Arctic and Alpine Research* 26:4, 319–327.
- Welch, D. 2005. What should protected area managers do in the face of climate change? *The George Wright Forum* 22:1, 75–93.
- USDOT [United States Department of Transportation, Federal Highway Administration]. 2005. *Emergency Relief Manual, Chapter 2: Eligibility of Damage Repair Work*. On-line at www.fhwa.dot.gov/reports/erm/ermchap2.htm#d2f. (Accessed June 2, 2009.)
- van Mantgem, P.J., and N.L. Stephenson. 2007. Apparent climatically induced increase of tree mortality rates in a temperate forest. *Ecology Letters* 10:10, 909–916.
- Veatch, F.M. 1969. *Analysis of a 24-year Photographic Record of Nisqually Glacier, Mount Rainier National Park, Washington*. U.S. Geological Survey Professional Paper no. 631. Washington, D.C.: USGS.
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Sustainable Management of the Crown of the Continent Ecosystem

Tony Prato and Daniel B. Fagre

Introduction

FEDERAL AND STATE PROGRAMS HAVE BEEN INITIATED to restore large, degraded ecosystems such as the Great Lakes, Chesapeake Bay, Everglades, Puget Sound, and the Gulf of Mexico. Considerable attention has also been given to sustainable management of large rivers, such as the Columbia, Colorado, and Missouri. Although these areas are deserving of ecological restoration and sustainable management, there is increasing recognition of the need to preserve relatively intact ecosystems and their connectivity in the Rocky Mountain West, such as the Crown of the Continent Ecosystem (CCE) that is shared by Canada and the United States (Mahr 2007; Figure 1).

The CCE shares many of the attributes and faces many of the same threats as the rest of the Rocky Mountain West that includes Arizona, Colorado, Idaho, New Mexico, Montana, Nevada, Utah, and Wyoming in the U.S., and Alberta, British Columbia, and Yukon Territory in Canada. The Rocky Mountain West contains a variety of flora and fauna that occupy a range of ecoregions from the desert grasslands in New Mexico to the prairies in Alberta and the alpine-tundra in the high mountain areas (Elias 2002). The human population of the region occupies both sparsely populated rural areas and densely populated urban areas. Large tracts of federal land account for 46% of the region's total land area (Whitney et al. 2005; World Almanac 2005).

The region is experiencing rapid population growth and economic development because its scenic landscapes and open spaces (i.e., environmental amenities) attract residents and visitors who find it a desirable place to live, work, and play and an escape from the fast-paced, high-pressure, congested environments of metropolitan areas (Rasker et al. 2004; Carruthers and Vias 2005). Between 1990 and 2000, the population of Colorado, Idaho, and Utah increased 23%, and the population of Alberta, British Columbia, Montana, New Mexico, and Yukon Territory increased between 10% and 15% (Travis et al. 2002). During the 1990s, the population of the U.S. portion of the Rocky Mountain West grew more than 25% (Riebsame et al. 1997), and two-thirds of the counties in the region experienced population growth that exceeded the national average (Beyers and Nelson 2000). During the same period, 5 of the 10 fastest-growing states and 9 of the 15 fastest-growing counties in the U.S. were in the Rocky Mountain West (Fagre 2000). From 1982 to 1997, two million acres of agricultural, forested, and open lands in the U.S. portion of the Rocky Mountain West were converted to urban, suburban, and exurban uses, which is the principal form of development



Figure 1. Map of the Crown of the Continent Ecosystem. Source: Prato and Fagre (2007b).

in the region (Carruthers 2000; Esparaza and Carruthers 2000; USDA 2002; Vias and Carruthers 2003).

Rolston (2005) attributes such growth to the way people respond to the natural world. He states: “Those who live in the Rockies find that nature becomes a defining part of our existence, palpably affecting our sense of presence.... The beauty of this landscape is that the human residents thereon are daily set in a world not entirely developed by human artifice for human interests.”

Growth in population and changes in economic activity have transformed land use in the Rocky Mountain West from the traditional resource extraction activities that character-

ized the Old West (i.e., agriculture, fishing, logging, and mining) to service-oriented recreation and tourism activities that characterize the New West (Riebsame et al. 1996; Power and Barrett 2001; Shumway and Otterstrom 2001; Travis et al. 2002). New West values emphasize preserving natural resources and the environment, enjoying year-round outdoor recreation and environmental amenities, and maintaining the high quality of life provided by gateway communities for protected areas.

Ironically, the very environmental amenities (Figure 2) that attract people and businesses to the New West, as well as the region's ecological integrity, are being threatened by population growth, economic development, and changes in land use (Turner and Meyer 1994; Solecki 2001). Open space is declining, fish and wildlife habitats are being lost or degraded, conflicts between human activities and the recovery of threatened and endangered species have increased (although a few species have been recovered), pollution of air and water has increased, and road construction and development have dramatically increased the spread of invasive species (Fagre, 2000; Miller and Brown 2001; Baron 2002; Prato and Fagre 2007b). An increasing threat to the ecological integrity of the region is tar sands development in Alberta, coal and coalbed methane extraction in southeast British Columbia, oil and gas development in the Rocky Mountain Front, and global climate change. This paper addresses the desirability and feasibility of sustainable management and the feasibility of adaptive ecosystem management of the CCE, and a recommendation for scaling up current sustainability efforts in the region to the ecosystem level. This paper is based on a book about sustainable management of the CCE to which 39 American and Canadian authors contributed (Prato and Fagre 2007b).

Crown of the Continent Ecosystem

The CCE is a 16,873-square-mile area of the northern Rocky Mountains that straddles northwestern Montana, southwestern Alberta, and southeastern British Columbia (Figures 1 and 3). Approximately 60% of the land area of the CCE is in the United States and 40% is in Canada (Waldt 2004). The CCE extends from the Highwood River south of Banff National Park in Alberta to the Blackfoot River in western Montana. It features many spectacular natural areas, including the Waterton–Glacier International Peace Park (WGIPP) in Alberta and Montana, which includes Waterton Lakes National Park in Alberta and Glacier National Park in Montana, the Castle Rock Wilderness and Elk River Valley in British Columbia, and the Bob Marshall, Great Bear, Scapegoat, Rattlesnake, and Mission Mountains wilderness areas in Montana. Two major Indian reservations overlap the U.S. portion of the CCE: the Blackfeet Indian Reservation, just east of Glacier National Park; and the Confederated Salish and Kootenai Tribes of the Flathead Reservation in the Mission Valley, which is home to the Bitterroot Salish, Kootenai, Pend d'Oreilles, and Chinook tribes (Long 2007). Triple Divide Peak in Glacier National Park and WGIPP is the inspiration for the name “Crown of the Continent.” Precipitation on Triple Divide Peak flows into three major rivers: the Columbia to the west; the Mississippi to the east; and the Saskatchewan to the north. Glacier and Waterton Lakes national parks are also designated as biosphere reserves and WGIPP is a World Heritage site and the world's first international peace park (Prato and Fagre 2007b).

The CCE consists of a mosaic of natural, rural, built-up, and cultural landscapes that provide environmental amenities; sustain economic growth and development; and contain rich cultural and biological diversity and abundant and diverse natural resources. Public lands in the CCE, which are managed by multiple agencies, make up 83% of the land area, and protected areas, which account for 32% of the land area, are managed primarily for public enjoyment and natural resource protection (McCool and Adams 2007). National, state, and provincial forests in the CCE are managed for multiple uses, including recreation, biodiversity, water supply, logging, and fish and wildlife habitats. Protected areas are managed for resource protection and are off limits to residential and commercial development, and in some cases, resource extraction and certain forms of recreation.

Despite the adverse impacts of rapid economic growth and development on the CCE's unique endowment of natural and cultural resources, the ecosystem harbors one of the most intact assemblages of mammals of any region in southern Canada or the contiguous United States with 65 species of native mammals, 270 species of birds, 27 native fish, and 12 species of reptiles and amphibians. The Flathead River in British Columbia and the North Fork of the Flathead River in Montana, which are located in the northwestern portion of the CCE, has the highest density of inland grizzly bears and the most diverse association of ungulates in North America (Prato and Fagre 2007b).

In 2005, 17 Canadian and 20 American scientists, managers, planners, and policymakers attended a workshop to discuss the CCE. Workshop participants agreed that "the [CCE] region is a globally unique nexus of converging ecosystems and biodiversity," and that it faces two critical issues: (1) "How do you provide access to a priceless resource without compromising the very thing, its pristine attributes, that makes it so valuable?" and (2) "What is needed to protect the natural environment yet facilitate economic prosperity?" (Crown of the Continent Ecosystem Committee 2005). Both issues can be distilled into one overarching issue, which is the primary focus of this paper: How can we achieve sustainable management of the CCE?

Desirability and feasibility of achieving sustainability

Prato and Fagre (2007b) posit four premises or conditions that are germane to sustaining the CCE and other ecosystems:



Figure 2. A typical landscape in the CCE. Source: Prato and Fagre (2007b).

1. *Natural landscapes in the CCE are worth preserving because they supply valuable ecosystem goods and services.* Natural landscapes in the CCE contain forests, soil, water, air, and minerals that are used to produce ecosystem goods in the form of timber, forage, and fossil fuels (i.e., coal, crude oil, and natural gas). Ecosystem goods are used in the production of primary goods (e.g., lumber, aluminum, and inorganic fertilizers) and primary goods are used in the production of consumer goods (e.g., homes, automobiles, and clothing). The value of ecosystem goods is derived from the market prices of the primary goods they are used to produce. Natural landscapes also provide ecosystem services in the form of air and water purification, flood and drought mitigation, waste detoxification and decomposition, soil generation and renewal, biodiversity preservation, partial climate stabilization, nutrient cycling and services, pollination, sustaining recreational/tourism activities and aesthetics, and others (Daily 1997). Since ecosystem services are not traded in markets, they lack prices, which make it more difficult to value such services.

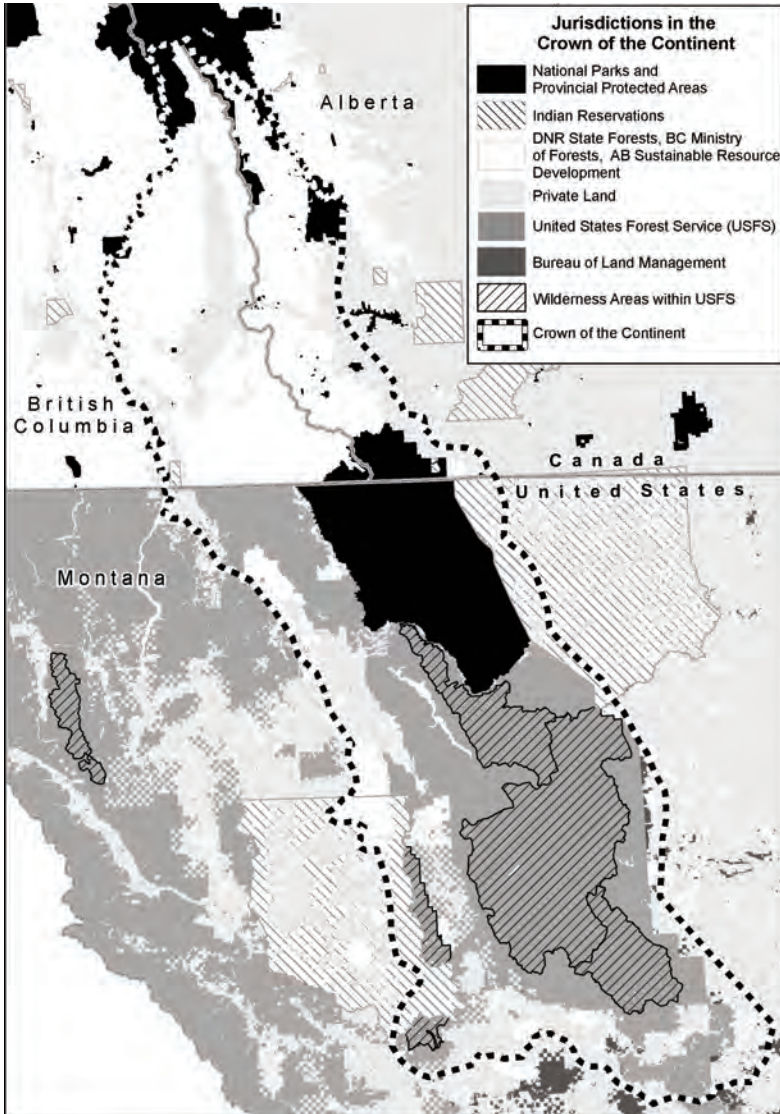
2. *Population/economic development and environmental threats are expected to continue in the CCE.* Economic growth is expected to continue in the CCE due to increased population and increased demand for outdoor recreation, outdoor tourism, and environmental amenities. The increased demand is fueled by higher per capita disposable income, higher rates of retirement, and larger numbers of urban refugees (i.e., people who move to gateway communities to escape the crime, social problems, and higher cost of living in urban centers). Continued population growth and economic development jeopardize the capacity of the CCE to provide ecosystem goods and services and threaten its ecological integrity. Future growth of some gateway communities could moderate, particularly if the adverse environmental effects of growth discourage people from moving to or visiting those communities.

3. *Despite the degradation of natural landscapes from human activities in the CCE, the ecosystem is relatively intact.* The CCE is considered one of the most biologically intact ecosystems in the contiguous U.S. and western Canada. The U.S. portion of the CCE has the only viable non-transplanted population of wolves, the largest native population of Rocky Mountain bighorn sheep, one of the largest elk herds, the largest mountain goat population, and the largest and densest population of grizzly bear in the American West (Waldt 2004). Although aquatic ecosystems in the CCE are healthy compared with other regions of the country, aquatic ecosystem health has been significantly degraded from its original condition (Hauer et al. 2007). Other protected landscapes have not fared as well. Air pollution is substantially worse in the Great Smoky Mountains, Sequoia, Kings Canyon, and Shenandoah national parks than in WGIPP (Mansfield 2002).

