NPS Centennial Essay: Designing Ocean Parks for the Next Century The Limits of Free-Market Environmentalism Wildlife Impacts on Development Adjacent to Protected Areas Building Community at Yosemite The Interpretive Potential of Setting at Cultural Heritage Sites

The George Wright Forum

The GWS Journal of Parks, Protected Areas & Cultural Sites

volume 25 number 3 • 2008



Origins

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

Mission

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

Our Goal

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

Board of Directors

ROLF DIAMANT, President • Woodstock, Vermont STEPHANIE TOOTHMAN, Vice President • Seattle, Washington DAVID GRABER, Secretary • Three Rivers, California REBECCA CONARD, Treasurer • Murfreesboro, Tennessee BRAD BARR • Woods Hole, Massachusetts SUZETTE M. KIMBALL • Kearneysville, West Virginia SUZANNE LEWIS • Yellowstone National Park, Wyoming MELIA LANE-KAMAHELE • Honolulu, Hawaii BRENT A. MITCHELL • Ipswich, Massachusetts JOHN WAITHAKA • Ottawa, Ontario ROBERT A. WINFREE • Anchorage, Alaska

Graduate Student Representative to the Board: REBECCA E. STANFIELD MCCOWN • Burlington, Vermont

Executive Office

DAVID HARMON, Executive Director EMILY DEKKER-FIALA, Conference Coordinator P. O. Box 65 • Hancock, Michigan 49930-0065 USA 1-906-487-9722 • fax 1-906-487-9405 info@georgewright.org • www.georgewright.org

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

© 2008 The George Wright Society, Inc. All rights reserved. (No copyright is claimed for previously published material reprinted herein.)

ISSN 0732-4715

Editorial and manuscript submission guidelines may be found on our website at www.georgewright.org/forum.html. Text paper is made of 50% recycled fibers. Printed by Book Concern Printers, Hancock, Michigan.

The George Wright Forum

The GWS Journal of Parks, Protected Areas & Cultural Sites

volume 25 number 3 • 2008

Society News, Notes & Mail • 3

The National Park Service Centennial Essay Series Designing Ocean Parks for the Next Century Gary E. Davis • 7

Privatizing Isle Royale? The Limits of Free-Market Environmentalism *Robert Pahre* • 23

Identifying and Protecting the Interpretive Potential of Setting at Cultural Heritage Sites *Christopher C. Mayer and George N. Wallace* • 40

Holding the High Ground: Interpreting the Civil War in National Parks *Robert K. Sutton* • 47

Stepping Outside the Boundary: Community-Building at Yosemite National Park Christopher C. Lever and J. Keith Gilless • 58

Evaluating Potential Wildlife Impacts of Future Land Development Adjacent to Protected Areas *Tony Prato, Anthony S. Clark, and Yan Barnett* • **70**

On the cover:

The Loggerhead Key light in Dry Tortugas National Park is an icon of one of the world's first underwater parks, home to the Carnegie Institute's pioneering marine laboratory from 1905 to 1941, and today presides over one of the world's largest fully protected marine protected areas in the park and surrounding Florida Keys National Marine Sanctuary. See the NPS Centennial Essay starting on p. 7. Photo by Dorothy A. Davis, © 2005 G.E. Davis & Associates.

FOR OVER 25 YEARS,

the George Wright Society has been about one thing:

CARING FOR PROTECTED AREAS.

The heart of the GWS is our support for professions that promote science, scholarship, and understanding in parks, protected natural areas, historic places, and cultural sites. We bring it all together in ways nobody else does. If you care about parks, won't you please join the GWS community of professionals? Membership includes a subscription to *The George Wright Forum* and discounts at the biennial GWS Conference. Use this form or join on-line at **www.georgewright.org**.

name
affiliation
address
city, state/prov, zip/postal code
work phone; work fax
email
expertise (name up to 4 areas)
<pre> regular \$55/yr (\$65*) supporting \$150/yr (\$160*) institution \$110/yr (\$120*) life \$1,000 (\$1,000*) full-time student \$25/yr (\$25*) library subscription \$55/yr (\$65*) * Prices marked with an asterisk apply to addresses outside of North America. Library subscriptions are available to libraries only, and include a subscription to The George Wright Forum only (no additional membership benefits) check enclosed please charge my Visa / MasterCard / AMEX card number</pre>
expiration date (MM/YY) 3-digit security code (back of card)
signature
MAIL TO: George Wright Society, P.O. Box 65, Hancock, MI 49930-0065 USA or FAX TO: 1-906-487-9405 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

SOCIETY NEWS, NOTES & MAIL

Diamant, Toothman, Kimball retain seats on GWS Board

In the April 2008 issue of The George Wright Forum we published our Call for Nominations for this year's Board of Directors election. The two seats open for election were held by two incumbent candidates, Rolf Diamant and Stephanie Toothman (who currently hold the positions of president and vice president, respectively). Both had previously indicated their willingness to run for another three-year term, and this was duly noted in the Call for Nominations. One additional candidate was nominated, but later withdrew from consideration, resulting in a situation where there were no challengers to the two incumbents. In cases such as this, Article X, Section 3(f) of the GWS By-Laws states that "the Board may, at its discretion, issue a finding that the intent of the Membership is for the incumbents to be reelected. Based on this finding, the Board may then, at its discretion, cancel the election procedure detailed in Section 3(b) of this Article and declare the incumbents to have been reelected." In essence, this allows the Board to declare the incumbents to have been re-elected by acclamation of the membership, thus saving the time and expense of holding an election whose outcome is a foregone conclusion. In September the Board did just that, so Diamant and Toothman each will serve a second three-year term, commencing January 1, 2009, and ending December 31, 2011. So will Board member Suzette Kimball, who was first appointed in 2006. Kimball, the associate director for geology at the U.S. Geological Survey, was reappointed by the Board at its annual meeting in early November.

"Climate Change in the Northeast" workshop DVD available

In June of this year, the National Park Service Northeast Region was one of the hosts of a workshop entitled "Climate Change in the Northeast: Preparing for the Future." The workshop was held at the University of Massachusetts in Amherst. Other hosts included the Northeast Region of the U.S. Fish & Wildlife Service, U.S. Geological Survey Eastern Area, U.S. Department of the Interior (DOI) Minerals Management Service, Northeast Region of the U.S. Forest Service, and the State of Massachusetts. The workshop focused on understanding present and anticipated climate change impacts to the forested and ocean and coastal ecosystems of the Northeast U.S. and identifying effective management approaches. An emphasis was put on collaboration among local, state and federal agencies.

The three-day workshop included keynote speakers, notably DOI Deputy Secretary Lynn Scarlett and Robert Corell of the H. John Heinz Center for Science, Economics and the Environment. Three concurrent sessions, highlighting resource impacts in the Northeast, management tools, and on-the ground examples of going green, helped frame the workshop and get participants involved in discussions.

A DVD of the workshop's PowerPoint presentations, session notes, and contacts was produced by the George Wright Society. If you want more information about the workshop, contact David Reynolds, chief of natural resources stewardship and science, in the NPS Northeast Region, at david_w_reynolds@nps.gov. If you want a copy of the workshop DVD, contact James Farrell, Northeast Region GIS specialist, at james_farrell@nps.gov.

George B. Hartzog, Jr., 1920–2008

Iconic National Park Service Director George B. Hartzog, Jr., a GWS Life Member, died in June at the age of 88. Many students of the National Park Service consider Hartzog to have been the last of the "larger than life" directors of the agency, someone who stands alongside Stephen T. Mather, Horace Albright, and Conrad Wirth in terms of his impact on the national park system.