4. *Sustainable management of the CCE is challenging because of its large size and the predominance of public lands.* As with other ecosystems in the Rocky Mountain West, the CCE is home to large expanses of public land whose management presents challenges not faced in private land management. Specifically, the allocation of private land to primary and consumer goods is guided by market prices for these goods. In addition, market prices for primary goods influence the use and value of ecosystem goods. In contrast, most ecosystem services provided by public land are not priced due to lack of markets or incomplete markets for these services. In cases where prices do exist for public goods, such as access fees to

national parks, the fees are administratively determined; they do not represent the price for any particular ecosystem service. Moreover, most decisions about the use and management of public land are based on statutory authority, regulations, public policy, and public opinion. Public land management in the CCE is also challenging because of the jurisdictional fragmentation in public land ownership, which results in land being managed by agencies having different statutory mandates (Quinn et al. 2007; Figure 3) and the difficulties encountered in implementing ecosystem management, which is discussed in the next section.

Figure 3. Jurisdictional map of the CCE. Source: Miistakis Institute for the Rockies.



Ecosystem management approach

Liszewski (2004) points out that “the complex nature of ecosystems, and the increasingly complex nature of human stresses and demands on ecosystems, means that simple and narrowly focused approaches are not sufficient to penetrate modern environmental problems.” Ecosystem management involves integrated management of human activities and natural resources over larger areas and longer time periods than conventional resource management (Franklin 1997). Ecosystem management is sustainable when it maintains the flow of ecosystem goods without permanently impairing the long-term capacity of the ecosystem to provide ecosystem services (Franklin 1997; Prato 2000). Sustainable management of an ecosystem involves maintaining the human uses (e.g., production of timber and energy and recreational experiences) and intrinsic values (i.e., values not directly related to human uses of an ecosystem) of the ecosystem without impairing its long-term capacity to supply ecosystem goods and services. Ecosystem management of the CCE is challenging because (1) it is large, complex, and dynamic; (2) scientific knowledge about the biophysical and socioeconomic processes operating in the ecosystem is incomplete; (3) data on ecosystem processes are often inadequate and expensive to acquire; and (4) the human and financial resources needed for research and management are limited and, in many cases, inadequate.

Implementation of ecosystem management involves (1) developing a common vision for the ecosystem, (2) identifying whether the current state of the ecosystem is sustainable, (3) selecting best management actions for achieving a sustainable ecosystem state when the current state of the ecosystem is not sustainable, and (4) monitoring and adjusting management actions to maintain a sustainable ecosystem state (Prato and Fagre 2007a). Each of these elements is discussed below in the context of the CCE.

Developing a common vision Efforts to achieve sustainable management of the CCE should be guided by a common or collective vision of the values provided by the ecosystem and why those values are worth preserving. Establishing a common vision does not require stakeholders to reach consensus about the relative importance of the ecosystem goods and services provided by the ecosystem, but rather to enumerate the values and their importance.

It is important to create a common vision for an ecosystem for several reasons. First, it builds stakeholder consensus around the most significant and unique ecosystem values. Second, it provides a basis for determining when human activities are adversely affecting the ecosystem (e.g., when such activities threaten those values). Third, it creates mutual respect among stakeholders that is essential for collaborative decision-making. Fourth, it helps stakeholders to select appropriate indicators of ecosystem integrity and health. For example, coal development in the Canadian Flathead River Basin in southeast British Columbia has been recognized by many stakeholders as a threat to water quality and wildlife habitat in the Flathead River Basin in northwest Montana (Thompson and Thomas 2007).

Stakeholders are already working together to preserve ecosystem values in the CCE. For example, in an effort to protect critical lower-elevation habitat for grizzly bears, trumpeter swans, and other species, conservation easements have been purchased on private land adjacent to Waterton Lakes National Park in Alberta (Quinn and Broberg 2007). The Crown Managers Partnership has brought together federal, aboriginal, provincial, and state agencies or organizations with significant land or resource management responsibility in the CCE for

the purpose of improving regional communication and resource management (Quinn et al. 2007). The Yellowstone to Yukon Conservation Initiative, which encompasses the CCE, has the goal of restoring and maintaining biological diversity and habitat connectivity in a large ecoregion that stretches from the state of Wyoming to the north-central Yukon Territory (Chadwick 2000; Mahr 2007).

A word of caution is in order about creating a common vision for the CCE. Because the CCE is large, it is easier to cobble together visions that are pertinent to different issues or threats facing the CCE (e.g., reducing the environmental impacts of energy production, reducing loss or fragmentation of wildlife habitat from residential development, and curtailing the spread of invasive species). The downside of such a piecemeal approach is that it does not address the cumulative effects of ecosystem threats, which have a direct impact on achieving ecosystem sustainability. For this reason, stakeholders should attempt to create a vision for the entire ecosystem.

Identifying whether the current state of the ecosystem is sustainable Identifying the current state of the CCE is subject to two kinds of errors. First, the decision can be made that the current state is sustainable when it is not, which results in inaction even though action is needed to achieve sustainability. Second, the decision can be made that the current state is unsustainable when it is actually sustainable, which results in the development and implementation of management actions to enhance ecosystem sustainability when none are required. Both decision errors result from uncertainty in determining ecosystem states from indicators of ecosystem conditions. Such decision errors can be minimized by using Bayesian statistical inference to test a set of hypotheses about ecosystem states (Prato 2007b).

Selecting best management actions for achieving a sustainable ecosystem state If it is determined that the current state of the ecosystem is not sustainable, then managers need to implement feasible management actions that have a high likelihood of achieving sustainability. For example, if the natural resources in a backcountry camping area are being negatively impacted by human use, then feasible management actions need to be identified and implemented that reduce those impacts. Feasible management actions are possible management actions that are financially feasible and provide efficient combinations of the attributes of the outcomes of management actions. An efficient combination of attributes of outcomes of management actions is one for which it is not possible to increase a positive attribute, such as human satisfaction from backcountry camping, without increasing a negative attribute, such as the natural resource impacts of backcountry camping.

Multiple attribute evaluation (MAE) can be used to determine the best management actions for achieving a sustainable ecosystem state. This involves using a MAE method to rank feasible management actions based on their multiple social, economic, and ecological attributes and the relative importance of those attributes to the decision-maker. The best management action is the highest-ranked feasible management action. MAE has been used to address a variety of agricultural and natural resource management issues (Strassert and Prato 2002; Mendoza and Martins 2006; Prato and Herath 2007).

Monitoring and adjusting management actions Since *a priori* knowledge about the likely ecosystem impacts of management actions is imperfect or uncertain, there is no guarantee that a sustainable ecosystem state will be achieved by implementing the best manage-

ment actions identified using MAE. Accordingly, it is important to monitor ecosystem responses to implemented management actions to determine whether the ecosystem state is becoming sustainable. If not, it will be necessary to adjust or change management actions.

The process of selecting, implementing, monitoring, assessing, and adjusting management actions is called adaptive ecosystem management (AEM; Holling 1978; Walters 1986; Prato 2003, 2007a). If passive AEM is used, the decision of whether or not to adjust management actions depends on whether the indicators or multiple attributes of the outcomes of management actions imply that the ecosystem is becoming sustainable. If active AEM is used, the decision of whether or not to adjust management actions is determined by testing hypothesis about how the ecosystem state is responding to management actions. Active AEM treats management actions as experiments. Unlike passive adaptive management, active AEM yields statistically reliable information about ecosystem responses to management actions although it is more expensive and difficult to apply than passive AEM and has several prerequisites (Lee 1993; Wilhere 2002) that may not be satisfied (Prato 2005).

Applications of adaptive ecosystem management

Passive and active adaptive management are being used to manage the impacts of human activities on a variety of natural resources. Banff National Park is using passive adaptive management to implement a human use management strategy for the park (Parks Canada 2002). Elk Island National Park in Alberta is using adaptive management in its prescribed burn program (Parks Canada 2003). Federal and state agencies are using passive adaptive management to evaluate management strategies designed to alleviate the risk of brucellosis transmission from bison to cattle outside Yellowstone National Park (Status Review Team 2005). In addition, passive adaptive management is being used in the bison management plan for Yellowstone National Park (National Park Service 2008). Adaptive management was the basis for implementing the final winter use rule for Grand Teton and Yellowstone national parks (National Park Service 2003).

The lower Colorado River, which flows through Grand Canyon National Park, is using active adaptive management to improve understanding of how water releases from Glen Canyon Dam influence sediment, vegetation, fish and wildlife and habitat, and other resources (Glen Canyon Adaptive Management Program 2003). The Comprehensive Everglades Restoration Plan (CERP) gives planners flexibility to refine and revise the plan “as part of (an) adaptive assessment process” (U.S. Army Corps of Engineers and South Florida Water Management District 2000). The Northwest Power and Conservation Council is using an active adaptive management in their salmon recovery program for the Columbia River Basin (Lee 1993, 1995; McLain and Lee 1996). British Columbia is exploring how adaptive management can be used to test alternative silvicultural practices in forest stands, evaluate ecosystem management for entire watersheds or landscape units, and test the effectiveness of land and resource management plans (BC Forest Service 2008). The National Research Council recommended immediate development and implementation of “an [active] adaptive management approach to reverse the ecological decline of the Missouri River” (National Research Council 2002).

Examples of sustainable management in the CCE

This section describes four examples of sustainable ecosystem management in the CCE. All four examples involve rather small areas in the CCE. The first example is in the Nyack floodplain, a 5.6-mile-long by 1.9-mile-wide floodplain on the Middle Fork of the Flathead River about 36 miles upstream from West Glacier, Montana. The Nyack floodplain provides important habitats for elk, moose, deer, mountain lion, black bear, cutthroat trout, bald eagle, and Canada geese, and critical habitats for harlequin ducks, grizzly bear, bull trout, and boreal toads. As long-time floodplain residents, the Dalimata family determined to make their ranch operations compatible with sustaining wildlife species and their habitats. The family's small ranch supports 150 cows, produces hay and grain for winter feed, selectively harvests mature timber, harvests and mills salvage logs from a river corridor, and operates a trout pond; wood products from the sawmill are used to manufacture prefabricated cabins and other value-added products (Stanford 2000). Stanford (2000) observed that "the Dalimatas have not received, nor have they asked for, compensation for avoiding elk calving areas during the spring, for allowing elk to graze in their hay fields year-round or for hazing the occasional grizzly away from their cattle. These and other activities by ranchers do have real monetary value, however, which figure into the decision by families to sell out to development or hang in there with traditional land-use activities that secondarily foster maintenance of natural attributes of the landscape."

The second example is in the Rocky Mountain Front, a 200-mile-long by 50-mile-wide area that forms the eastern boundary of the CCE and stretches from southern Alberta to northern Montana. Due its relatively unfragmented landscapes, the Rocky Mountain Front affords prime habitats for grizzly bear, black bear, wolf, cougar, lynx, wolverine, elk, deer, and moose. It is one of the few places in the Rocky Mountain West where grizzly bear habitat extends into the prairie.

The outstanding native prairie in the Rocky Mountain Front makes it ideal for ranching. The Nature Conservancy's (TNC's) 18,000-acre Pine Butte Swamp Preserve is an example of an area that is operated as a sustainable working ranch. The preserve is located just east of the eastern boundary of Glacier National Park near Choteau, Montana. Ranch management goals include supporting biodiversity and providing seasonal habitat for wildlife, especially prairie habitat for grizzly bear. Local ranchers lease grazing rights to the preserve from TNC. TNC requires leaseholders to use grazing systems that "mimic the buffalo's seasonally intensive use of grass and ... integrate into the rancher's agricultural operations" (TNC 2006). According to TNC, the use of sustainable grazing systems in the Rocky Mountain Front is generating local economic benefits and improving the health of native grasslands.

The third example is the Blackfeet Trust, a private, nonprofit land trust for the Blackfeet Indian Reservation located west of Glacier National Park. One of the goals of the trust is to "involve people in the community, educate them about protecting the land and actually regain some of the lands that have been lost to us" (TNC, n.d.). The trust works collaboratively with TNC to reclaim and protect nontribal lands that were once under tribal ownership, and to prevent development in high-quality prairie foothill, prairie pothole, and wetland ecosystems.

The fourth example is the Blackfoot Challenge, a coordinated effort by private landowners to “enhance, conserve and protect the natural resources and rural lifestyle of the Blackfoot River Valley for present and future generations” (Blackfoot Challenge 2007). The Blackfoot River is in the southeastern portion of the CCE. Accomplishments of the Blackfoot Challenge include weed-free grasslands, public access to recreation, restored fisheries, and conservation of scenic vistas by people who live on the land. The Blackfoot Community Project is a land transaction partnership that involves the Blackfoot Challenge, TNC, and Plum Creek Timber Company (Blackfoot Challenge 2007). The project provides an opportunity for local residents to guide the future ownership and management of nearly 88,000 acres of large, intact landscapes that possess critical community, agricultural, and biological values. As part of the Blackfoot Challenge, TNC purchased 42,927 acres from Plum Creek Timber in 2004, 11,155 acres in 2005, and 13,970 acres in 2006, and plans to purchase the remaining 20,000 acres in 2007.

Sustainable ecosystem management is more likely to be practiced in the CCE if landowners: (1) adopt a stewardship ethic (like the Dalimatas, ranchers in the Pine Butte Swamp Preserve, Native Americans in the Blackfeet Nation, and private landowners in the Blackfoot River valley), (2) become knowledgeable about sustainable landscape-management practices, and (3) demonstrate a willingness and ability to implement such practices. A stewardship ethic has a greater chance of developing if the economic and environmental benefits of sustainable landscape management exceed the environmental costs of unsustainable landscape management.

Feasibility of adaptive ecosystem management

For the most part, current management decisions in the CCE are made in much the same manner as in the rest of the U.S. and Canada. These decisions occur in an adversarial setting in which stakeholders file lawsuits to “get their way,” work the political system to outwit their “opponents,” and impose their preferences for management actions on their opponents regardless of social and economic consequences. In such an adversarial approach, individuals and organizations use the political system to achieve self-serving management outcomes (e.g., the rent-seeking behavior described in Anderson 2005). In particular, private commercial interests exert political influence through the actions of corporate entities and executive leaders, and lobbying activities. Environmental groups exert political influence by lobbying for actions and legislation that support their position and filing lawsuits to get their way. Federal and state agencies manage natural resources under their jurisdiction based on statutory authority, policies, and court decrees. Scientific and professional organizations influence natural resource policy and legislation by issuing position statements and lobbying government officials. The adversarial approach is not only contentious and divisive, but also costly and often counterproductive. It generally produces win-lose outcomes (i.e., the welfare of one stakeholder group increases at the expense of the welfare of another stakeholder group). In contrast, an AEM approach cultivates mutual respect among stakeholders who work together to develop and implement a common vision of ecosystem values and sustainability, and resolve conflicts using collaborative decision-making approaches. The AEM approach has the potential to produce win-win outcomes.