Hartzog led NPS for nine years in the 1960s and early 1970s. During his tenure, the park system expanded significantly, not only in numbers of sites and acreage but in scope: he championed national recreation areas near large cities, new park designations such as national lakeshores and seashores, and a large expansion of historic sites. Hartzog was instrumental in helping draft the National Historic Preservation Act of 1968, a foundation law of historic preservation ever since. He made a top priority of raising the NPS's profile in urban areas, and broke several barriers by advancing minorities into positions of authority, having appointed the first African American, female, and American Indian superintendents in the agency's history. Before coming to the directorship, Hartzog served in a variety of positions, including at Jefferson National Expansion Memorial, where he promoted the building of the Gateway Arch. Hartzog received many conservation awards over the years, including the Society's highest honor, The George Melendez Wright Award for Excellence, at the 2007 GWS conference in St. Paul. In an obituary published in *The New York Times*, former National Park Service Historian Robert Utley called him "an empire builder.... I judge George Hartzog the greatest director in the history of the service."

He is survived by his wife, Helen, a sister, three children (among them George B. Hartzog III, himself a GWS Life Member), four grandchildren, and one great-grandchild.

Pepito receives NPS preservation award

GWS Life Member Rosie Pepito was among the three co-winners of the 2007 Appleman-Judd-Lewis Award, one of the National Park Service's most prestigious awards for cultural resource management. Pepito is chief of cultural resources at Lake Mead National Recreation Area, where she leads interagency preservation efforts at Lake Mead, Grand Canyon–Parashant National Monument, and the NPS Submerged Resources Center, as well as partnership bureaus throughout southern Nevada. She was instrumental in the development of a cultural resources program for Parashant that has already inventoried more than 5,000 acres and documented more than 100 archeological sites and three historic compounds. Pepito was also cited for her work with the Southern Nevada Agency Partnership, a consortium of five federal agencies, to secure funding to address needs on an interagency basis. Established in 1970, the Appleman-Judd-Lewis Award is named for three wellrespected, long-time National Park Service employees: historian Roy E. Appleman, historical architect Henry A. Judd, and curator Ralph H. Lewis.

Enklerin, Wallace share top IUCN Protected Areas Award

Two GWS members, Ernesto Enkerlin Hoeflich and George Wallace, were among several winners of the International Union for the Conservation of Nature's highest protected

areas award, the Fred Packard Award. The honors were bestowed at the World Conservation Congress in Barcelona in October. Enklerin heads Mexico's CONANP, the Comisión Nacional de Áreas Naturales Protegidas (National Commission for Natural Protected Areas). As IUCN stated, Enkerlin "has substantially elevated the profile of conservation in the national political agenda, a strategic move which has resulted in multiple opportunities as well as new challenges and responsibilities for the conservation sector." During his tenure there has been a sizeable increase in the number of Mexican wetlands listed under the Ramsar Convention and in the number of biosphere reserves under UNESCO's Man and Biosphere Program. Wallace, a professor at Colorado State University, was cited for his decades of work to build capacity for protected areas through his teaching, research, and writing. Among other accomplishments, IUCN singled out Wallace's leadership of a wellknown, five-week, intensive field course-taught in Spanish-for Latin American park managers, which is now in its 20th year, as well as for organizing two decades' worth of in-country protected areas training courses and technical assistance in Brazil, Mexico, and elsewhere. The Fred Packard Award is named for the first head of IUCN Protected Areas Program.

Park practice highlighted in revived publications

Many GWS members will be familiar with the old publications *Trends, Grist* and *Design,* which were part of the highly regarded but now defunct Park Practice publications series. Now, at the urging of many former subscribers and interested professionals, the original concept is returning in early 2009 in the form of an electronic subscription package called the Park Practices Program. The American Academy for Park and Recreation Administration is the sponsoring organization, partnering with Sagamore Publications of Illinois, Clemson University, and the National Recreation and Park Association to present this new series. Papers that bridge the gap between research, management, and practice for the conservation, stewardship, and preservation of natural resources within parks and recreation agencies are being solicited. Articles on park management practices, interpretation, natural and cultural resource protection, law enforcement, maintenance, visitor management, resource-based tourism, administration, and other topics pertinent to the management of parks and recreation resources will be encouraged. For more information, contact the editor, William E. Hammitt of Clemson's Department of Parks, Recreation, and Tourism Management, at hammittw@clemson.edu.

Duly noted

Toothman assists heritage conservation in Russia. At the request of the U.S. State Department and the U.S. Embassy in Moscow, GWS Vice President Stephanie Toothman traveled to Russia in late May and early June to talk about "the indispensable role of civil society in finding sustainable solutions for preserving cultural heritage." Toothman shared the "U.S. experience of constructive involvement of the private sector in developing and preserving cultural heritage sites." In addition, she participated in a program to discuss the role of heritage tourism in the economic revitalization of communities. She made site visits, participated in a digital video conference that was beamed to the Russian Far East, met with Duma officials in the Kremlin as well as with the Russian minister of culture, and made several presentations at universities and other forums.

Erratum. In the article "The Isle Royale Wolf–Moose Project: Fifty Years of Challenge and Insight" (volume 25, number 2), the caption to the photo on p. 108 refers to a moose eating moss; actually, the moose is eating lichen. Your editor, who supplied the caption, once was a seasonal at Isle Royale National Park—and should have known that!

1916 ESSAY SERIES 2016

Designing Ocean Parks for the Next Century

Gary E. Davis

If human stewardship has been lax on land, it has been even worse in the sea. National Park System Advisory Board, 2001¹

Fishing in national parks

FISHING HAS LONG BEEN A TRADITIONAL USE OF NATIONAL PARKS. Fishing has been part of park lore and attraction, from 19th-century commercial cutthroat trout fishing in Yellowstone Lake to world-renowned sport fishing for tarpon and bonefish in Everglades National Park's Florida Bay and the annual 70,000-ton take of market squid from Channel Islands National Park in the late 20th century.² National Park Service policies that direct fishing have been published for decades, with a stated goal to preserve wild, native species in their natural habitats, while providing fishing opportunities that do not interfere with preservation efforts. Such policies could also have been developed for other "renewable resources" such as birds, bees, and redwood trees, but were not. The removal of marine wildlife in parks still occurred although there is no authority that exempts fish and other aquatic wild life in parks from the protection of the 1916 Organic Act, which directs NPS to "conserve ... the wild life [in parks] and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired...." The 75 ocean units currently in the national park system include large submarine areas of Glacier Bay, Alaska, Dry Tortugas, Florida, and Channel Islands, California, that entered the park system early, in the 1920s and 1930s. Narrow strips of ocean adjacent to a host of barrier islands and beaches in national seashores from Cape Cod to Point Reyes, Great Lakes lakeshores, recreational areas, and parks like Redwood and Olympic came into the park system, mostly in the 1960s and 1970s. A few park units are virtually all underwater, such as Biscayne National Park, Florida, and Buck Island Reef and Virgin Islands Coral Reef national monuments in the U.S. Virgin Islands. Inclusion of these sites in the national park system clearly indicates the legitimacy of affording ocean ecosystems the protections such designations afford terrestrial resources. The apparent *de facto*, unstated, hypothesis for ocean parks seems to have been that protecting

NPS Centennial Essay

habitats and water quality would be sufficient to mitigate the negative effects of fishing mortality and leave exploited populations and ecosystems unimpaired. That hypothesis is falsified repeatedly in virtually every national park system unit in which it has been examined. In light of this new information, it is time to re-evaluate the assumptions of sustainable fishing and unimpaired ocean wild life in national parks.

A vision for future generations

Place-based conservation in the ocean lags a century behind similar endeavors on land. Establishment of Yellowstone National Park in 1872 and the passage of the Marine Protection, Research, and Sanctuaries Act a century later in 1972 provide emblematic mileposts. As a consequence of this circumstance, wild life in ocean parks has been neglected and abused. It is high time to close that land-sea gap, especially as we envision the future of national parks in another century of NPS stewardship. To achieve the vision of the Organic Act, wild life in ocean parks must be fully protected. Also, coastal parks in which park boundaries fragment ecosystems, thus depriving wild life of essential habitats by being politically cut off from the sea, need to be made ecologically whole by adding adjacent submerged lands and waters to adequately protect foraging and other ocean habitats essential to the daily survival of park wild life, such as seabirds and seals (Figure 1). The confluence of human interests with coastal watersheds and ocean waters should drive designs of new ocean parks and differentiate them from other marine protected areas.

Forecasting the long-term future is needed to achieve more than just incremental adjustments in the park system. Significant change will come only with inspirational visions of great things that will

Figure 1. Shorelines are artificial boundaries that distract viewers from seeing connections among mountain watersheds and deep seascapes; they obscure the dependence of coastal wild life on both realms, and mask powerful links between land and sea. Photo by Dorothy A. Davis, © 2002 G.E. Davis & Associates.



The George Wright Forum

NPS Centennial Essay

stir passions in people to achieve them. To that end, I propose that at the bicentennial of the National Park System in 2116, people visiting ocean parks should expect to see and experience:

- Well-managed, fully protected ocean parks with spectacular features as iconic as those of Yellowstone, Grand Canyon, and Yosemite;
- Park wild life in the ocean as pristine as it was before the Industrial Revolution (Figure 2);

• Wilderness in ocean parks that inspires people to be better stewards of nature; and

 Ocean parks that are living laboratories teaching people about nature and how to improve human health and wellbeing.

These goals, well within our grasp today, are rapidly slipping through our collective fingers, and windows of opportunity are closing. If the current generation of park professionals does not act decisively now with broad and persistent public support, no subsequent generation will have an option to know the sea as we first experienced it, to know the joy of fishing, or to wonder at the beauty of coral reefs and kelp forests. These experiences are fading now. Irreplaceable species critical to the integrity,

Volume 25 • Number 3 (2008)

stability, and beauty of ocean parks are perilously close to extinction.

In spite of dire conditions in ocean parks, one can find glimmers of hope in the general sea of despair regarding ocean conservation and preservation of maritime heritage. One of the brightest was establishment in 2006 of the 89.5-million-acre, fully protected Papahanaumokuakea Marine National Monument in the near-pristine northwestern Hawaiian Islands. Administered jointly by the U.S. Fish and Wildlife Service and the National Oceanic and At-

Figure 2. Diversity of wild life in the ocean dwarfs biodiversity on land, stretches human imagination about life forms, and offers opportunities for communities to act locally in ways that can reduce global forces challenging human health and well-being. Photo by G.E. Davis, © 2006 G.E. Davis & Associates.



mospheric Administration, this one national monument is larger than the entire U.S. national park system. Elsewhere, much remains to be done to repair the damage from decades of denial and neglect of special places in the ocean. Knowing how this situation developed may help avoid the mistakes of the past and guide us to a different outcome in the future.

Expectations and sliding baselines

Expectations are powerful forces of human nature. As a child, I loved to fish. So my first job was a dream come true. In June 1957, I became a deckhand on the commercial passenger fishing vessel Fisherette out of San Diego, California. I loved the adventure of fishing. The boat captain taught me where, when, and how to catch yellowtail, tuna, and marlin. Our passengers caught their limits of 20-plus-pound yellowtail nearly every day. Striped marlin that tipped the scales at 150 pounds were plentiful. One day we landed ten marlin, limits for all five passengers. In the beginning, my mentors seemed to know all there was to know about fishing and the ocean, and they shared that traditional knowledge with me freely. Every day I learned something new. I was in paradise.

As we slipped out of San Diego harbor each morning in the pre-dawn darkness, twinkling city lights reflected on the smooth dark water, invoking visions of the romantic lyrics of "Harbor Lights," a popular tune of the day. Our first order of business each morning was "making bait"—catching the sardines, anchovies, or mackerel we used later to catch the gamefish our sport fishing clients desired. We proudly reported our daily take of gamefish to the local newspapers. The papers published box scores of the landings to let prospective clients know what they could expect to catch if they went fishing with us.

Then in 1960, everything changed. The yellowtail failed to appear as they "normally" did in June. After searching desperately for weeks, we finally located schools of albacore tuna far offshore in early July. For the next few years we chased elusive schools of tuna as they mysteriously appeared and disappeared along the coast. Any concept of "normal" seemed hopeless as we struggled to make sense of our new experiences and to provide good fishing opportunities for our passengers.

The mysteries of these early years led me to university training in fisheries science and marine ecology. Now we understand that 1957-59 was one of the strongest El Niño events of the 20th century. It marked the beginning of a decadal oscillation of warm water some oceanographers are calling El Viejo (father of El Niño) that lasted 50 years. What I naively thought was normal in the 1950s from my personal experience turned out to be one of the most extreme natural events in a century. The apparently elusive comings and goings of albacore were also a function of predicable patterns in nature. When colliding "fronts" between cool and warm ocean water masses remain stable in sun-lit surface waters for more than two weeks, nutrients in the cool water have enough time to be converted into food webs that produce the small forage fish sought by tuna. Before satellites gave us synoptic ocean views, it was difficult to see and understand such patterns in oceanic water masses. Such new ecological knowledge helped us understand and rationally explain nature's variability. It also provided even more power to exploit an apparently vast inexhaustible ocean.

Newspapers still report daily landings

by commercial passenger fishing vessels in southern California. The big difference now is that they report the number of mackerel they caught. After 50 years of science-based fishery management, we are now proud to report that we caught the bait. The current generation of fishermen accepts catching mackerel as normal because it is what they first experienced when they discovered the ocean, just as I had expected the El Niño conditions of 1957-59 to continue forever as "normal." Fishermen discovering the southern California ocean at the onset of the 21st century have set a new baseline, with substantially lower expectations of the ocean's bounty than the one my generation did just a few decades earlier. Such lowered expectations aid and abet continued degradation of ocean resources. Setting appropriate expectations as a fixed baseline is critical for rebuilding the nation's ocean heritage (Figure 3).

Oceans obscure out-of-sight wild life in an alien environment. How do people know what is normal? In an ever-fluctuating environment, how can we discover what causes the changes in nature that we experience? How can we tell if fishing and other consumptive uses of the sea are sustainable? Traditionally, we measured what we took from the sea, and sometimes recorded how much effort we expended to take it, e.g., number of boats or traps or days fishing. We then used landings and catch rates as indications of population change. We assumed that exploited populations remained the same if landings and catch rates were unchanged. This was somewhat akin to managing a bank account by monitoring the checks written, but never recording the

Figure 3. Twice a day the tide falls in Cabrillo National Monument, San Diego, California, opening a window on the sea for people of all ages to explore nature, and in protected parks to discover how the coast used to be when their grandparents first saw it. Photo by G.E. Davis, © 2006 G.E. Davis & Associates.



Volume 25 • Number 3 (2008)

deposits and assuming there were reserves to balance the account.

During the 20th century, fishing in the ocean continued virtually everywhere technology provided access. The U.S. National Marine Protected Area Center inventoried managed areas in U.S. waters and determined that even with 1,688 marine protected areas, 99.9% of U.S. territorial waters were still available for fishing in 2008.³ As boats got larger and faster, more remote areas were lost as *de facto* refugia, sources of replenishment. Any hope of sustaining exploited populations rested on fishery constraints exercised through limits on fishing seasons, gear, fish sizes, quotas, and bag limits. In the oceans, no systems of fully protected areas emerged as they did on land to serve as benchmarks by which human behavior could be assessed.

What happened?

After decades of research and monitoring, it became clear that fishery resources in parks were in the same depleted condition as those outside parks. Controlling fishery take with state regulations and protecting habitats and water quality in parks were insufficient to assure sustained populations and intact ecosystems. Park fisheries collapsed widely, from tropical Florida and the Virgin Islands to temperate seas in California and Alaska. Opportunities were lost to benefit from fishing, to otherwise enjoy unimpaired wild life, and to learn the effects of fishing on ecosystems.