The current institutional framework (i.e., laws, rules, regulations, and norms) for managing public lands in the CCE and other ecosystems in the U.S. is undergirded by a myriad of statutes, including the National Environmental Policy Act of 1969, the Clean Air Act of 1970, the Clean Water Act of 1972, the Endangered Species Act of 1973, the National Forest Management Act of 1976, and other statutes. Although these statutes have noble purposes, they can run counter to AEM. For example, AEM is susceptible to being challenged for non-conformance with the planning requirements of the National Environmental Policy Act. Also, collaborative decision-making can be stifled by the Federal Advisory Committee Act of 1972. In contrast, a 1998 amendment to Canada's National Parks Act seems compatible with AEM because it establishes maintenance of ecological integrity through the protection of natural resources as the first management priority in Canadian national parks (Dearden and Rollins 2002). The AEM approach proposed here is not predicated on abandoning the suite of well-intentioned U.S. environmental statutes mentioned above. Rather, Congress should consider amending these statutes and supporting regulations in a manner that supports and facilitates AEM in cases where the existing statutes and AEM are conflict in one another.

Perhaps the biggest boost for AEM in the CCE would be for stakeholders to adopt and implement collaborative decision-making approaches to AEM. Collaborative approaches have been successful in resolving public land management conflicts (Wondolleck and Yaffee 2000). For example, the Keystone Center for Science and Public Policy (2005) has assisted numerous stakeholders in gathering the scientific, economic, and political information necessary to reach consensus-driven decisions, plans, and agreements related to energy, environment, health, and social policy. Additionally, consensus-building or collaborative decision-making processes have been successfully employed in resolving public land-management conflicts in California, Montana, and North Dakota.

Several geospatial technologies, notably geographic information systems, remote sensing, and Interactive Map Server, can aid stakeholders in implementing ecosystem management. In particular, these technologies can be used to create a decision support tool for AEM that would help users to (1) identify whether the current state of an ecosystem is sustainable, (2) select best management actions for achieving a sustainable ecosystem state, and (3) monitor and adjust management actions as needed.

Recommendation for scaling up AEM to the CCE

The two previous sections describe sustainable management efforts and the feasibility of implementing AEM in the CCE. Although AEM of the CCE would be challenging, the approach represents a potentially viable alternative to the current adversarial approach to resolving resource conflicts. In contrast to the adversarial approach, the proposed AEM approach attempts to draw stakeholders together rather than pull them apart and uses a collaborative approach to resolve inter-stakeholder conflicts in the preferences for ecosystem values and/or management actions. Admittedly, implementing AEM in the CCE does not guarantee the CCE would achieve a sustainable ecosystem state.

Given the mounting threats to the CCE and the breakdown of communication and polarization that often accompanies an adversarial approach to decision-making, we recommend that serious consideration be given to implementing a proactive, collaborative, and

adaptive approach to sustainable management of the CCE. One way to act on this recommendation is to scale up to the CCE level one or more of the current, successful, collaborative resource management efforts underway in the ecosystem, such as sustainably managing the Rocky Mountain Front and the Blackfoot River Valley. These particular efforts focus on natural resource use and management in rural areas of the CCE. The scaling-up approach must also consider sustainable ways to develop urban centers and surrounding areas. AEM at the scale of the CCE will require designing institutions that facilitate a proactive, collaborative, and adaptive approach to sustainable management of the CCE in a manner that protects private property rights and acknowledges legal mandates governing the management of public lands.

References

- Anderson, T.L. 2005. From the Old West to the New West and back again. In *2005 State of the Rockies Report Card*. Economics and Business Department, Colorado College State of the Rockies Project. Colorado Springs, Colo.: Colorado College, 15–20.
- Beyers, W.B., and P.B. Nelson. 2000. Contemporary development forces in the nonmetropolitan West: New insights from rapidly growing communities. *Journal of Rural Studies* 16, 459–474.
- BC [British Columbia] Forest Service. 2008. *Adaptive Management Initiatives in the BC Forest Service*. Ministry of Forests and Range, British Columbia. On-line at www.for.gov.bc.ca/hfp/amhome/amhome.htm. (Accessed March 11, 2008.)
- Blackfoot Challenge. 2007. *Better Communities through Conservation*. On-line at www.blackfootchallenge.org/am/publish/. (Accessed October 25, 2007.)
- Carruthers, J.I. 2003. Growth at the fringe: The influence of political fragmentation in the United States metropolitan areas. *Papers in Regional Science* 84, 475–499.
- Carruthers, J.I., and A.C. Viaz. 2005. Urban, suburban, and exurban sprawl in the Rocky Mountain West: Evidence from regional adjustment models. *Journal of Regional Science* 45, 21–48.
- Chadwick, D.H. 2000. *Yellowstone to Yukon*. Washington, D.C.: National Geographic Society.
- Crown of the Continent Committee. 2005. Transboundary synthesis workshop for the Crown of the Continent Ecosystem. *Flathead Lake Journal*. On-line at www.umt.edu/flbs/Help/FLJournals/FLJ%2019-1%20Final%206-9-05.pdf. (Accessed October 2, 2007.)
- Daily, G.C. 1997. Introduction: What are ecosystem services? In *Nature's Services: Societal Dependence on Natural Ecosystems*, G.C. Daily, ed. Washington, D.C.: Island Press, 3–6.
- Dearden, P., and R. Rollins. 2002. *Parks and Protected Areas in Canada: Planning and Management*. 2nd ed. Don Mills, Ont.: Oxford University Press.
- Elias, S.A. 2002. *Rocky Mountains*. Washington, D.C.: Smithsonian Institution.
- Esparza, A.X., and J.I. Carruthers. 2000. Land use planning and exurbanization in the rural Mountain West: Evidence from Arizona. *Journal of Planning Education and Research* 20, 26–39.
- Fagre, D.B. 2000. Changing mountain landscapes in a changing climate: Looking into the future. *Changing Landscapes* 2, 1–39.
- Franklin, J.F. 1997. Ecosystem management: An overview. In *Ecosystem Management: Appli-*

- cations for Sustainable Forest and Wildlife Resources*, M.S. Boyce and A. Haney, eds. New Haven, Conn.: Yale University Press, 21–53.
- Glen Canyon Adaptive Management Program. 2003. *Adaptive Management Work Group*. On-line at www.gcdamp.gov/. (Accessed March 11, 2008.)
- Hauer, R., J.A. Stanford, M.S. Lorang, B.K. Ellis, and J.A. Craft. 2007. Aquatic ecosystem health. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 117–134.
- Holling, C.S. 1978. *Adaptive Environmental Assessment and Management*. Chichester, U.K.: John Wiley & Sons.
- Keystone Center for Science and Public Policy. 2005. Introduction. On-line at www.keystone.org/spp/index.html. (Accessed October 23, 2007.)
- Lee, K.N. 1993. *Compass and Gyroscope: Integrating Science and Politics for the Environment*. Washington, D.C.: Island Press.
- . 1995. Deliberately seeking sustainability in the Columbia River Basin. In *Barriers and Bridges to the Renewal of Regional Ecosystems and Institutions*, L.H. Gunderson, C.S. Holling and S.S. Light, eds. New York: Columbia University Press, 214–238.
- Liszewski, M.J. 2004. The Glen Canyon Dam adaptive management program. *Water Resources Impact* 6, 10–13.
- Long, B. 2007. The Crown of the Continent Ecosystem: Profile of a treasured landscape. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 17–35.
- Mahr, M. 2007. Transboundary conservation and the Yellowstone to Yukon Conservation Initiative. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 229–248.
- Mansfield, D. 2002. Smokies the nation's most polluted park, says study. *WRAP Sheet* 12:10 (November/December). On-line at www.cis.tennessee.edu/publications/wrap_archive/wrap_novdec2002.shtml. (Accessed October 22, 2007.)
- McCool, S.F., and J.C. Adams. 2007. Sustaining wildland recreation: Issues, challenges, and opportunities. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 67–82.
- McLain, R.J., and R.G. Lee. 1996. Adaptive management: Promises and pitfalls. *Environmental Management* 20, 437–448.
- Mendoza, G.A., and H. Martins. 2006. Multi-criteria decision analysis in natural resource management: A critical review of methods and new modelling paradigms. *Forest Ecology and Management* 230, 1–22.
- Miller, H., and L. Brown. 2001. Losing ground to urban sprawl: Is progress costing us our natural resources? *Missouri Conservationist* 62, 19–23.
- National Park Service. 2003. Final winter use rule for Grand Teton and Yellowstone published in Federal Register. On-line at www.nps.gov/yell/parknews/07106.htm.

(Accessed March 11, 2008.)

- . 2008. Bison management operations continue near Gardiner. On-line at www.nps.gov/yell/parknews/0808.htm. (Accessed March 11, 2008.)
- National Research Council. 2002. Ecological dynamics on Yellowstone's Northern Range: The report of the National Academy of Sciences. Chapter 5: Conclusions and recommendations. *Yellowstone Science* 10, 3–11.
- Parks Canada. 2002. *A Review of the Implementation of the Banff National Park Management Plan*. Report of 2002 Forum, Banff Centre, November 29–30. Banff, Alberta: Parks Canada, Banff National Park. On-line at www.pc.gc.ca/pn-np/ab/banff/plan/plan7_E.asp. (Accessed March 11, 2008.)
- . 2003. *Elk Island National Park of Canada, Natural Wonders & Cultural Treasures*. On-line at www2.parcscanada.gc.ca/pn-np/ab/elkisland/natcul/natcul1di_E.asp. (Accessed March 11, 2008.)
- Power, T., and R. Barrett. 2001. *Post-Cowboy Economics: Pay and Prosperity in the New American West*. Washington, D.C.: Island Press.
- Prato, T. 2000. Multiple attribute evaluation of landscape management. *Journal of Environmental Management* 60, 325–337.
- . 2003. Alleviating multiple threats to protected areas with adaptive ecosystem management: The case of Waterton–Glacier International Peace Park. *The George Wright Forum* 20:4, 41–52.
- . 2005. Ecosystem management. In *National Parks and Protected Areas: Approaches for Balancing Social, Economic and Ecological Values*, T. Prato and D. Fagre, eds. Ames, Iowa: Blackwell Publishers, 109–153.
- . 2007a. Adaptive ecosystem management. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 249–259.
- . 2007b. Selection and evaluation of project to conserve ecosystem services. *Ecological Modelling* 203, 290–296.
- Prato, T., and D. Fagre. 2007a. Achieving ecosystem sustainability. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 302–311.
- Prato, T., and D. Fagre, eds. 2007b. *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*. Washington, D.C.: RFF Press.
- Prato, T., and D. Fagre. 2007c. The Crown of the Continent: Striving for ecosystem sustainability. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 3–16.
- Prato, T., and G. Herath. 2007. Multiple-criteria decision analysis for integrated catchment management. *Ecological Economics* 63, 627–632.
- Quinn, M., and L. Broberg. 2007. Conserving biodiversity. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 102–116.

- Quinn, M., D. Duke, and G. Greenaway. 2007. Cumulative effects analysis and the Crown Managers Partnership. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 215–228.
- Rasker, R., B. Alexander, J. van den Noort, and R. Carter. 2004. *Prosperity in the 21st Century West: The Role of Protected Public Lands*. Bozeman, Mont.: Sonoran Institute.
- Riebsame, W.E., H. Gosnell, and D.M. Theobald, eds. 1997. *Atlas of the New West*. New York: W.W. Norton.
- Rolston, H., III. 2005. Mountain majesties above fruited plains: Culture, nature, and Rocky Mountain aesthetics. Manuscript submitted for publication.
- Shimek, C. 2003. Water wizardry station pioneers new river flood plain model. *Vision* (University of Montana). On-line at www.umt.edu/trelations/vision/2003/12wizardry.htm. (Accessed October 23, 2007.)
- Shumway, J.M., and S.M. Otterstrom. 2001. Spatial patterns of migration and income change in the Mountain West: The dominance of service-based, amenity-rich counties. *Professional Geographer* 53, 492–502.
- Solecki, W.D. 2001. The role of global-to-local linkages in land use/land cover changes in South Florida. *Ecological Economics* 37, 339–356.
- Stanford, J.A. 2000. Family stewardship of a river floodplain: A demonstration project. Unpublished paper. Flathead Lake Biological Station, University of Montana, Missoula.
- Status Review Team. (National Park Service; U.S. Department of Agriculture–Animal and Plant Health Inspection Service; U.S. Department of Agriculture–Forest Service; Montana Department of Livestock; and Montana Department of Fish, Wildlife and Parks.) 2005. *Interagency Bison Management Plan: A Status Review of Adaptive Management Elements, 2000 to 2005*. On-line at www.nps.gov/yell/naturescience/upload/bmpstatus-review.pdf. (Accessed January 17, 2008.)
- Strassert, G., and T. Prato. 2002. Selecting farming systems using a new multiple attributes decision model: The balancing and ranking method. *Ecological Economics* 40, 269–277.
- The Nature Conservancy (TNC). N.d. Blackfoot Land Trust names its first property “So-keeps-kim” Ranch. On-line at www.nature.org/wherewework/northamerica/states/montana/news/news750.html. (Accessed October 23, 2007.)
- _____. 2006. *Land Stewardship on the Front*. On-line at www.nature.org/wherewework/northamerica/states/montana/science/art15847.html. (Accessed October 19, 2007.)
- _____. 2007. *Pine Butte Swamp Preserve, Montana*. *The Nature Conservancy*. On-line at www.leo.lehigh.edu/fen/profiles/pine_butte_swamp_preserve/. (Accessed October 25, 2007.)
- Thompson, S., and D. Thomas. 2007. Resolving transboundary conflicts: The role of community-based advocacy. In *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, T. Prato and D.B. Fagre, eds. Washington, D.C.: RFF Press, 285–301.
- Travis, W.R., D.M. Theobald, and D. Fagre. 2002. Transforming the Rockies: human forces, settlement patterns, and ecosystem effects. In *Rocky Mountain Futures: An Ecological Perspective*, J.S. Baron, ed. Washington, D.C.: Island Press, 1–26.