When Jack Randall, a professor at the University of Miami, needed specimens for his pioneering biological surveys and studies of Virgin Islands National Park and Buck Island Reef National Monument in the 1950s and 1960s, he could spear dozens of large groupers and snappers any day. He collected hundreds of big fish. Local fishermen could feed their families and meet fresh seafood demands of local resorts using traditional woven arrowhead traps to catch big predatory fish. Snorkeling in shallow water, they caught spiny lobster and conch. Fifty years later, fish traps catch only small herbivores. Mature conch and lobster are rarely seen, even in deep water, and resorts import frozen seafood from afar. Now, teams of scientists surveying fish populations in Virgin Islands National Park search for weeks to find a single small grouper.4 Even though the baseline had already shifted substantially downward from Jack Randall's experience 30 years before the current studies began, monitoring fish abundance and size in the park over the past 20 years revealed continued declines. Traditional artisanal fishing eventually removed most large reef predators and grazers, allowing algae to increase and compete with corals for light and space. Environmental stress on reef-building corals reached critical limits when ecological effects of fishing down the food pyramid combined with impacts of increased sediments and nutrients in runoff from humanaltered local watersheds (Figure 4). The increased stress appears to have impaired the corals' immune systems and made them more sensitive to global forces, such as warming sea temperatures. This, in turn, increased the corals' susceptibility to previously unknown diseases. Warm water in 2005 caused nearly 50% of reef corals at park study sites to die, some directly from thermal stress and others from subsequent diseases months later.⁵ A cascade of these interdependent stress factors further diminished reef resilience to normal hurricane disturbances, exacerbating an already precarious situation for park reefs. Hundreds



Figure 4. Clearly impairment of sea life in parks has reached critical levels when major reef-building corals, such as elkhorn (Acropora palmate) and staghorn (A. cervicornis), and one-time mainstays of commercial fisheries, such as white abalone, *Haliotis* sorenseni, approach extinction and appear on threatened and endangered species lists. Photo by G.E. Davis, © 2008 G.E. Davis & Associates.

of species of park wild life depend exclusively on these reefs for food, shelter, and other life essentials. Two major western Atlantic reef-building corals, elkhorn and staghorn (*Acropora palmata* and *A. cervicornis*), were designated "threatened" under the U. S. Endangered Species Act in 2006.⁶ The coral reef chain of life is stretched dangerously thin in Virgin Islands parks, with many links poised to fail.

When Everglades National Park was authorized in 1934, Florida Bay and the other ocean waters of the park were true wilderness (634,000 acres), difficult to penetrate and seen only by the heartiest adventurers. By the 1970s the ocean parts of the park had become a battleground criss-

Volume 25 • Number 3 (2008)

crossed with boat tracks; the park was losing 1,000 tons of fish, crabs, and lobster every year to fishing.7 Fishermen competed with eagles and crocodiles and with one another for what all believed to be diminishing resources. While nearly everyone agreed resources were declining, none knew what caused the declines or when they began. Lacking historical data, I interviewed experienced fishers in an attempt to find a pattern of environmental events to help explain the deteriorating conditions. No patterns emerged. No connections among hurricanes, real estate development, pollution, boat traffic, agriculture, human population growth, park regulations, or other events matched the onset of the

declines all interviewees could so vividly recall. The only pattern I found was that the declines seemed to begin, on average, 11 years after the interviewee arrived in South Florida. Apparently, it took people 11 years to notice a shift from their personal baseline.

Eventually, professional fishing guides in the Florida Keys petitioned the park to take remedial actions, specifically requesting prohibition of commercial fishing. NPS lacked sufficient ecological knowledge to deal with the underlying causes of this situation. Therefore the park addressed only a symptom of the stress, competition among users-nature, sport fishers, and commercial fishers-and reallocated the available resources to nature and sport fishers. The park banned commercial fishing, introduced daily bag limits for sport fishers, protected stone crabs and spiny lobster, and closed sensitive crocodile nesting areas. These actions delayed the inevitable for 20 years. Decades of altered watershed conditions eventually combined with physical habitat damage and loss of ecological integrity from fishing to push Florida Bay into a new community state more conducive to algae and bacteria than bonefish and tarpon, and helped precipitate a multibilliondollar restoration program.8 Delay born of denial and ignorance can be expensive.

Hard by Miami, Florida, to the north, Biscayne National Park affords habitat protection to 173,000 acres of unbroken mangrove shoreline, tropical lagoon, seagrass beds, shallow patch reefs, and outer coral reef tract, in addition to the northernmost Florida Keys. Commercial and sport fishing of all kinds have been major activities in the park since Biscayne's inception in 1968. Fishing activities have been managed by the state of Florida, while the park monitored

fishery take and resource conditions. In the mid-1970s Florida established a spiny lobster sanctuary in the park's bay waters to protect juvenile lobsters from fishinginduced injuries and mortality, complemented today by similar lobster reserves in Everglades and Dry Tortugas national parks.9 Reef fisheries in South Florida, including in the park, have been under tremendous pressure for the past 50 years. Recreational boat registrations in the region are now nearly five times what they were when the park was established. Park fisheries show the strain with signs of impairment. An independent analysis in 2002 designed to explore alternative park management strategies revealed that 70% of exploited species in the park were much smaller and overfished, meaning their spawning capacity was reduced by more than 70%. For example, black grouper were 60% smaller and had lost 95% of their spawning potential. Investigators also indicated that traditional fishery regulations, e.g., sizes and seasons, were not likely to restore or to sustain fishing as it had been in the past.10

Patterns of fishery over-exploitation, serial depletion, and cascading ecosystem shifts are not limited to warm-water parks. Giant kelp forests dominate the cool waters of Channel Islands National Park, off California's southern coast. Often described as rainforests in the sea, these highly productive communities are home to more than 1,000 species. When the park was expanded in 1980 from the 1938 national monument boundaries, it was widely recognized as the last, best place in the region to fish and to see wild life. The park was at the core of California's most valuable fisheries, including abalone, spiny lobster, red sea urchin, market squid, and a wide variety of

fin fish, including more than 50 species of rockfish (Scorpaenidae), California sheephead, and lingcod. After more than 20 years of national park protection, 80% of the kelp forest was gone; all five abalone fisheries had collapsed serially, with one species (Haliotis sorenseni) now on the federal endangered species list; and several rockfish fisheries were closed to prevent population collapses.11 Reduction of large predators and grazers left smaller species, e.g., purple sea urchins, brittle stars, and sea cucumbers, without competition, which allowed their populations to increase rapidly and over-graze kelp forests. Without kelp to provide food and shelter, the entire community shifted to bare rock reef. The small grazer populations, now stressed from lack of food, died back as a result of disease, initiating a series of abnormal boom and bust cycles triggered by natural El Niño events.12 A similar story is unfolding in the remote vastness of Glacier Bay National Park and Preserve in Alaska, where salmon and crab fisheries are struggling and park ecosystems are stressed on more than 600,000 acres of submerged lands.13

Hope on the horizon

The untested assumptions that ocean vastness and species-based fishing rules would sustain populations were wrong. As an unintended consequence, 90% of the world's populations of large fishes have been depleted to critical levels, fisheries have collapsed, and wild life populations have been destabilized and threatened with extirpation while some species face extinction.¹⁴ Not only has fishing reduced populations, it selectively reduced or removed higher trophic levels from systems. This "fishing down the food chain" initiated additional ecological consequences that

cascaded through ecosystems, altering system states from diverse, complex, resilient, and stable to simple, chaotic, and less productive. Clearly, it is time for a change in our approach to ocean conservation.

On land, people around the world have set aside portions of landscapes as national parks and other designations as wild places. These systems of protected areas, as the places most insulated from human perturbation, complement species-based conservation strategies and serve as:

- Benchmarks, dynamic standards, to define normal conditions and ecological integrity (resilience, biodiversity conservation, and historical fidelity);
- Sources of replenishment—for both nature and human spiritual values (recreation);
- Foundations of education—stories to tell and lessons to learn about nature;
- Common ground that facilitates diverse cultures living together peace-fully; and
- Means to sustain options for future generations to connect with their heritage.

Protecting wild life in analogous designated ocean areas to obtain these values has yet to be tried. Although special places in the ocean were included in coastal parks and refuges early in the 20th century, system-wide, place-based conservation first arrived in the ocean in the 1970s, a full century after Yellowstone National Park ushered in modern place-based, landscapescale conservation of terrestrial ecosystems. Pioneering efforts in systemic place-based ocean conservation include the 1975 Great Barrier Reef Marine Park Authority in Australia, and the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA, P.L. 92-532) in the USA which authorized multiple-use national marine sanctuaries. Nevertheless, these early efforts still did not prohibit fishing in the "protected" areas. Today, the major U.S. systems of marine protected areas, such as national marine sanctuaries, wildlife refuges, national parks, and estuarine research reserves, still do not categorically prohibit taking of fish, shellfish, or plants.

Protection of wild life in special ocean places has increased only incrementally for the last 50 years. At first, small places were set aside to allow swimmers safe havens from boats and fishing gear. Places like the underwater trails in Trunk Bay and Buck Island in the U.S. Virgin Islands broke new ground in the 1950s when they protected fish, lobster, conch, and whelk along the trails so visitors could see coral reef inhabitants. These truly protected zones were generally limited to areas of 10-15 acres. As SCUBA diving became popular in the 1960s and 1970s, a few slightly larger areas, 30-50 acres, were protected in state parks like John Pennekamp in Florida and Point Lobos in California to give divers a chance to experience nature and to separate spearfishing from other divers and swimmers.

In a few places, people explored protected areas as nurseries for exploited species or gathering sites for mass spawning. During the 1970s in Florida, a series of spiny lobster, stone crab, and conch refuges were established to protect spawning stocks or juveniles. This helped to rebuild and sustain those popular fisheries, but did little to ensure ecosystem health. However, these species-based, fishery-driven efforts did demonstrate the potential value of national parks as sources of replenishment and benchmarks for evaluating fishery management. Today these refuges in Biscayne, Dry Tortugas, and Everglades national parks continue to contribute significantly to the success of Florida's valuable invertebrate fisheries.

Recent lessons from fully protected reserves

Where fishing mortality has been reduced, benefits to exploited populations and ecosystems in parks accrued quicker and more dramatically than expected. When the Great Barrier Reef Marine Park was authorized in 1975, only 5% of the park was off-limits to fishing, and because of the park's size and remoteness, just 5% of the reef was accessible to day visitors. Today, faster boats make 95% of the reef accessible to day-trippers and a third of the park now protects wild life from fishing. The response of newly protected coral trout surprised everyone: in two years trout numbers in reserves went up 36-64%, yet did not change in nearby fished zones.¹⁵ Just three years after implementing no-take marine reserves covering nearly 140,000 acres at Dry Tortugas, Florida, scientists found significantly greater fish abundances and larger fish in the reserves.¹⁶ In the five years since a network of 10 no-take marine reserves covering a total of 111,276 acres around the California Channel Islands was implemented in 2003, kelp forests have expanded more in reserves than outside, fish and invertebrate species exploited by fishing had greater population densities and sizes in reserves than outside, while species not taken by fishing remained the same inside and outside reserves.¹⁷

As park fisheries collapsed and ecosystems shifted from complex and productive to simple and barren, opposition to new management strategies softened. Larger areas in parks (thousands of acres rather than tens of acres) were set aside from fishing to aid in resource recovery and to rebuild lost fishing opportunities. These new reserves revealed amazing resiliency of ocean ecosystems, from the coral reefs in Great Barrier Reef Marine Park, Dry Tortugas National Park, and Florida Keys National Marine Sanctuary, to the giant kelp forests in Channel Islands National Park and Channel Islands National Marine Sanctuary. The consequences of protecting ocean wild life in parts of parks and sanctuaries are now much clearer. Places in which all wild life is protected from human exploitation recover and sustain their ecological integrity, stability, and beauty. The capacity for self-renewal quickly returns in such places. They begin to contribute to regional environmental well-being. The question we must now confront is, "Why should fishing continue in special 'protected' places like national parks?"

Time for a change

How can you tell how it used to be when there's nothin' left to see? *Jimmy Buffett, "Prince of Tides"*

Over the past century, well-intentioned, but ill-informed, fishing activities inadvertently altered the integrity, stability, and beauty of ocean wild life in national parks. It is time to change those uninformed policies and practices to incorporate new information on the widespread effects of fishing on both exploited species and ocean ecosystems, and to use recent experiences with fully protected marine reserves to improve design of ocean parks. Just as wildfire and predator "control" policies and practices in national parks changed with new information in the 20th century, fishing in ocean parks needs to change in the 21st

Volume 25 • Number 3 (2008)

century while critical elements of ocean park ecosystems remain extant.

I find four basic tenets of park stewardship useful to structure the needed changes:

- 1. Know and understand how park ecosystems work;
- Restore impaired elements of park ecosystems and design new functional systems;
- 3. Protect parks and mitigate threats to their integrity, stability, and capacity for self-renewal; and
- 4. Connect people emotionally to parks and spark public interest to learn about nature.

Know and understand. Until we understand better how ocean park ecosystems work, stewardship will, in effect, be limited to treating symptoms of stress reactively. Greater ecological understanding will permit proactive reductions in the causes of stress, thereby reducing costs and improving the likelihood of successful treatment and prevention of additional losses. Investments in more knowledge will yield dividends in better, faster, and cheaper stewardship. Knowledge of ocean parks pales in comparison with that of land-locked parks.

Restore and design. Fixing broken parts of parks has become a core mission for park stewards. Setting goals for desired future conditions based on former conditions is fraught with uncertainty, and may well be impossible when species have been lost. The 20th-century concept of ecological restoration that looked backward to set future goals is shifting into a new forwardlooking paradigm that recognizes the need to design future systems using available remnants of the past. With increasingly pervasive human effects on global environmental forces, design seems inevitable. However, the designs will be constrained heavily by conspicuous limits of human control on outcomes and future conditions. Living with such limits will be a major challenge for humans in the 21st century. Parks will likely be some of the easiest and cheapest places to learn those lessons.

Protect and mitigate. Fully protecting all wild life in ocean parks is essential to comply with the 1916 National Park Service Organic Act and to make the parks whole. Annually removing thousands of tons of fish, invertebrates, and plants remains the greatest threat to ocean park integrity, stability, and capacity for selfrenewal, i.e., environmental health.

Connect and educate. The public needs to feel connected to out-of-sight, outof-mind, seemingly alien life forms in the sea, and understand that people are also interdependent parts of ocean communities. If they do not, essential parts of ocean parks will be lost forever. With such losses, people everywhere will be forced to forego opportunities for sustained human health and well-being. I believe compiling scientif-

ic facts and information about wild life in the sea is, by itself, insufficient to spark public interest and light the fires of education. We need artists to join the fray, as they did in the 19th century. Painters inspired by the Hudson River School conveyed the grandeur of western landscapes to an American populace confined to the eastern seaboard by limited transportation and communication technologies. The artists created sweeping tableaux on huge canvasses that still hang in the halls of Congress, the White House, and museums in eastern cities. These artistic renderings of nature inspired Americans to join in an expression of their best idea-a system of special places protected so that all could enjoy the nation's shared heritage (Figure 5). Today's technologies afford even more capacity to touch diverse audiences and inspire them to take the next steps to effectively sustain and extend the park system into ocean realms. Indeed, Jean-Michel Cousteau's beautiful and moving film Voyage to Kure triggered President Bush's recent decision to establish Papahanaumokuakea Marine National

Figure 5. People have used abalone (large marine snails, *Haliotis* spp.), for food, utensils, and jewelry for thousands of years. This wall-sized, stylized shell in Nanaimo, British Columbia, symbolizes the powerful bonds people forge between art and nature. Photo by G.E. Davis, © 2007 G.E. Davis & Associates.