- Turner, B.L., and W.B. Meyer. 1994. In *Global Land-use and Land-cover Change: An Overview. Changes in Land Use and Land Cover: A Global Perspective*, W.B. Meyer and B.L. Turner, eds. Cambridge, U.K.: Cambridge University Press, 3–10.
- U.S. Army Corps of Engineers and South Florida Water Management District. 2000. *Master Program Management Plan, Comprehensive Everglades Restoration Plan*. West Palm Beach, Fla.: South Florida Water Management District.
- U.S. Department of Agriculture. 2002. *1997 National Resources Inventory*. Machine readable data available on CD-ROM. Fort Worth Tex.: National Cartography and Geospatial Center.
- Vias, A.C., and J.I. Carruthers. 2003. The highest and best use? The outcome of land use change in the Rocky Mountain West, 1982–1997. Working paper. Storrs, Conn.: Department of Geography, University of Connecticut.
- Waldt, R. 2004. *Crown of the Continent: The Last Great Wilderness of the Rocky Mountains*. Helena, Mont.: Riverbend Publishing.
- Walters, C. 1986. *Adaptive Management of Renewable Resources*. New York: Macmillan.
- Whitney, C., B. Hurlbutt, and F.P. Holmes. 2005. Rockies energy futures. In *2005 State of the Rockies Report Card*. Economics and Business Department, Colorado College State of the Rockies Project. Colorado Springs, Colo.: Colorado College.
- Wilhere, G.F. 2002. Adaptive management in habitat conservation plans. *Conservation Biology* 16, 20–29.
- Wondolleck, J.M., and S.L. Yaffee. 2000. *Making Collaboration Work: Lessons from Innovation in Natural Resource Management*. Washington, D.C.: Island Press.
- World Almanac Education Group. 2005. *World Almanac*. New York: World Almanac Education Group.
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Loss of a Sacred Shrine: How the National Park Service Anguished over Yellowstone's Campfire Myth, 1960–1980

Lee H. Whittlesey

SINCE ITS ESTABLISHMENT IN 1916, the National Park Service (NPS) has been empowered by Congress to “conserve the scenery and the natural and historic objects” in the nation’s national park system and to manage them “in such manner and by such means as will leave them unimpaired for future generations.”¹ To generations of park rangers, that *high decree* has meant preserving the country’s special places with a *high degree* of care—in the protection of places of unusual natural beauty and celebrated historical sites. Yellowstone, established in 1872 some thirty-four years before the National Park Service, was the first of these “special” places and the first national park in the world. Congress’s setting aside of Yellowstone not only started the nation’s national park system, it also inaugurated the “national park idea,” another concept considered sacred by NPS.²

The “national park idea” is the notion—essentially unheard of before Yellowstone—that a federal government should run a park. Historically, parks were run by lower governments, such as cities, states, provinces, or counties. From Nebuchadnezzar’s “Hanging Gardens of Babylon” to England’s town deer parks to Central Park in New York (a city park dating from 1857) and Yosemite Park in California (granted to the state in 1864), parks run by governments below the federal level had been the historical models.³

Because Yellowstone—known very early as “Wonderland”—was the first national park in the world, the National Park Service has always considered its origins almost sacred. Although it was visited earlier by various Indian tribes, fur trappers, and prospectors, Yellowstone was formally “discovered” in 1870 by the Washburn-Langford party. That party left numerous accounts of its travels, but one account, written by N.P. Langford and published thirty-five years later, became the book that held sway over the NPS’s interpretation of Yellowstone’s origins for some seventy-five years. Because of Langford’s 1905 book, NPS’s “take” went like this, in what became a cherished story: The idea for Yellowstone National Park originated with one man on a specific day, because the area was discovered by the 1870 Washburn-Langford party, whose members discussed around their campfire at Madison Junction the idea of not only protecting Yellowstone from private ownership but also the idea of it becoming a “national park.” Because of this story, the NPS long believed that Langford’s party members were the first to vocalize that “national” idea.⁴

Thus when Congress established NPS in 1916, the bureau quickly learned—if its members did not already know—that Yellowstone’s origins were related to its own origins.

Without Yellowstone, there might have been no NPS, and Horace Albright, one of the first NPS officials, latched on to that fact early. When Albright was appointed superintendent of Yellowstone—only three years later—he took that consciousness with him to Yellowstone and “mortared it into place” by telling the Langford story in the park, encouraging others to tell it, and accepting it as fact in his capacity as park superintendent. That made it the *de facto* (and essentially official) origin story for the park. Albright served as Yellowstone’s superintendent for nearly a decade.⁵

This was the scene in 1928, when Albright succeeded in obtaining money for four new Yellowstone museums. Inspired by officials who had done that in Yosemite (which was added to the national park system in 1890), Albright wrangled \$118,000 from the Laura Spelman Rockefeller memorial “for the development of educational activities in Yellowstone National Park.”⁶ From this money, the NPS built four trailside museums in the park—at Old Faithful, Madison Junction, Norris Geyser Basin, and Fishing Bridge—during the period 1928 to 1931. One of them, the Madison Museum, was intended by its designers with Albright’s blessing to tell the “sacred” story of Yellowstone’s (and indirectly NPS’s) origins. Architecturally, the four Yellowstone museums were (and are today) very significant in the national park system, because they were “unlike anything that came before” and because they “added new meanings to landscape scenery in the twentieth century” by opening for Americans “the experience of places to new dimensions of appreciation.”⁷

These museums—all survive today except for the one at Old Faithful—were really the beginning of NPS’s formal attempts to tell the stories of (interpret) Yellowstone. Besides Albright (who would soon be leaving the park anyway to become national director of NPS), three men were the leading spirits behind Yellowstone’s four trailside museums. The men were an NPS field naturalist, Carl Parcher Russell; a founder of the American Association of Museums and its first president, Hermon Carey Bumpus; and an architect, Herbert Maier.⁸ Even though his Ph.D. was in ecology, Russell would spend his life specializing in frontier history, would “set the basic pattern for museums in the national parks,” and would produce several major works, including *Guns on the Early Frontier* (1957) and *Firearms, Traps, and Tools of the Mountain Men* (1967).⁹ Bumpus was a former director of the American Museum of Natural History, a leading authority on national park museums, and a professor of biology at Brown University.¹⁰ Maier was a San Francisco architect who began working on modest building projects for the national parks in 1922. The park museums that he created—inspired by Yellowstone’s earlier Old Faithful Inn—were, according to architectural historian Ethan Carr, “more than any other . . . the ideal expression of [National] Park Service Rustic style.”¹¹ With these three men, the NPS “in one fell swoop” (1) accepted rustic architecture as its overriding building design for national parks, and (2) established the Madison Museum as the linchpin or host vehicle for telling both Yellowstone’s and the national park idea’s origin stories (Figure 1). Madison Museum, even in these planning stages, was already headed for “shrinehood.” But perhaps the fact that there was not an academically trained, professional historian in this group should have been a warning to NPS.

Each of the four new museums was to have a theme, and Madison’s theme was to be history.¹² Small though it was with groundbreaking and beautiful architecture, that was not the most important element at Madison. Bumpus stated in 1930 that the new Madison Museum



Figure 1. The completed Madison Junction Museum, probably in 1930, showing its west-facing window. YELL photo no. 44347, Yellowstone National Park Archives.

would celebrate the place where “the Washburn party, in 1870 ... resolved that this part of the public domain [Yellowstone] should be preserved inviolate.” In addition, he attributed the national park idea to that party—thus helping to further instill that part of the myth into NPS—and noted that “in its function as an historical monument, the [museum’s] southerly wall, by means of a large transparency, will depict the Washburn party encamped at the near-by confluence of the Firehole and Gibbon Rivers.”¹³

Sure enough, this large transparency—erected over a southern window so that light could shine through it in an almost religious fashion—served as the museum’s main exhibit until about 1971. It, along with a sign on the museum’s east wall, effectively turned the small building into a monument to the origins of the park and the national park idea. The sign read: “The purpose of this museum is to outline the history of the Yellowstone and to consecrate the setting aside of large areas for the benefit and enjoyment of the people” (Figure 2). Bumpus and Russell actively used, or acquiesced in the use of, the word “shrine” to refer to Madison Museum and a number of their roadside nature exhibits, which they called “nature shrines.”¹⁴ Now they were using the word “consecrate”—a word which means “to make or declare sacred or holy.” Words like “shrine” and “consecrate” made it clear that—in their minds at least—this “trailside shrine” known as Madison Museum was to “shine forth” for the public with a dazzling, almost religious aura. It was an image that would instill pride in both park visitors and National Park Service rangers for some forty years.

With Bumpus and Russell having built the Madison Museum as a shrine in 1929, and with the museum not yet open to the public, NPS decided at the time of the death of its founder Stephen Mather in 1930 to elevate the “shrine” idea one step further. One can almost picture their thinking. Madison was already a shrine to both the establishment of the



Figure 2. The new Madison Museum’s interior about 1940 exhibited a sign proclaiming: “The Purpose of this Museum is to outline the history of the Yellowstone and to consecrate the setting aside of large areas for the benefit and enjoyment of the people.” It hung between other signs that announced significant years in park history. Photo from William E. Kearns, “A Suggested Plan for Madison Junction Historical Museum,” 1940, Yellowstone National Park Archives.

first national park and the national park idea, so why should it not also be a shrine to the agency that managed them? No doubt officials wanted the agency, new though it was, to receive a place in the history of Yellowstone and no doubt they wanted to commemorate Director Mather’s recent death, but the idea that the Madison Museum could also be a monument to NPS as well as to Mather fit right into the shrine concept. Horace Albright, as former superintendent and now national director, was in a convenient position to help make it happen. Thus Albright, Yellowstone superintendent Roger Toll, and assistant superintendent Guy Edwards joined Bumpus and Russell in spearheading the erection of a metal plaque celebrating Stephen Mather’s life on a twelve-ton boulder just outside of the Madison Museum. Dedicated on July 4, 1932 (Mather’s birthday) and still there today, the plaque—embossed with a sculpture of Mather—proclaimed the following:

Stephen Tyng Mather, July 4, 1867–January 22, 1930. He laid the foundation of the National Park Service defining and establishing the policies under which its areas shall be developed and conserved unimpaired for future generations. There will never come an end to the good that he has done.¹⁵

The NPS’s ceremony to dedicate this “Mather memorial tablet” involved speakers and around seven hundred members of the public, and it is clear from the many words expended at the ceremony and from the guests who attended it that the Park Service considered the

new tablet a very important monument (Figure 3). Director Albright could not attend the dedication, but his telegram to the park made it clear he believed it significant for NPS. He called Mather “one of nature’s noblemen ... [who] brought about expansion of our [NPS’s] activities in Yellowstone.” NPS Landscape Architect Thomas Vint recommended placing the Mather plaque “within the Historical Shrine at Madison Junction”—his capitalized words showing awareness that the Park Service already considered Madison a shrine—but the Mather Appreciation group wanted to place it outside the building. Eventually the NPS placed similar monuments to Mather in at least 23 national parks and 33 national monuments. Madison Museum thus became one of the Park Service’s earliest iterations of this shrineage to Mather.¹⁶

Meanwhile, NPS rangers at the new Madison Museum were busily delivering their message to park visitors, and so were the museum’s exhibits. The aforementioned transparency—created by park photographer Jack Haynes and erected over the museum’s southern window—boasted a panoramic photo of contemporary re-enactors of the 1870 Washburn party camped at the foot of National Park Mountain. Under it was text that was headlined “The Beginnings of the National Park Idea” (Figure 4) Many years later, naturalist Don Stewart still remembered this conspicuous “Haynes Window” as being the center of the museum’s displays and general appeal. Stewart—a dedicated ranger who worked at Madison from 1955 through 1962 and believed fervently in it as a national shrine—saw the window

Figure 3. Dedication of the Stephen Mather plaque by NPS and other officials at Madison Junction, Yellowstone National Park, on July 4, 1932. Left to right are park superintendent Roger W. Toll, E.V. Robertson (representing Governor Clark of Wyoming), Struthers Burt (chairman of Stephen T. Mather Appreciation group), D.W. Greenburg (Mather Appreciation group), Samuel T. Woodring (superintendent of Grand Teton National Park), and U.S. Commissioner John W. Meldrum. The park’s main road, shown in the background here, no longer goes past this spot. YELL photo no. 32745-3, Yellowstone National Park Archives.





Figure 4. The Madison Museum’s south wall around 1940 utilized photographer Jack Haynes’s beautiful transparency to point up the site at Madison Junction then believed to represent the origin of Yellowstone and the national park idea. Photo from William E. Kearns, “A Suggested Plan for Madison Junction Historical Museum,” 1940, Yellowstone National Park Archives.

as the main “*raison d’être*” (reason for being) of the Madison Museum. Stewart described it as follows:

The museum’s other beautiful window, on the south wall, was not so large as the picture window, but it was the premiere attraction of our building. In 1930 Jack Haynes, official Yellowstone Park photographer, took several shots of men dressed in the costumes of 1870 as they gathered around a campfire near the confluence of the Gibbon and Firehole Rivers. Mr. Haynes selected the one he thought best and then enlarged it into a black and white positive on a plate of glass coated with a photographic emulsion. After the black and white positive was developed on the large plate of glass, Mr. Haynes and his people tinted it, supplying the appropriate blues, yellows, pinks, and other colors needed. Finally, he put a translucent pane on the emulsified side of the plate of glass to protect it. The finished picture was then framed and set in place in the Madison Museum. The picture confused many people. They would stand before it exclaiming how beautiful a painting it was—the brush strokes were visible in places—but remarking how lifelike the figures seemed! Few knew, of course, that such a thing as a combination photograph and painting even existed. . . . But eventually [after doing other things at Madison] we were always drawn back to Jack Haynes’ impressive memorial to the birth of the national park idea. No person who ever came to Madison Museum failed to notice it. It was the first thing he saw as he stepped into the museum, and it was the last thing to catch his attention as he left. And when we had told each park visitor the event it commemorated, he left with a sensation of having been at a place significant in the history of his country.¹⁷

This, then, was the continuing message conveyed by rangers at Madison Museum from 1931 through about 1970. From 1935 through 1939 alone, at least 282,881 visitors came to the museum—and those were lean years for park visitation because of the Great Depression.¹⁸ Thousands if not millions more received the Madison Museum’s message during the succeeding quarter century. They joined Don Stewart and his fellow rangers in paying homage to the place where Yellowstone was ostensibly established, the place where the national park idea was supposedly born, and one of the places where Steve Mather and his National Park Service rangers received consecration for preserving America’s special places.