The George Wright Forum

Monument, with encouragement by straight talk from Sylvia Earle and other ocean advocates.¹⁸

Today, we labor under a tyranny of diluted words and euphemisms. Special places labeled "national parks," "sanctuaries," and "refuges" do not offer protection, sanctuary, or refuge for wild life. We describe taking and exploitation of ocean park wild life as "harvest" as if a crop were planted, tended, and gathered. Fish killed and removed from parks are labeled "landings," and fish taken from the sea become "vield" as if they were interest on an investment we made. We must acknowledge we are at the end of millennia of human "hunting and gathering" in the sea, and begin to recognize that the future is one of stewardship in which we invest, tend, and care for wild life in the sea. Those special places we recognize as critical to preserving our shared ocean heritage should be first among equals.

Recovery is still possible

National parks in the sea reside at the confluence of human interests with coastal watersheds and the ocean. Understanding ocean ecosystems gives people hope for rebuilding depleted resources; for restoring integrity, stability, and beauty of degraded ecosystems; and for returning capacity for self-renewal to intact ecosystems. Just as returning wild wolves to Yellowstone National Park restored ecological integrity, when fishing was curtailed in existing marine protected areas, populations of fish and invertebrates rebounded swiftly. This positive and hopeful response to protection has been witnessed and documented carefully in many places, including Australia's Great Barrier Reef Marine Park, in Florida's Dry Tortugas National Park and Florida

Volume 25 • Number 3 (2008)

Keys National Marine Sanctuary, and in California's Channel Islands National Park and Channel Islands National Marine Sanctuary. The ecological concepts are now well known and tested. The current challenge is applying what is known to policy and practice through political processes.

Inspire the next generation to do more

I know from personal experience that fishing can forge powerful, life-long bonds to nature. Perhaps the greatest challenge facing ocean park stewards today is engaging sport fishing communities to search for new strategies that will restore and sustain integrity, productivity, and capacity for selfrenewal of ocean parks. People in these communities have the greatest potential for understanding what is at risk and the values to be gained by changing current human behavior in the sea. Yet continued denial that sport fishing contributes to deteriorating conditions of ocean park resources will doom timely restoration efforts politically and result in Pyrrhic victories when remedial actions are finally taken, too little and too late.

To preserve options for future generations of humans to enjoy unimpaired wild life in ocean national parks (Figure 6), we must now: (1) care for all wild life in existing ocean parks by extending the same protections national parks afford life on land to life in the sea; (2) make coastal parks ecologically whole by adding submerged lands adjacent to coastal watersheds in those places where park boundaries stop at the water line or reach less than a mile from shore, effectively denying park wild life access to critical habitat; and (3) join efforts of the national park system, NOAA sanctuaries and estuarine research reserves, the U.S. Fish & Wildlife Service national wild-



Figure 6. Coastal waters offer park visitors access to explore alien realms and to discover nature on their own terms in ways that are difficult to imagine on land. Photo by G.E. Davis, © 2006 G.E. Davis & Associates.

life refuge system, states, territories, and tribes to design and implement a cooperative national system of marine protected areas that builds on existing sites and fills the gaps in biogeographic and functional designations needed to meet the nation's needs.

Endnotes

- 1. National Park System Advisory Board, *Rethinking the National Parks for the 21st Century*, J.H. Franklin, chair (Washington, D.C.: National Geographic Society, 2001).
- J.D. Varley and P. Schullery, "Yellowstone Lake and Its Cutthroat Trout," in Science and Ecosystem Management in the National Parks, W.L. Halvorson and G.E. Davis, eds. (Tucson: University of Arizona Press. 1996), pp. 49–73; W. Jennings, "Florida Keys Tarpon," Fly Fisherman (2008), on-line at http://flyfisherman.com/florida/wjfloridatarpon/index.html; L.D. Zeidberg, W.M. Hamner, N.P. Nezlin, and A. Henry, "The Fishery for California Market Squid (Loligo opalescens) (Cephalopoda: Myopsida), from 1981 through 2003," Fishery Bulletin 104 (2006), pp. 46–59.
- 3. National Marine Protected Areas Center, *The State of U.S. Marine Managed Areas: West Coast*, L. Wooninck and R. Grober-Dunsmore, eds. (Silver Spring, Md.: NOAA, 2008).

On-line at http://mpa.gov/helpful_resources/inventoryfiles/wcoast_mma_report-0608.pdf.

- A. Friedlander and J. Beets, Temporal Trends in Reef Fish Assemblages inside Virgin Islands National Park and around St. John, U.S. Virgin Islands, 1988–2006, NOAA Technical Memorandum NOS NCCOS 70 (2008).
- J. Miller, R. Waara, E, Muller, and C. Rogers, "Coral Bleaching and Disease Combine to Cause Extensive Mortality on Reefs in U.S. Virgin Islands," *Coral Reefs* 25 (2006), p. 418.
- 6. See www.nmfs.noaa.gov/pr/species/invertebrates/elkhorncoral.htm.
- G.E. Davis, "Fishery Management Conflicts in Everglades National Park," In Marine Recreational Fisheries, Proceedings of the Seventh Annual Marine Recreational Fisheries Symposium, Fort Lauderdale, Florida, May 10-11, 1982, R.H. Stroud, ed. (Washington, D.C.: Sport Fishing Institute,) pp. 65-75; G.E. Davis, An Assessment of Fishery Management Options in Everglades National Park, Florida, National Park Service South Florida Research Center Technical Report T-523 (1979).
- J.W. Fourqurean and M.B. Robblee, "Florida Bay: A History of Recent Ecological Changes—Estuaries," in SeaGrant Florida, *Florida Bay Science Conference Proceedings* 22:2B (1999), 345–357, on-line at www.floridabay.org/pub/conf_proceedings/index.shtml; Committee on Independent Scientific Review of Everglades Restoration Progress (CISRERP), National Research Council of the National Academies, *Progress toward Restoring the Everglades: The First Biennial Review, 2006* (published 2007), on-line at www.evergladesplan.org/index.aspx.
- G.E. Davis, "Spiny Lobsters as Flagship Species for Marine Ecosystems," Wings (fall 2004), pp. 16–19. (Published by the Xerces Society.)
- J.S. Ault, S.G. Smith, G.A. Meester, J. Luo, and J.A. Bohnsack, Site Characterization for Biscayne National Park: Assessment of Fisheries and Habitats, NOAA Technical Memorandum NMFS-SEFSC-468 (2001).
- 11. G.E. Davis, P. L. Haaker, and D.V. Richards, "The Perilous Condition of White Abalone, *Haliotis sorenseni*," *Journal of Shellfish Research* 17:3 (1998), pp. 871-875.
- M.D. Behrens and K.D. Lafferty, Effects of Marine Reserves and Urchin Disease on Southern California Rocky Reef Communities, Marine Ecology Progress Series 279 (2004), pp. 129–139; Davis et al, "The Perilous Condition of White Abalone," pp. 871–875.
- 13. For a brief history of Glacier Bay fisheries issues, see www.nps.gov/archive/glba/in-depth/learn/preserve/issues/fish/history.htm.
- D. Pauly, V. Christensen, J. Dalsgaard, R. Froese, and F. Torres, Jr., "Fishing Down Marine Food Webs," *Science* 279 (1998), pp. 860–863; J.B.C. Jackson et al., "Historical Overfishing and the Recent Collapse of Coastal Ecosystems," *Science* 293 (2001), pp. 629–638; V. Christensen et al., "Hundred-year Decline of North Atlantic Predatory Fishes," *Fish and Fisheries* 4 (2003), pp. 1–24; R.A. Myers and B. Worm, "Rapid Worldwide Depletion of Predatory Fish Communities," *Nature* 423 (2003), pp. 280–283.
- 15. G.R. Russ, A.J. Cheal, A.M. Dolman, M.J. Emslie, R.D. Evans, I. Miller, H. Sweatman, Volume 25 • Number 3 (2008) 21

NPS Centennial Essay

and D.H. Williamson, "Rapid Increase in Fish Numbers Follows Creation of World's Largest Marine Reserve Network," *Current Biology* 18 (June 24, 2008), pp. R514–R515.

- J.S. Ault, S.G. Smith, J.A. Bohnsack, J. Luo, D.E. Harper, and D.B. McClellan, "Building Sustainable Fisheries in Florida's Coral Reef Ecosystem: Positive Signs in the Dry Tortugas," *Bulletin of Marine Science* 78:3 (2006), pp. 633–654.
- 17. California Department of Fish and Game, Partnership for Interdisciplinary Studies of Coastal Oceans, Channel Islands National Marine Sanctuary, and Channel Islands National Park, *Channel Islands Marine Protected Areas: First 5 Years of Monitoring* (2008).
- 18. At the June 6, 2006, signing of the national monument proclamation, President Bush said, "I think the American people will understand better about why I made the decision I made when they see the movie that Jean-Michel has produced." See www.white-house.gov/news/releases/2006/06/20060615-6.html.

Gary E. Davis recently retired from the U.S. National Park Service after a long and distinguished career as a marine scientist. He is also a past president of the George Wright Society.

Join the Centennial conversation!

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

Privatizing Isle Royale? The Limits of Free Market Environmentalism

Robert Pahre

ONE OF THE MOST RAPIDLY GROWING APPROACHES to the study of environmental policy calls for a greater use of market-based instruments to improve policy outcomes. As a result, we now have a coherent body of studies under the rubric of "free-market environmentalism" (FME; Baden and Leal 1990; Anderson and Leal 1992, 1996; Cordato 1997; Huber 1999; Anderson and Hill 2004; see also Stavins and Whitehead 1992 *inter alia*). The most notable success of FME have been the development of tradable emissions schemes in the United States and European Union, leading many to think about how best to extend the market to other environmental problems, such as endangered species.

This paper will focus on the problem of using FME approaches to manage preserved lands. Nearly 30% of the United States is federally owned, mostly in the form of national parks, national forests, national wildlife refuges, Indian reservations, and Bureau of Land Management (BLM) national interest lands. These lands have a variety of mandates, but recreation plays an important part in all of them except, in most cases, on Indian reservations. Advocates of FME have argued that the U.S. Forest Service (USFS) and BLM systematically undervalue recreation because they do not obtain significant revenue from providing it. Similarly, they argue that the National Park Service (NPS) undersupplies recreational infrastructure such as campgrounds because the fees are set too low and revenues generated go directly to the U.S. Treasury instead of staying in the park or the NPS. U.S. Fish and Wildlife Service management of national wildlife refuges would face a similar indictment (see, for

example, Snyder and Shaw 1995). As a result of poor agency incentives, recreation is underprovided, and cash-strapped agencies lose a potentially significant source of funds.

The typical FME recommendation for national parks and national forests has been to align managers' incentives with social demands through price and similar market mechanisms. Charging users an entrance fee, raising camping fees to rates comparable with those charged by private campgrounds, or increasing the now-low royalty rates on concessionaires in national parks would better signal scarcity to potential users and prevent overcrowding. If the revenue from such fees were to go directly to each unit's manager, then those activities that society values most-recreation in most cases-would receive greater investment. Timber harvest and livestock grazing, which USFS and BLM managers currently favor because of subsidies and distorted incentives, would be disfavored under a market regime. Switching to recreational users, who have less impact on parks than do loggers or grazers, might better serve environmental goals, among others.

Some of these suggestions have been introduced since the 1990s. Entrance fees to national parks are much higher, national forests now charge for parking at some trailheads, demonstration fee programs are in place at many sites, and many campgrounds do charge fees comparable with those of privately owned campgrounds with similar facilities and services. However, the supply side of the FME agenda has been less successful. Congress generally prefers to direct revenue to the U.S. Treasury instead of letting these fees remain in the unit where they were generated. Nor has revenue received by each unit necessarily made that unit better off since Congress can, and does, reduce appropriations accordingly even when it makes commitments to the contrary (for a non-FME introduction to these issues, see Lowry 1994).

Most important, this focus on manager incentives shrinks back from pursuing FME to its logical conclusion: privatizing public lands. Privatization would mean that Congress would no longer be able to distort manager incentives. If the FME argument is correct, new owners would seek out the highest and best use for the land, which is recreation in most cases. Though otherwise strong advocates of market incentives, Anderson and Leal (1996:75) refrain from recommending privatization "for reasons of political feasibility." Certainly a closer examination of the economics of the issue would be more appropriate than a weak dismissal.

Even if we reject privatization as inimical to the purpose of national parks, thinking about the problem has implications for other types of NPS reforms. For example, some critics of the National Park Service have suggested putting conservation trusts or environmental groups in charge of individual parks in place of the NPS, with these trusts having much stronger environmental mandates and less political interference (e.g., Baden and Stroup 1981; Hess 1993, chap. 5; Anderson and Fretwell 1999; Le-Roy 2005). For example, the Presidio unit of Golden Gate National Recreation Area is governed by the Presidio Trust, a mix of conservation and economic development trusts that some hold out as an example of how to manage national parks in the coming century (but see Rothman 2004, chap. 9). Tallgrass Prairie National Preserve is overwhelmingly owned by The Nature Conservancy (TNC), and managed by the NPS in conjunction with TNC and the Kansas Park Trust. Some FME advocates have suggested similar types of trusts for the Arctic National Wildlife Refuge, handing over management to environmental groups who would be allowed to keep some or all of any oil and gas royalties, or to prohibit such development altogether if they wish (Snyder and Shaw 1995). Such trusts would still need to worry about revenue and expenses, and the present paper suggests the limits of what they would be able to do without on-going government subsidies-subsidies that would, if continued, permit the very political interference that conservation trusts are meant to prevent.

To evaluate the FME approach to national parks, and to provide a foundation for discussing the economics of conservation and other trusts for parks, this paper conducts a thought experiment: What would happen if the U.S. government were to privatize Isle Royale National Park? I chose Isle Royale because it has many distinctive features that raise the challenges of FME in stark form: its primary resources are scientific- and wilderness-based, and its visitation rate is very low. I examine this problem with a series of rough estimates and back-of-the-envelope calculations (as in Anderson and Fretwell 1999). For example, if the U.S. were to privatize Isle Royale, what price would it demand? What revenue sources would be available to an imaginary private purchaser, the Isle Royale Company (ISROCO)? Would it turn a profit and, if so, under what conditions?

The central finding of this paper is that ISROCO could not come close to making a profit from Isle Royale. Privatizing the park would therefore require highly concessional terms or on-going subsidies, raising serious questions about the FME approach when applied to national parks. A conservation trust would face similar challenges since it too would be dependent on subsidies, and these subsidies would encourage on-going political interference in its management.

Of course, existing public ownership and NPS management already represents a form of subsidy. This subsidy is effectively given to recreational and scientific users of the park. This implies that one can either subsidize the profit-making concessionaires or the recreational and scientific users. Since the users, as citizens, are also the collective owners of the resource, it makes the most sense to subsidize them instead of a private purchaser who would charge citizens to use the resource. These distributional issues, which apparently have been ignored by both sides in the debate over FME, are in fact central to the problem of allocating property rights in any market (North 1984, chap. 2).

Many criticize FME for excluding nonhuman values, the preferences of future generations, democratic discourse and the public weal, or for failing to recognize various market or political and legal imperfections (e.g., Blumm 1992; Smith 1995). These are serious issues but I will set them aside here. For others, FME is judged guilty by association because many advocates receive funding from corporations and politically conservative foundations (Beder 2001), an issue I address in the conclusion. For the thought experiment here, I take FME seriously on its own terms, imagining the implementation of FME prescriptions. This thought experiment highlights (1) the distributional consequences of a shift to FME recommendations; and (2) the practical limits of using FME for some kinds of environmental problems, especially for natural resources such as national parks that are, by definition, unique. These concerns will be found, albeit often in a less-severe form, when discussing privatization of any public lands.