In 1960, park officials brought back Carl P. Russell—retired and now thirty years older but known in history circles for his books *One Hundred Years in Yosemite* and *Guns on the Early Frontiers*—to re-examine exhibits at the Madison Museum with an eye toward changing or upgrading them. Not mentioned, but perhaps present in at least some minds, was the fact that Yellowstone’s one hundredth anniversary would occur in twelve more years. The question of what messages and exhibitry the NPS should proclaim and display in its Madison Museum on that celebratory occasion must have occurred to Russell if not to others. Many if not most believed that the museum’s aging exhibits needed upgrading to make certain that the national shrine would continue to proclaim—if not radiate dazzlingly—its message celebrating the supposed origins of Yellowstone, the national park idea, and the National Park Service.¹⁹

Also on the minds of some was the fact that historian Aubrey Haines’s research was gradually revealing that the famous Madison campfire story was not historically accurate. Haines’s research was already having an impact on other historians, and Carl Russell was a subscriber. In touch with Haines through letters and probably telephone calls, Russell did not mince words to park officials about his general agreement with Haines. With regard to proposed new exhibits at Madison, Russell called it unrealistic and unfair to the American people to repeat the mistaken story about the Madison campfire birth of the national park idea. “It is not necessary to make such an unsupported claim,” he wrote, “in order that Yellowstone National Park might be lighted by an extra blaze of glory.”²⁰

But regardless of Russell’s support of Haines, Haines’s findings were not “sitting well” with other NPS officials. The main one of these was Ronald F. Lee (1905–1972)²¹ in NPS’s Washington, D.C., office. Lee, an academically trained historian, had served as NPS’s chief historian and chief of interpretation, and in the early 1960s he was an NPS regional director in Philadelphia. Spearheaded by Lee, an internal NPS dispute began to arise, at first between Lee and Haines but eventually involving numerous other personalities. The most noteworthy of these—although his influence often occurred behind the scenes—was Horace M. Albright.²²

The dispute centered on the Madison campfire story—the traditional park story suggesting that the idea for Yellowstone National Park originated with one man on a specific day (Cornelius Hedges on September 19, 1870). Historian Aubrey Haines, during his long research into park history beginning in 1938, discovered that these assertions were problematic at best and downright wrong at worst. The story could be traced to N.P. Langford’s 1905 book,²³ a “reconstructed account” which claimed that Langford’s party originated around their campfire the idea of preserving the area as some kind of “national park,” that

Cornelius Hedges suggested that there “ought to be no private ownership” of the area, and that the national park idea itself was born from this campfire conversation.

Haines discovered that problems with this story were numerous. First, exactly what was discussed by 1870 party members at their campfire could not be confirmed or ascertained. Second, there was uncertainty as to whether the party even discussed the momentous idea of preserving Yellowstone as some kind of park, let alone whether it would be a “national” park or whether the members would work toward such a goal. Third, both the process by which the national park was established and the national park idea itself did not seem to have sprung directly or indirectly from any such campfire conversation. Fourth, Langford’s description of the party’s alleged conversations did not appear until 1905—thirty-five years after the fact. Fifth, Langford’s 1905 discussion contained alleged direct (and lengthy) quotations from party members of the type that make historians suspicious. Sixth, Langford’s handwritten 1870 diary was found to be the only one in a long series of his diaries that was missing from the Minnesota Historical Society, so it could not be used to confirm his reconstructed 1905 account of the campfire conversation. Seventh, even though there existed at least seventeen written accounts by members of the 1870 party, not one of them corroborated Langford’s story of the alleged campfire discussion or of the idea of preserving Yellowstone or creating a “national park” in 1870, including two earlier accounts by Langford himself. Finally, the public-spirited sentiments attributed to the park’s alleged founders were seen to be *not* the only motivators driving their actions.²⁴

Not surprisingly, the story had defenders who refused to believe historian Haines²⁵ or to “let the story go.” They went so far as to denounce Haines and to castigate him for daring to disparage a sacred story that was cherished by the National Park Service. This writer and a co-author have noted that no one should have been surprised to learn that “stories this deeply embedded in the thinking and self-perception of so many people do not yield to easy disregard.” Instead the story had become a much ingrained “part of the historic and even the psychic fabric of the National Park Service and of the conservation community.”²⁶

As the one hundredth anniversary of Yellowstone in 1972 approached, NPS officials argued among themselves as to what to do about Madison Museum exhibits and what to say at the upcoming ceremony, which was to be held there at Madison. Some, especially Ronald Lee, urged that the campfire story be a centerpiece of the celebration as it had been fifty years earlier at Madison (Figure 5), but Haines stood firm in his historical interpretation. “Aubrey was a stone in a lot of people’s shoes,” says Haines’s former boss John Good, “and he just would not back down on that campfire myth.”²⁷ Ordinarily this kind of dispute would have settled into a long, slow debate so that Haines’s theory could have had time to be sorted out and confirmed by fellow historians. However, NPS did not have such time because the anniversary celebration was soon to occur. Washington officials resolved the problem with a compromise: the wording of the new sign at Madison Museum was made vague to give recognition to Haines’s theory while also allowing Lee to acknowledge Cornelius Hedges. Meanwhile, new exhibits in the museum would also become somewhat vague with regard to the Madison campfire.

The new sign at the museum that was to be erected for the 1972 festivities—one whose wording was apparently much argued about—was written to acknowledge that some kind of



Figure 5. C.W. Cook and Yellowstone superintendent Horace Albright, 1922, at Yellowstone's fiftieth anniversary celebration at Madison Junction. At that time NPS believed that both Yellowstone's preservation and the national park idea began at Madison. Yellowstone National Park slide file no. 03018.

campfire discussion had taken place and that at this campfire, "there emerged an idea, expressed by Cornelius Hedges, that there should be no private ownership of these wonders but that the area should be preserved for public enjoyment." "Others shared these views,"

continued the sign in a key vague statement, “and on March 1, 1872, President Ulysses S. Grant signed the act establishing Yellowstone as the world’s first national park.” Eventually Haines’s historical view prevailed. Regardless, this somewhat vague wording remains today on the sign located just west of Madison Information Station that overlooks Madison River and National Park Mountain.²⁸

But in 1960, Carl Russell was twelve years away from that decision by his superiors, so his recommendations for Madison Museum gave a mere nod to Haines’s new theory while offering suggestions for museum upgrades. Notwithstanding his “extra blaze of glory” statement, Russell had not sorted through the abstract elements buried in the alleged 1870 events. He still believed enough in those events at Madison to state that the Langford campfire was “an occasion so great in America’s social history as to make of the site a national shrine.” He, like others in NPS, was conflicted about the Madison campfire story. While recognizing that Haines was probably right in his historical interpretations, Russell could not bring himself at this late date in his life (it was 1960 and he was 66 years old) to summarily abandon his long-held idea that the Madison area was “sacred.” Thus his report gave a chronology of historical events that he believed should be interpreted at Madison Museum and toned down the campfire story (a little), but he could not completely “let go” of the “sacred national shrine” concept.²⁹

NPS officials at Yellowstone, at the regional office, and at the national office seem to have partly instituted but mostly ignored Russell’s recommendations for changing the museum’s interior. Instead, park officials, teaming with national NPS officials, moved during the period 1961–1962 (still early in Haines’s revelations) to protect the actual Madison campfire *site*, to increase the NPS story inside the museum, and to erect three new interpretive signs in the area. The agency removed an old bridge over the river that impinged on the campfire site, added a new campground to the area, decided not to make the Madison Museum larger, and continued for at least one more year the annual re-enactment of the 1870 party’s campfire as a scripted play. Surrounding all of these developments was what NPS believed about Madison. An NPS planner stated in early 1962 that “the primary objective at Madison Junction is to preserve this original campsite and provide adequate interpretation for the visitor[s] to instill in them the tremendous importance of the decision of the Washburn Expedition and how it has guided and influenced the entire development of the National Park Service.”³⁰ Of course even then Haines’s new conclusions were questioning whether the 1870 party had discussed anything about their discoveries around their campfire, whether they had made any such “decision” that the area should be protected, whether they would work for that decision, and whether they would call it a “national park.” All of these formerly accepted propositions were under fire by Haines.

But NPS’s three new signs nevertheless promoted the Madison area as a sacred shrine and touted the traditional campfire story as the true one. The largest new sign was erected at the junction of the roads, and it directed visitors with a huge arrow to “Madison Junction *Historic Shrine* [italics added] of Yellowstone Our First National Park, March 1, 1872.”³¹ A second sign, this time an interpretive one, was erected near Madison Museum. It attributed both the national park idea and the establishment of Yellowstone to Langford’s party on that night in 1870:

Madison Junction—The Birth of an American Idea. Across the Gibbon River, between you and National Park Mountain at the junction with the Firehole River forming the Madison a new idea in wild land conservation was conceived on September 19, 1870. Around the evening campfire, members of the Washburn-Langford-Doane exploring party agreed that this land of natural wonders must be set aside as Yellowstone National Park. The Park should be forever free for future generations and held inviolate in its natural state. Established by a benevolent Congress on March 1, 1872, Yellowstone the first national park has set a world-wide precedent for man's aesthetic appreciation of pristine beauty.³²

Park officials erected a third sign on Madison River some distance downstream from the museum and accessible to visitors from a roadside pullout. It too gave Langford's party credit for the national park idea:

National Park Mountain—In the shadows of this mountain around a campfire, the Washburn-Langford-Doane exploring party on September 19, 1870 conceived the idea of a national park. Yellowstone the first of many parks has set a precedent for this nation and the world. Great good will come to unborn generations from the wise decision of these farsighted men to preserve the area inviolate for all time.³³

But these new signs were to have short lives, because Aubrey Haines's research was already making them obsolete. Notwithstanding a "Decision of the Director" of the National Park Service in September 1962 that a new, improved Madison Junction Visitor Center would "tell the National Park Service story both nationally and internationally as well as [tell] the original concept of the National Park idea"—an acknowledgment of the idea that NPS history was part of the Madison shrine—Haines's conclusions were making things more complicated than NPS officials probably preferred.³⁴

The NPS would be carried almost kicking and screaming to Haines's side of the story in an extremely slow acceptance of the findings of one of its own historians—an acceptance that took more than twenty years. The notion that NPS was slow to accept the dismantling of its beloved campfire story has found confirmation in the writing of Barry Mackintosh, a later NPS historian. Mackintosh concluded that NPS "was its own worst enemy" at times by continuing to present the national park origin story in park after park long after Russell affirmed Haines's findings in 1960. Mackintosh also told of another NPS official, Edwin Alberts, who had become a subscriber to Haines's theory by 1964:

Investigations from the 1930s on cast doubt upon the "campfire story," but it was already firmly entrenched in Service tradition and continued to be retailed in publications, museum exhibits, and public programs. In 1964 the Midwest Region's chief of interpretation, Edwin C. Alberts, courageously dissented to his regional director: "It is obvious that the frequent attribution, with respect to 'birth of the National Park idea,' to the participants at this 19th Century campfire are based on very tenuous grounds and in view of current curiosity about the matter by more than one non-Service historian, we'd be wise to pull back on our

approach to avoid embarrassment.” The story could still be presented, argued Alberts, as a legend.³⁵

In 1971, when this author first served as a bus tour guide in the park and attended NPS campfire lectures, park naturalists were saying nothing about the Madison campfire controversy (at either Madison or other places in the park) and instead were still telling the old campfire story as if it were accepted fact. Already eleven years had passed since Haines debunked the old campfire story, and yet NPS was nowhere near to even partial acceptance of the new story.³⁶

Ronald Lee’s presence and influence were large factors in the continued delay of NPS’s acceptance of Haines’s work. Lee retired in 1966 but continued to be a writer and spokesman for national park issues during his six-year retirement. Ironically, he died in 1972, during the one hundredth anniversary year of Yellowstone National Park. But even then NPS was nearly a decade away from full acceptance of the campfire story as heroic myth rather than literal truth.³⁷

Horace Albright’s opposition was probably the largest factor in the delay of this acceptance. Albright served as NPS Director and then left the National Park Service in 1933, but lived on for fifty-four more years. He continued to wield amazing influence from afar upon NPS by meeting with its officials, writing articles, and giving speeches. He opposed Haines’s version of the Madison campfire story from the moment he heard about it. Former Yellowstone superintendent Bob Barbee was a seasonal NPS worker at Yosemite National Park in 1964 during one hundredth anniversary activities at that park on the day that Albright and other NPS “oracles” showed up for the festivities. When Albright was told that the historian at Yellowstone had determined that the Madison campfire story was a myth, Barbee says he heard Albright say, “He ought to be fired!” Of course the intent of such a statement at that early date could have been much lighter than it turned out later to be, but there is no doubt that Albright did not like hearing such news. His continuing influence within the NPS was powerful. Albright did not pass away until 1987, and there seems to be little doubt that his longevity helped to discourage the bureau from fully embracing Haines’s newer history. Most people in the NPS were reluctant to offend or speak against Albright.³⁸

With those factors operating, a memo to Park Superintendent Jack Anderson from Chief Historian Robert Utley, dated June 30, 1971, probably had a large impact upon preparations for the redesigned Madison Museum, upon plans for the upcoming Yellowstone centennial celebration, and upon the way park officials, including Anderson, ultimately treated historian Haines. Utley’s memo makes it clear that NPS regional directors (!) at a national meeting were then decrying the new findings by Haines. Here is the relevant material from Utley’s memo:

At the Grand Canyon regional directors meeting last week I was exposed to views of considerable intensity on both sides of the current campfire controversy. You should know, if you haven’t already heard, that Ronnie Lee has probed this question deeply and found a number of serious flaws in Haines’ research. I have been compelled to recede quite a distance in my

advocacy of Haines' findings. Almost certainly the Hummel committee, myself included, will conclude that the subject of public reservation was discussed on the night of September 19, 1870, at Madison Junction and that several of the people who were there later worked very effectively for the park bill. It appears that Haines has been too harsh on Hedges and Langford and that they deserve more credit than Aubrey has been willing to grant them.

On the other hand, we must not let this judgment lead us back to the simplistic story of old. I fear there is a real danger of this. A balanced interpretation must acknowledge the contributions of Kuppens, Meagher, Cook-Folsom, Hayden, and the congressional sponsors as well as Langford, Hedges, and their associates. The birth of the idea, and the origins of effective action, should not be traced exclusively or even primarily to Madison Junction.

Most of us lean to Louis Cramton's study of Yellowstone as a balanced interpretation on which all can hopefully unite until the findings of Haines and Bartlett can be further tested by unhurried study. Cramton, you may know, was very close to HMA and his booklet was published when HMA was director.³⁹

"HMA" was Horace Marden Albright. Here we see Utley downplaying it but unquestionably being influenced by Albright's lobbying for the old story. Utley's use of the initials HMA instead of Albright's name certainly betokened the notion that he and other NPS staff held Albright in oracle-like esteem. We also see Albright's likely influence here upon numerous NPS regional directors—people who were arguing about Yellowstone's campfire story while occupying very high positions in the agency (few if any of them were historians). And while we see Utley's rejection here of the national park idea as having been totally born at Madison—itsself a very large step for the NPS—we do not yet see Utley siding with Haines against N.P. Langford, as he would later do.

This memo tells us a lot about the views in 1971 of high NPS officials, including Utley, regarding Aubrey Haines and the Yellowstone campfire story. It is likely that this memo and their views had strong influences on Yellowstone officials like Jack Anderson, and that those views trickled down to castigate Haines and his revisionist campfire story as the time approached for the opening of the new Madison "Explorers' Museum," the Yellowstone centennial celebration, and the Second World Conference on National Parks. Many, probably most, of those NPS officials were unwilling to offend Horace Albright and the Ronald Lee advocates by accepting revisionist history that had not yet been "tested by unhurried study,"⁴⁰ especially when a middle course could be steered by simply making the wording of a new sign a bit vague and by making the new museum into an "Explorers' Museum" rather than one touting the old campfire story. As mentioned, Utley would later change his mind about supporting Lee when Haines's research convinced him that no one could know whether a "public reservation" was discussed at the 1870 campfire or even whether discussion of anything relating to Yellowstone occurred there. And Haines had definitively shown that the national park idea itself had earlier origins.

In hindsight, many NPS officials should have been listening to Yellowstone's Chief Naturalist John Good. In 1966, Mr. Good warned of trouble surrounding the campfire story

that would come to the agency within a few years. “I am raising this rather sticky subject,” he cautioned, “because . . . I believe the Service could easily paint itself into a tight corner if we are not careful.” Sensing a problem in the arising books and films that were being produced as Yellowstone’s centennial approached, and also a problem with an NPS Director (George Hartzog) who did not believe in Haines’s new research, Good wrote—with the approval of his Yellowstone bosses—the following remarkable (and gutsy!) memo to NPS officer Bill Everhart, who had Director Hartzog’s ear:

If we say the idea of a National Park was hatched or even formalized at the famous Madison Campfire[,] we will be disregarding every bit of knowledge that exists. . . . There is so much evidence accumulated over the years and so readily available which refutes our Madison myth [that] I honestly believe the only reason no one has pointed to our feet of clay is a general lack of interest in the subject. But to the extent the Centennial is publicized[,] interest will rise and someone will clobber us.

If we were the Pinedale [Wyoming] Chamber of Commerce claiming Jim Bridger as a founding father[,] this would be one thing and nobody would mind a bit of embroidery to the story. But the National Park Service is a big boy! It prides itself on the professional standards of its historical research and interpretation. Can we afford seriously to champion what is so obviously a sham concocted by an old man (N.P. Langford) who feared his share of the Yellowstone glory was about to be lost? I hope not. . . .

If you agree [that] we should get back on the track of history, perhaps you can find a good time to discuss the matter with the Director. Mr. [George] Hartzog seems completely sold on the Madison myth, I suspect by Horace Albright. [Yellowstone Superintendent] John McLaughlin has tried to raise the matter but Mr. Hartzog did not care to discuss it—to put it mildly. Apparently the subject is an emotional one to him. . . .

A few more speeches by the Secretary [of Interior] and the Director [of NPS] alluding to “that little band of far seeing men” [at Madison in 1870]—and we will be stuck with the story until the roof falls in.

The monkey is on your back for obvious reasons. You head up interpretation and you are a historian. But most important of all, Mr. Hartzog knows you well and trusts your judgment. Your raising this matter gives it importance and urgency [that] none of us here can supply. . . . There certainly is no point in trying to show the public the lapses in Langford’s memory or worse, his prevarications.⁴¹

Whether Bill Everhart responded to John Good or approached Director Hartzog at the time to encourage him to accept Haines’s research is not known. But he *would* respond five years later.

With urgency that seems palpable today, Good had carefully “run this material by” his own bosses, including John McLaughlin, a few weeks earlier, saying to McLaughlin that he

believed the issue of the campfire story would soon come up and laying out where the agency—at least in Yellowstone—had been was currently was with regard to the new conclusions. Good thought that the national NPS leaders would soon be forced to confront the falsity of the old campfire story by admitting that Haines was right:

If so, why not now over my signature instead of yours so that if the sky falls you can claim [blame] an overeager staff man? Lest you think I have gone crackers[,] I can't think what else to do. Dev[ereux Butcher, a book author] has asked our help; can we write back and say everything [in his book] is great when we know very well it is not? And if we do, won't we find it that much harder to change the story with the next inquiry or when the movie is made? I think there is too much at stake to continue supporting the Madison Junction myth. We know far more about Yellowstone's establishment than we have publicly let on, and if Service integrity in history means a thing[,] we can no longer plead ignorance or confusion or any other mitigating reason for not presenting the evidence we have. There are pragmatic reasons for such a letter, too. I am sure the trail is too clear not to have some sensationalist or historian pick it up between now and 1972. Can you imagine how silly the NPS would look with a \$100,000 film based on a fairy tale which we had been calling history publicly[,] knowing full well it wouldn't hold water? I know there is a chance [that] George [Hartzog] would blow his lid, but he is a smart enough man to see we are propping up a dead horse. If there were a gray area large enough to contain our story we might be justified in clinging to it, but there is not. Aubrey [Haines] knows this as does Roy Appleman, Charlie Porter, Dick Bartlett, and Ray Mattison, to name a few.⁴²

But apparently few persons in the NPS listened to John Good, and the matter continued to simmer until 1971, when Robert Utley heard the aforementioned regional directors discussing the campfire story. As Utley made clear, Albright was involved in these discussions as he maintained his campaign to discredit Haines's version of the facts. By this time, John McLaughlin had been transferred to Sequoia/Kings Canyon National Park where, like many superintendents, he continued to be in the NPS loop by virtue of expertise and authority. Yellowstone Chief Naturalist Bill Dunmire asked him in 1971 for some advice about the Madison campfire story for the upcoming centennial, and McLaughlin responded by acknowledging Albright's continuing influence in the debate:

The material you sent me on the [campfire] subject matter is very helpful and much appreciated. My reinterest in this has been "triggered" by Horace Albright, who is endeavoring to get [all] the former Superintendents of Yellowstone to support what develops to be the old "Campfire Story." He mentioned a "statement" now being issued by the Park which I gather is the one you sent me. This is roughly the one developed, I believe, by John Good or this is a facsimile thereof. In any event, although I haven't been close to the ongoing historical study since I left Yellowstone, the statement you sent me coincides with the historical information as it now stands so I have written Horace that I support the information therein.⁴³

Here McLaughlin had apparently made an effort to tell Albright that NPS was supporting a

vaguer version of the campfire story, thus becoming one NPS official who showed at least some predilection to resist Albright's influence.

Others were slowly following. Bill Everhart, still director of the NPS's Harpers Ferry Center, was finally responding to the problem that John Good had so forcefully warned him about five years earlier. Everhart appears to have taken the news to NPS Director George Hartzog that Madison Museum would become an "Explorers' Museum," and Hartzog then told Albright of that development. Said Everhart:

Talking with George [Hartzog] about the [Madison] museum project, he tells me that he has clearly informed Horace Albright that this museum will be devoted only to Yellowstone exploration and will not treat the campfire. He reports that Horace responded that he thought it was wrong not to include the campfire but he would be willing to open the museum on the explorer theme. I predict there may be some changes in this understanding.⁴⁴

It is interesting to wonder what Everhart meant by that last sentence. Did he mean merely that Albright might withdraw his vague endorsement of the museum? Or did he mean, more ominously, that he thought it possible that Albright would eventually succeed in pressuring Hartzog to return to acceptance of the old campfire story so that Hartzog could then issue a director's order forcing Yellowstone to include it in the new museum's story? A cynical observer might opt for the latter interpretation.

It is sad that many NPS officials and their advisors during the period 1966 through 1972 acted so intractably, such that, at least for some of them, saving the cherished myth became more important than the simple truth. That much can be argued because, as Good noted, three NPS historians (Roy Appleman, Charles Porter, and Ray Mattison), plus Carl Russell after a fashion, had signed on by 1966 to Aubrey Haines's version of the story, along with one academic historian (Richard Bartlett) and an NPS regional chief of interpretation (Edwin Alberts). Additionally, NPS Chief Historian Bob Utley was on board in early 1971. Therefore enough of these reputable historians agreed with Aubrey Haines by 1971 that it can be argued that NPS had adequate evidence to formally side with Haines prior to the Yellowstone Centennial.⁴⁵ On the other hand, none of these historians had produced a formal study replicating Haines, and Haines's nemesis Ronald Lee had looked into the campfire documents more than any other NPS historian. So NPS could claim—arguably without real honesty—that it was faced with the dilemma of not yet knowing what was true, even on the heels of Good's forceful memos. Good was a geologist, not an historian. Meanwhile Yellowstone officials—at least Haines's immediate supervisors—were placed in the position of having to protect him by getting him out of the line of fire while still keeping their higher bosses happy by not appearing to subscribe (yet) to Haines's new story. The situation at Madison was ultimately resolved by playing down the old campfire story, replacing it with a vaguer story, and keeping exhibits out of the new "Explorers Museum" that referred in any way to the old story. In protecting Haines and resisting Albright, John Good emerged as an unexpected secondary hero for Yellowstone.

Probably because some NPS officials (and Albright) harbored grudges against Haines, it would be many years before he was out of danger and could emerge as a primary hero.

Shipped to temporary duty at Big Hole National Battlefield, Haines retired from NPS in 1969. Strangely, either Haines was not invited to speak at the formal opening of the newly redesigned Madison Junction “Explorers’ Museum” on July 28, 1972, or else he himself decided not to participate. If NPS officials decided not to invite Haines, that is a measure of how poorly the agency was treating its own historian and of how intimidated NPS officials continued to be by Albright and Lee. Instead, with Park Superintendent Jack Anderson in attendance, the history speech was presented by Ned Frost from the Wyoming Recreation Commission, a “historian” whose working life was spent as an outfitter. Considering that Yellowstone officials with the possible exception of Anderson are known to have gone to some lengths to protect Haines from NPS higher-ups, if Haines was purposely excluded from the centennial ceremonies at Madison, the best guess is that that pressure came from sources outside of Yellowstone. Those sources were most likely to have been Horace Albright and Ronald Lee.⁴⁶

Also present that summer of 1972 was yet another symbol of NPS’s indecisiveness and irresolute thinking about its cherished Madison campfire story. This was seen in the agency’s use—at the Second World Conference on National Parks held in Yellowstone in September—of Freeman Tilden’s pamphlet “Yellowstone, the Flowering of an Idea” rather than usage of earlier literature that restated the Madison campfire story. Tilden’s pamphlet totally ignored the campfire story, not mentioning it at all. Instead the pamphlet took note of the travels of Langford’s 1870 party and vaguely stated that “from that journey and those men came suggestions setting aside Yellowstone as a national reservation.” Just as they did not appear on the new sign at Madison “Explorers’ Museum,” references disappeared in Tilden’s pamphlet to Langford’s party originating the national park idea in general and to claims that they were the first to specifically propose setting Yellowstone aside. Present at that Second World Conference on National Parks was Horace Albright. Not physically present due to ill health but very much present in influence was Ronald Lee. Both men still opposed Haines’s conclusions.⁴⁷

“Out of the loop” where these internal NPS debates were concerned, former park naturalist Don Stewart revisited Yellowstone in 1973 for the first time since his final summer of working at Madison ten years earlier. Walking into the Madison Museum that summer, Stewart found that the old exhibits had been “replaced by gaudy modern exhibits brightly illuminated by spotlights mounted on the interior superstructure of the building.” He was horrified and lamented that the new exhibits told “less than a quarter of the story imparted by the exhibits which once detained visitors to the museum for hours.” Old-timers everywhere often fume about changes to the world that follow their time spent, and Stewart was no different. He referred to Madison Museum as “spiritually empty” at that time and stated in his reminiscences that he could not bring himself to ever enter it again. For him, the museum was a mere shell of what he had known for so many years. Stewart apparently did not realize that the Madison campfire story had been exposed as essentially untrue. He probably would have been heartbroken, had he known in 1973 that his cherished story and the “sacred shrine” concept of Madison Museum would both be abandoned within a few years.⁴⁸

However, it was taking awhile for NPS to accept Haines’s new story. This author remembers wondering in 1974 upon the publication of Richard Bartlett’s book *Nature’s*

*Yellowstone*⁴⁹ why Bartlett had so vehemently indicted N.P. Langford and the campfire story but why park naturalists were yet saying nothing to the public about the campfire story being in disrepute. At least one of the reasons for this, it now appears, was that Haines had so toned down his discussions of the Madison campfire story in his 1974 and 1977 books (because of Chief Historian Robert Utley's requests) that uncritical readers easily missed his distrust for and dislike of Langford and hardly noticed that Haines had methodically dismantled the campfire story.⁵⁰ Indeed, one would think that the new story would have been accepted more quickly in Yellowstone than in NPS as a whole. Instead, it appears that Haines's caution in his writing (encouraged by Utley), along with Albright's and Lee's opposition to the new story, aided in delaying park naturalists and park bus interpreters from accepting the story fully for a few more years.

So just when did NPS interpreters begin relating the Madison campfire story as a myth or heroic metaphor and not as literal truth? Finding the answer to that abstract question has been a bit difficult, but neither of two long-term Yellowstone rangers remembers any kind of official NPS memo ever being issued to Yellowstone staff about how to discuss the Madison campfire story. Instead, says Linda Young, John Whitman (the park's acting North District naturalist) began telling his interpreters—in the late 1970s, Young thinks—that if interpreters wanted to tell the campfire story to be sure that they said it was a myth and then to tell the public “here's what we think really happened.” Park Senior Technical Writer Paul Schullery agrees and “seems to remember” that this way of doing things was “in place” by 1980.⁵¹

As we consider the Yellowstone campfire story, we must also consider the larger scale examined by authors Paul Shackel and Michael Kammen in their studies of the uses of history and myth over time in the United States. Shackel has noted that the past and its myths may certainly be used—and have indeed been used—to serve partisan purposes, and that history may also be used as a means to resist present change. Kammen has claimed that other National Park Service sites besides Yellowstone have participated in mythmaking too. For example, at George Washington Birthplace National Monument, says Kammen, NPS personnel were so embarrassed by their collusion in the spurious location and style of a house pushed on them by super-patriots that they long would not inform the public of “just how phony the site really was.”⁵² The use of history by super-patriots who do not want to teach or even believe anything negative about a nation or its heroes has also been studied within the purview of formal education by Gary Nash and his co-authors in their book *History on Trial*.⁵³ This type of near-religious fervor that Nash, Kammen, and Shackel chronicle, involving shrines such as Madison Museum or heroes like George Washington, “Buffalo” Bill Cody and George A. Custer, is lately generating more critics among writers who have closely scrutinized and pondered the complexities of history and who recognize that history is not simple.

At this point, astute readers who have been considering the Yellowstone story may have discerned a side to this that probably explains Albright's strident and venomous opposition to Haines's new conclusions—conclusions that were effectively dismantling the “sacred” Madison campfire story during the 1960s. Albright had originally obtained the funds for the Madison Museum and then personally and vigorously pushed and oversaw the building to its completion (1929–1931). As NPS director he had approved, if not originated and/or pro-

moted, the additional monument to Stephen Mather—and therefore to Albright’s own organization, the NPS. Hence, Albright had had great influence in the setting up of what was essentially a *triple national shrine* at Madison Museum with worldwide implications! One could even argue that Madison was a worldwide shrine, making the place even more important! Thanks in large part to Albright, Madison Museum with the entire Madison area was a shrine to the setting aside of Yellowstone as the first national park in the world, a shrine to Yellowstone and the Langford expedition as the beginning point for and the originators of the national park idea and thus for the entire national park system worldwide, and a shrine to Albright’s agency—the National Park Service—through the “boulder plaque” honoring Steve Mather. In the eyes of many NPS persons, including Albright, the establishment of Yellowstone was the direct link to the establishment of the national park idea, which started the national park system worldwide and resulted in the establishment of the U.S. National Park Service as an agency. Therefore if NPS’s “sacred” Madison campfire story were to be proven incorrect or exposed as a myth, that exposure might somehow denigrate all three entities: Yellowstone, the national park idea, and the National Park Service, to say nothing of (possibly) reflecting back onto Albright himself.⁵⁴

It seems small wonder, then, that Albright attacked Aubrey Haines’s research so vehemently! How else can we explain the vindictive pressure on Haines’s bosses to “punish” him—through his removal from his historian position (the first-ever such position in Yellowstone history), the actual transferring of him to another park, the seeming urgency to put him into retirement, and the apparent hesitancy of NPS to invite him to speak at the park’s centennial celebration at Madison?⁵⁵

John Good today does not remember why Haines was not invited to speak, but he does remember that “it was something that a lot of us wondered about at the time.” He says that he personally had nothing to do with Haines’s transfer to Big Hole National Battlefield (“It wasn’t me; I wouldn’t have done it!”). His thought about NPS’s compulsion to force Haines into early retirement is: “I’m sure that *that* pressure came from Horace Albright!” Albright, explained Good, “thought he knew everything about Yellowstone and he had not worked there in about half a century.”⁵⁶

The NPS’s handling of Haines’s research is a commentary on the dilemma faced by any organization when credible new information surfaces that cannot be quickly confirmed. Witness the problems of Congress recently with regard to White House official Karl Rove’s alleged participation in politicizing the U.S. Justice Department, Scooter Libby’s affair under Vice President Dick Cheney, and other such foibles involving President George W. Bush’s administration. Perhaps it is also a commentary on the tendency of some officials and managers to hold long grudges *against historians, scientists, and journalists* who dare to reveal certain truths, especially where losses of “shrines” or bad public relations for an organization might occur. The idea of shooting the messenger (killing an innocent person who brings bad news) has been part of reality back to the ancient Greeks, and it remains an occurrence that is often seen in corporations, clubs, nonprofit organizations, and government agencies, as reported by newspapers and television news stories.⁵⁷ All of this also illustrates a parallel problem within agencies and corporations: sometimes their managers fail to seek out and understand their own histories. Too often managers do not wish to hear from historians or

journalists that they may be making a mistake by “repeating the past.” But past events often predict the future and point to possible solutions to problems.

Apparently fearful of losing their “sacred shrine”—Madison Museum—and their cherished campfire story, certain officials in and outside of NPS treated historian Aubrey Haines very shoddily, but others, especially Haines’s Yellowstone bosses, stood by him through the fiasco. Haines himself, while personally deeply hurt for awhile, ended up believing that “it came out all right.” His own statement on the subject, made many years later, concerned the ramifications of his dismantling of NPS’s sacred Madison campfire tale:

It cost me my historian position and that caused me to retire early, but that wasn’t all bad. I continued to work on Yellowstone’s history, and on other good projects, from the basis of a secure retirement (I am in the twenty-ninth year of that retirement now), so I don’t see that they hurt me much. Frankly I was sustained by the fact that Yellowstone Park supported me—put me in the then open position of Naturalist-Geologist, George Marler’s slot, vacated by his retirement—so I could finish *The Yellowstone Story* after my historian position was terminated. The NPS historians in Region II and the Washington office (Mattes, Tompson, Appelman [*sic*], Utley, and Mattison) were supportive and helpful. It came out all right.⁵⁸

As this writer and his previous co-author Paul Schullery have noted, controversies in Yellowstone have often generated rudeness on the part of participants, and “it is probably past time that some participant in a Yellowstone controversy is guilty of being too polite.”⁵⁹ In this statement, Haines was certainly polite. We naturally do not want to be accused of any of the rhetorical excesses and careless thinking that characterized the early defenses of the Madison campfire story, and which often demeaned Haines. If Aubrey Haines himself could be so forgiving, we are probably wise to follow his example. But we also need to learn from these examples and try not to repeat the mistakes.

Hindsight being “twenty-twenty,” we know today that Haines’s revelation of the truth about the Madison campfire story has had few negative consequences in Yellowstone except to change the status of Madison Museum from triple national shrine to simple information station. Instead, Yellowstone itself, the national park idea, and the National Park Service all march blithely along, with history proceeding in its usual “merry unpredictable way.”⁶⁰ Yellowstone is still celebrated and preserved as the world’s first national park, even if we do not know whether Langford party members discussed around a campfire its preservation or whether they would work toward that end; the national park idea is still celebrated as a uniquely American idea, even if it did not begin with the 1870 Langford party; and the National Park Service is still revered by the American public as its favorite government agency. Horace Albright, Ronald Lee, and their supporters within the National Park Service need not have worried. With regard to the Madison Museum and its campfire myth, all was and is still well in Wonderland.

Endnotes

1. National Park Service Organic Act, *U.S. Statutes at Large*, vol. 17, chapter 24, pp. 32–33, as reproduced in Aubrey L. Haines, *The Yellowstone Story* (Boulder: University

of Colorado Press, 1977, 1996), vol. II, pp. 471–472.

2. For example, Hermon Bumpus, one of the creators of the Madison Museum, noted in 1930 at Madison that “here originated the national park idea—an idea that has since been adopted by many civilized nations.” H.C. Bumpus, “To Messrs. Demaray, Yeager, Jones, Kelly, McDougall” [on pink paper], January 30, 1930, pp. 7–8, in box K-18, file 833-05, “H.C. Bumpus 1930,” Yellowstone National Park Archives. For another example, when the Steve Mather memorial tablet was placed at Madison Museum in 1932, Superintendent Roger W. Toll stated that the museum itself “was built on this spot because it seemed most fitting to locate it at the birthplace of the national park idea.” R.W.T[oll], “Draft of a Talk for the Dedication of the Mather Plaque at Madison Junction, July 4, 1932,” in file 111.1, “Director (Stephen T. Mather).” This file is currently located in “Biography (Mather),” Yellowstone National Park Library vertical files, but it will eventually be moved to Yellowstone National Park Archives.
3. Alfred Runte, *National Parks: The American Experience* (Lincoln: University of Nebraska Press, 1997), pp. 2–4. Hot Springs National Park in Arkansas was a special case. Although it was established in 1832 as a “federal reservation,” it originally was not a national park in the strict sense of the word because its establishment occurred to allow *commercial use* of its hot spring waters. Its receipt of the title “national park” in 1921 was a purely political matter. Runte, *American Experience*, pp. 217–218.
4. The complete story of N.P. Langford and the Madison campfire “myth” is in Paul Schullery and Lee Whittlesey, *Myth and History in the Creation of Yellowstone National Park* (Lincoln: University of Nebraska Press, 2004). The present study can be seen as an extended “footnote” to that book. The “one man on a specific day” statement was touted not only by NPS interpretive signs in the early 1960s but also for a much longer time in the well known *Haynes Guide* from 1906 through 1966. See for example Jack Ellis Haynes, *Haynes Guide Handbook of Yellowstone National Park* (St. Paul: Haynes, Inc., 1939), p. 74; 1966, p. 75.
5. What Albright believed about Yellowstone’s origins and the Madison campfire story can be seen in his book *Oh, Ranger!* (Stanford, Calif.: Stanford University Press, 1928), p. 121, and it is the standard Langford story, taken from Langford’s 1905 book.
6. Haines, *Yellowstone Story*, II, p. 310. For the details of this gift, see Beardsley Ruml to Secretary of Interior Hubert Work, March 2, 1928; and H.C. Bumpus to Horace Albright, February 9, 1928, both in box K-18, file 154.3 “F.Y. 1928,” Yellowstone National Park Archives.
7. Ethan Carr, *Wilderness by Design: Landscape Architecture and the National Park Service* (Lincoln: University of Nebraska Press, 1998), pp. 144–145.
8. Kiki Leigh Rydell and Mary Shivers Culpin, *Managing the “Matchless Wonders”* (Yellowstone National Park, Wyo.: National Park Service, Yellowstone Center for Resources, 2006), pp. 100–101.
9. During his thirty-four years with the National Park Service, Russell (1894–1967) would also serve as chief naturalist and superintendent of Yosemite National Park and regional director of NPS. His personal papers are at the University of California–Berkeley. “Yosemite Park Superintendent Envisions Great Western History Museum for St.

- Louis,” *St. Louis Globe-Democrat*, July 21, 1949, p. 1; Ralph H. Lewis for National Park Service, *Manual for Museums* (Honolulu: University Press of the Pacific, 2005), preface; Ralph H. Lewis, “Retracing Curatorial Developments in the National Park Service,” *CRM Bulletin* 5 (December 1982); on-line at <http://crm.cr.nps.gov/archive/05-4/5-4-all.pdf> (unpaginated version).
10. Hermon C. Bumpus, Jr., *Hermon Carey Bumpus, Yankee Naturalist* (Minneapolis: University of Minnesota Press, 1947), pp. 68–72, 104–120. Bumpus (1862–1943) received the Pugsley gold medal “for outstanding service in the field of national park education.” He has been credited with establishing the conceptual foundations for today’s NPS interpretive centers and thus has been called the “father of museums in national parks.” He produced “Museum Work in National Parks,” in *Museum News* 7 (January 15, 1930); “Outdoor Education, The Part Played by Our National Parks,” *Hobbies: The Magazine of the Buffalo Museum of Science* 10 (June 1930); and “Trailside Museums,” in *Museum Journal* (London) 30 (July 1930). For his work in Yellowstone, park officials named a riverside pinnacle for him “Bumpus Butte.” Lee H. Whittlesey, *Yellowstone Place Names* (Gardiner, Mont.: Wonderland Publishing Company, 2006), p. 58.
 11. Carr, *Wilderness by Design*, p. 145.
 12. Haines, *Yellowstone Story*, II, p. 310; Rydell and Culpin, *Matchless Wonders*, p. 101.
 13. H.C. Bumpus, “To Messrs. Demaray, Yeager, Jones, Kelly, McDougall” [on pink paper], January 30, 1930, pp. 7–8, in box K-18, file 833-05, “H.C. Bumpus 1930,” Yellowstone National Park Archives.
 14. Madison Museum was shown as “Trailside Shrine” on a 1931 blueprint. National Park Service (T.C. Vint), blueprint “Yellowstone National Park Parking Area Development Madison Junction,” August 18, 1931, YEL-1008, in box K-18, file “H.C. Bumpus 1930,” Yellowstone National Park Archives. See also Carl P. Russell, “Museum Prospectus: Madison Junction Visitor Center Yellowstone National Park,” June 3, 1960, in box D-66, Yellowstone National Park Archives; and Thomas C. Vint to Roger W. Toll, January 5, 1932, in NPS file 111.1 “Director (Stephen T. Mather), held in “Biography (Mather),” Yellowstone National Park Library Vertical Files. The “nature shrines” designed by Bumpus and Russell are in box K-18, Yellowstone National Park Archives, and are mentioned in Carr, *Wilderness by Design*, p. 145.
 15. David Nathanson, “The Mather Memorial Plaques,” January 7, 2002, in National Park Service History Collection, Harpers Ferry Center, Harpers Ferry, West Virginia; Joseph Joffe, “Stephen T. Mather Plaque Dedicated,” *Yellowstone Nature Notes* 9 (nos. 6–7), June–July 1932, pp. 27–28. See also Guy D. Edwards to NPS director, May 24, 1932, in box K-18, file 702.133, “Museums General Plans and Suggestions/Corrections,” Yellowstone National Park Archives; and “Report of Kenneth C. McCarter, Asst. Landscape Architect. . .,” July 1–4, 1932, in box D-67, file 329, “Landscape Division Matters FY 1933 FY 1934,” Yellowstone National Park Archives.
 16. Thomas C. Vint to Roger W. Toll, January 5, 1932; Horace Albright, telegram to Roger W. Toll, July 2, 1932, both in NPS file 111.1, “Director (Stephen T. Mather).” This file is currently located in “Biography (Mather),” Yellowstone National Park Library Vertical Files, but will eventually be moved to Yellowstone National Park Archives.

17. Stewart, "Yellowstone's Madison Museum," *Montana the Magazine of Western History* 25 (summer 1975), pp. 65–66. This also appears in Stewart, *My Yellowstone Years* (Fowlerville, Mich.: Wilderness Adventure Books, 1989), pp. 167–168.
18. Lee H. Whittlesey, "History of the Madison Museum—Today's Madison Information Center—at Madison Junction, Yellowstone National Park, Wyoming," unpublished draft manuscript, National Park Service, July 23, 2008, p. 14, Yellowstone National Park Library, citing William E. Kearns, "A Suggested Plan for Madison Junction Historical Museum," 1940, in box D-66, Yellowstone National Park Archives.
19. Carl P. Russell, "Museum Prospectus," June 3, 1960, in box D-66, Yellowstone National Park Archives.
20. Russell, "Museum Prospectus," June 3, 1960, in box D-66, Yellowstone National Park Archives.
21. Ronald F. Lee is deserving of a major footnote. About his role in the National Park Service, former Chief Historian Robert Utley has written: "After the war Ronnie emerged as one of the major powers that made historic preservation a national concern. He was a founder and longtime honcho of the National Trust for Historic Preservation, and he cemented [NPS's] solid ties to the American Institute of Architects and the American Association for State and Local History. No one in NPS, above or below him, challenged his rule in matters historical. He did not look authoritarian: [he was] short, bald-headed, moon-faced, [with] horn-rim glasses, and a wide mouth that articulated slowly and with painfully long pauses between clauses. Although Verne Chatelain was the first NPS Chief Historian, I think few would dispute that Ronnie Lee laid the foundation for the NPS history program and built the walls to a respectable height." Utley to Paul Schullery, January 5, 1998, copy in possession of Lee Whittlesey. This makes it clear that Lee was a very important figure in public history in America. His role as a pioneer in historic preservation and as a senior NPS official whom other agency officers had no reason to doubt must have made a lot of less-than-knowledgeable observers skeptical of Haines's viewpoint.
22. Although much of this dispute occurred during the period 1966–1972, Carl Russell included his "extra blaze of glory" statement in the text of his 1960 report on Madison Museum, indicating that his suspicion of the campfire story existed that year, so probably he and Aubrey Haines had already been communicating about the issue. For the "extra blaze" quotation by Russell and analysis of it, see Schullery and Whittlesey, *Myth and History*, pp. 45–46. For Lee's role, see pp. 57–60. For Albright's role, see pp. 51–55.
23. Nathaniel P. Langford, *Discovery of Yellowstone Park 1870: Diary of the Washburn Expedition to the Yellowstone and Firehole Rivers in the Year 1870* (St. Paul: J.E. Haynes, 1905), pp. 117–118. J.E. Haynes published a second edition in 1923, and Haynes too had a stake in the campfire story because he had promoted it so vociferously in his Haynes guidebooks. A third edition of the book was entitled *Discovery of Yellowstone Park 1870: Journal of the Washburn Expedition to the Yellowstone and Firehole Rivers in the Year 1870* (Lincoln: University of Nebraska Press, 1972) and is, according to

Aubrey Haines, “defective” in some senses, even though Haines himself wrote the foreword to that edition.

24. For details, see Schullery and Whittlesey, *Myth and History*, chapters three and four.
25. Haines served as Yellowstone National Park’s first historian for ten years, 1960–1969, and then was summarily “lateralled” to Big Hole National Battlefield, Montana, as a direct result of his having “dared” to question NPS’s sacred Madison campfire story. Langford, *Discovery of Yellowstone Park 1870*, 1972 edition, back cover, has a snippet on Haines as Yellowstone historian. The story of his difficulties with NPS after 1969 is detailed in Schullery and Whittlesey, *Myth and History*, chapters seven and eight.
26. Schullery and Whittlesey, *Myth and History*, pp. xiii–xiv.
27. Author’s conversation with former Yellowstone Chief Naturalist John Good, Jackson, Wyoming, August 13, 2008.
28. Schullery and Whittlesey, *Myth and History*, pp. 61–65. This author saw the sign there on June 12, 2008.
29. Russell, “Museum Prospectus,” June 3, 1960, p. 5.
30. William S. Rosenberg, “Design Analysis, Madison Junction,” February 1962, p. 2, contained in “Master Plan for the Preservation and Use of Yellowstone National Park, Wyoming,” chapter 5, in box D-66, file “Madison Junction Museum Prospectus 1960.” For the scripted play and other developments at Madison, see Lemuel Garrison, “Madison Junction Address,” August 20, 1961, in box A-398, file “A8215 Book #2, 1961–Jan 1962.”
31. Photo of sign in Schullery and Whittlesey, *Myth and History*, p. 82. That Madison Junction was seen as a “national shrine” in 1962 is also attested to by naturalist Don Stewart in his *My Yellowstone Years*, p. 162.
32. Photo of sign in Schullery and Whittlesey, *Myth and History*, p. 86.
33. Photo of sign in Schullery and Whittlesey, *Myth and History*, p. 93.
34. “Decision of the Director on Madison Junction Visitor Center,” September 4, 1962, in box D-66, file “Madison Junction Museum Prospectus 1960.”
35. Barry Mackintosh, *Interpretation in the National Park Service: A Historical Perspective*, no date, chapter two, “Historical Challenges,” at note 19. On-line at www.nps.gov/history/history/online_books/mackintosh2/branching_challenges.htm. (Accessed July 2008.) Mackintosh’s original statement is in his “The National Park Service Moves into Historical Interpretation,” *The Public Historian* 9, no. 2 (spring 1987), p. 60.
36. Schullery and Whittlesey, *Myth and History*, p. 71; author’s memories of living and working in Yellowstone, 1969–1972.
37. “Chief Historians for the National Park Service,” on-line at www.nps.gov/history/history/hisnps/NPSHistory/chiefhistorians.htm. (Accessed July 2008.)
38. Author’s telephone conversation with Robert Barbee, Belgrade, Montana, September 11, 2008. A study of Albright’s lifelong influence on the NPS, especially after his 1933 departure from the bureau, seems sorely needed, because he had so much behind-the-scenes influence. Our conjectures about his likely influence on the Madison campfire story appear in Schullery and Whittlesey, *Myth and History*, pp. 51–55. Two examples

of how highly NPS held him in esteem occurred in 1963 when the Park Service's training center at Grand Canyon National Park, Arizona, was named the "Albright Training Center" and in 1979 when the Mammoth Visitor Center at Yellowstone was rededicated as the "Albright Visitor Center." See John A. Tyers, "Albright Visitor Center Dedicated at Yellowstone," 1979 in box 1, file 1.17, Isabel Haynes papers, collection 1505, Montana State University, Bozeman.

39. [NPS Chief Historian] Bob Utley to [Park Superintendent] Jack Anderson and "signed off on" by Chief Park Naturalist Bill Dunmire, June 30, 1971, in box A-92, file "Centennial 1972," Yellowstone National Park Archives. Cramton's study is Louis C. Cramton, *Early History of Yellowstone National Park and its Relationship to National Park Policies* (Washington, D.C.: Government Printing Office, 1932).
40. Utley to Anderson, June 30, 1971.
41. [Yellowstone Chief Naturalist] John Good to Bill Everhart [director, Harpers Ferry Center], November 28, 1966, in box A-92, file "Centennial 1972," Yellowstone National Park Archives.
42. John Good, chief park naturalist, to superintendent through assistant superintendent, November 8, 1966, in box A-92, file "Centennial 1972," Yellowstone National Park Archives. Devereux Butcher's book is *Exploring Our National Parks and Monuments* (Boston: Gambit, 1969; 2nd ed. 1976); the 1976 edition (pp. 175-176) safely attributed the suggestion for Yellowstone to Cornelius Hedges. Compare this with his 1995 edition, pp. 213-214, wherein he continued to quote Langford's 1905 book even more extensively.
43. John McLaughlin to Bill Dunmire, July 2, 1971, in box A-92, file "Centennial 1972," Yellowstone National Park Archives.
44. William C. Everhart to superintendent, Yellowstone National Park, August 3, 1971, in box K-89, file "K1817 Interpretive Activities Interpretive Planning 1971," Yellowstone National Park Archives.
45. John Good implied that Roy E. Appleman, Charles W. Porter, III, Richard A. Bartlett, and Ray Mattison were all supporters of Haines's new conclusions. Documents cited here show that Carl Russell and Edwin C. Alberts were also partly if not fully "on board." Bob Utley would "sign on" by 1971 (*Myth and History*, p. 64). Appleman, Mattison, Porter, Utley, and Russell (after a fashion) were all historians who worked for NPS. Bartlett was an academic historian. Alberts was NPS regional chief of interpretation at the time; he wrote histories of Scotts Bluff National Monument and Rocky Mountain National Park.
46. National Park Service, "Formal Opening Explorers' Museum," Madison Junction, July 28, 1972, pamphlet in box A-51, Yellowstone National Park Archives. Haines's poor treatment by NPS is discussed in Schullery and Whittlesey, *Myth and History*, chapters seven and eight.
47. Freeman Tilden, "Yellowstone, the Flowering of an Idea," [1972] pamphlet filed in "Yellowstone Centennial and Second World Conference Materials," September 17-27, 1972, Yellowstone National Park Library Vertical Files, "Special Events." Many key documents in this tale of NPS's slow consideration of the Madison campfire story may

be found in box H-6, file “Madison Campfire Myth by Schullery and Whittlesey, 1971–2000,” Yellowstone National Park Archives. Some of the most important letters are: Roy Appleman to Aubrey Haines, undated (but Haines wrote on it “sent recorded tape 10/28/64”); John S. McLaughlin to director of NPS, June 27, 1967 (suggesting that NPS establish a panel of three historians to rule on the case); Ronald F. Lee to Edward A. Hummel, June 3, 1971 (saying he thinks Haines is wrong); William C. Everhart to Ronald F. Lee, February 7, 1972 (NPS Director sides with Lee); Ronald F. Lee to Edward Hummel and Robert Utley, June 7, 1971 (Lee’s arguments on why he thinks Haines is wrong); and perhaps the most important one, Aubrey L. Haines to Robert M. Utley, January 3, 1972 (Haines’s arguments on why he thinks Lee is wrong).

48. Stewart, *My Yellowstone Years*, p. 187.
49. Richard A. Bartlett, *Nature’s Yellowstone* (Albuquerque: University of New Mexico Press, 1974), pp. 150, 168, 199–200, 205.
50. Schullery and Whittlesey, *Myth and History*, pp. 64, 71; author’s memories of living and working in Yellowstone, 1969–1972. Haines’s 1974 book, *Yellowstone National Park: Its Exploration and Establishment* (Washington: Government Printing Office, 1974) made the case against Langford more forcefully than his 1977 book *The Yellowstone Story*, but even the former was toned down a bit due to Utley’s requests.
51. Author’s telephone conversation with (Chief of Interpretation) Linda Young, July 23, 2008; author’s conversation with (Senior Technical Writer) Paul Schullery, July 22, 2008, and his review comments on Whittlesey’s “History of Madison Museum.”
52. Paul Shackel, ed., *Myth, Memory, and the Making of the American Landscape* (Gainesville: University Press of Florida, 2001), pp. 10–11; Michael Kammen, *Mystic Chords of Memory: The Transformation of Tradition in American Culture* (New York: Alfred A. Knopf, 1991), pp. 467, 500–501. For more on NPS at U.S. historical sites and a photo of historian Ronald F. Lee, see pp. 465–473.
53. Gary B. Nash, Charlotte Crabtree, and Ross E. Dunn, *History on Trial: Culture Wars and the Teaching of the Past* (New York: Alfred A. Knopf, 1997).
54. In a similar manner, some of today’s environmentalists oppose Yellowstone’s winter planning proposal that touts plowing park roads and using buses instead of snowcoaches, probably because—like Horace Albright—they have spent years of time and energy paying tribute to one ideal (snowcoaches) and therefore do not want to hear about something that might be different or better. Even in the face of evidence that snowcoaches would use two-and-a-half times more fuel than buses, the snowcoach boosters do not want to hear it. National Park Service, “Winter Use Plan Final Environmental Impact Statement, Yellowstone and Grand Teton National Parks, John D. Rockefeller, Jr. Memorial Parkway,” (Yellowstone National Park, Wyo.: NPS), 2007, pp. 79–80, discussed in Michael J. Yochim, *Yellowstone and the Snowmobile: Locking Horns Over National Park Use* (Lawrence: University of Kansas Press, in press), chapter five.
55. Details of this story and Haines’s involvement in it are in Schullery and Whittlesey, *Myth and History*. Fellow historian Paul Schullery and I are among those who believe that Haines’s career was vindictively cut short by some vague set of people in the Department of the Interior and their advisors. As we state in our book on the subject, “We are

among those who are certain that this happened but we cannot prove it” absolutely. Schullery and Whittlesey, *Myth and History*, p. 94.

56. Author’s conversation with former chief naturalist John Good, Jackson, Wyoming, August 13, 2008.
57. Gregory Y. Titelman, *Random House Dictionary of Popular Proverbs and Sayings* (New York: Random House, 1996), p. 67. Sophocles wrote in *Antigone*: “Nobody likes the man who brings bad news.”
58. Schullery and Whittlesey, *Myth and History*, pp. 71–72.
59. Schullery and Whittlesey, *Myth and History*, p. 72.
60. Schullery and Whittlesey, *Myth and History*, p. 92.

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