Isle Royale: The nature of the resource

Critics sometimes accuse FME of wanting to turn Yellowstone into Disneyland. That objection raises serious questions of values, which I will set aside in this paper. That example neglects, however, another question: Could Disney make a profit from Yellowstone? I suspect that the answer is yes, given both the success of Disneyland and the large number of visitors to Yellowstone (about three million a year, though this is much less than the sixteen million that visit Disney's Magic Kingdom in Florida each year). In such cases, turning Yellowstone over to the private sector would certainly maximize *some* social values, though doubtless a very different set of values than it currently serves.

Yellowstone and a few other "crown jewels" in the park system represent special cases. FME offers an analytical approach that aspires to be useful for all environmental issues at all times. Instead of evaluating that claim against high-attendance, highrevenue destinations such as Yellowstone, Great Smoky Mountains, Rocky Mountain, or Yosemite national parks, it makes more sense to examine a hard case of roughly similar size.¹ In light of its very different profile, Isle Royale National Park presents a good case against which to evaluate the limits of FME.

Because of its remote location in northwestern Lake Superior, Isle Royale attracts very few visitors each year. With only 17,070 visitors, it ranked 318th of 359 NPS units in 2006 (NPS 2007). Outside Alaska, it is the least-visited NPS unit designated as a "national park," and those other "nonnational park" NPS units ranked below it in attendance tend to be obscure national historic sites. Interestingly, despite its low attendance, Isle Royale is also the most widely revisited park in the entire system (NPS, personal communication). This high revisitation rate hints at the existence of less-obvious social values being served by the park.

Isle Royale's major assets are wildlife and wilderness (see DuFresne 1991 [2002], part 1; Shelton 1997; for critical evaluation, see Wockner 1997). In 1940, Isle Royale became the first national park to be preserved largely on the basis of its wildlife resources, as opposed to its monumental scenery (see, more generally, Runte 1979 [1987]); Everglades National Park, much more well known, was established for similar reasons in 1947.² Though Isle Royale and Everglades were the first, parks based on wildlife and wilderness have become more common since then, notably in Alaska. These kinds of natural assets now provide a common justification for national park status, and must be considered in any proposal for reform.

Isle Royale's most famous fauna, the gray wolf, did not arrive until after park establishment, in the winter of 1948-49. The relationship between wolves and moose-who had themselves been on the island for only a few decades-provide the foundation for a classic study of predator-prey relationships that is the world's longest-running scientific study in a protected area (Allen 1993; Peterson 1995; see www.isleroyalewolf.org). This distinctiveness, and the park's scientific importance, have led the United Nations Educational, Scientific, and Cultural Organization (UNESCO) to designate it as an international biosphere reserve. Because other wildernesses do exist in the Lake Superior region and elsewhere, these scientific assets are Isle Royale's most distinctive attributes.

From a political standpoint, Isle Royale's major resource is wilderness. About 99% of the park was designated a federally protected wilderness in 1976, with only a few developed campgrounds, three stores, and various administrative buildings excluded from the wilderness designation. Because the nearby Boundary Waters Canoe Area Wilderness (BWCAW) on the Superior National Forest sees about one million visitors a year, Isle Royale offers a remote, solitary wilderness experience not readily available elsewhere in the region.

Isle Royale attracts a hardy group of backpackers, canoeists, and kayakers each

year. Of its 17,000 visitors, about 14,000 venture into the backcountry, for an average stay of over five days (NPS 2005). The remaining visitors are foot travelers who stay overnight in the small frontcountry zones or else are boaters who use motorized boats to travel the non-wilderness waters around the main island. For comparison, Isle Royale sees roughly the same number of backcountry campers as does Yellowstone, despite the latter park's three million or so visitors a year. Because the average stay at crown jewels such as Yellowstone and Yosemite is measured in hours, not days, Isle Royale clearly represents a unique recreational resource. For FME, the question is whether market incentives can lead to better management of this resource.

Surprisingly, in light of the low level of visitors, Isle Royale is subject to significant crowding in the backcountry. Current visitors already express concerns about overcrowding of both campgrounds and trails degrading the wilderness experience (NPS 2005:11). Policy changes that would increase visitation must take these issues into account.

Such complaints reflect several factors, which become more evident in comparison with a crown jewel park such as Yellowstone. First, Isle Royale's users are selfselected to those seeking a wilderness experience, and solitude is generally an important wilderness value (see Hendee et al. 1990 inter alia). As a result, they are likely to be more sensitive to any crowding effects than the motor tourists in a destination such as Yellowstone. This crowding is most noticeable in the northeastern part of Isle Royale, where motorized boating and NPS activity harm the soundscape. Jack Oelfke, the park's former chief of natural resources, admitted that "aircraft noise [and] propeller-boat noise diminish the feelings of the wilderness out there" (cited in Wockner 1997:197). Similarly, Rolf Peterson, the now-retired leader of the wolf-moose study, notes that "Isle Royale has always had a lot of boats run[ning] around making noise" (cited in Wockner 1997:203). Only Lake Yellowstone wilderness campsites, a small share of all wilderness campsites in Yellowstone, are subject to the same soundscape impact as the wilderness areas near Rock Harbor on Isle Royale.

Second, Isle Royale has a short season, and is closed from November 1 to April 15 each year. In contrast, Yellowstone is open year-round, though all but one of its roads close down for various periods. In addition, most visitors to Isle Royale avoid periods with heavy mosquito and fly populations, effectively limiting usage to the period from July 15 to Labor Day. The short season increases crowding on Isle Royale.

Third, Isle Royale's wilderness users are likely to encounter other parties despite its remoteness and low visitation. Isle Royale has about 230 campsites, including shelters and frontcountry sites at Windigo and Rock Harbor, which is not much less than Yellowstone's 300 backcountry campsites. With the shorter season on Isle Royale, those campsites often fill and visitors must double up (Isle Royale National Park 2005).

The fact that the resource is already subject to crowding effects at low levels of usage complicates the task of privatizing Isle Royale. Increasing visitation would attract a different category of users, those further along the "recreational use spectrum" along which land managers arrange visitors by their tolerance for crowding (Manning 1986). However, these more intensive users already have lower-cost alternatives on the nearby mainland, and it is not clear why they would pay significantly more for an Isle Royale experience that can be had more cheaply in the BWCAW. The crowding issue poses challenges for valuing and pricing Isle Royale in the next section, warranting a somewhat cautious approach to any reform.

Valuing and pricing Isle Royale

If Isle Royale were privatized, could it make a profit? To answer this question, I will make a series of rough, back-of-theenvelope calculations about the revenue that our imaginary private company, ISRO-CO, would need. For simplicity, I will assume that ISROCO seeks profits of about 10% on total revenue, or a 10% return on capital, neither of which are uncommon returns for a business in the United States. It seems certain that this estimate is within an order of magnitude of the actual revenue that would be derived, and, as it turns out, an estimate within an order of magnitude is all we need to raise serious questions about privatizing this national park.

The most intractable issue for applying FME to a national park such as Isle Royale is the question of pricing the land. Yet pricing the land is essential for any reasonable application of FME to outdoor recreation: national parks and national forests provide large, mostly intact tracts of land whose very size represents a substantial part of the overall attraction. There are very few private sites with similar amounts of land (one example would be the Philmont Scout Ranch in New Mexico), making the national parks all the more valuable.

Before becoming a national park, Isle Royale historically had been exploited for copper, lumber, and fish. Copper mines were abandoned as uneconomical. Given the location, timber is probably just as uneconomical today. This leaves only the island's fishing resources as a potentially valuable economic resource. Those fisheries on Isle Royale's many inland lakes are probably valuable only as a recreational resource. The offshore fishery might be commercially viable, and is already exploited for the lodge on the island. Beyond this revenue, which I fold into the lodge operation, I was unable to estimate the value of this fishery. Commercial fishing operations before park establishment consisted of single-family operations earning only modest revenue. Because of the weather on Lake Superior in winter, an offshore fishery would be only a seasonal resource.

To determine a price for recreational use, I examined prices on the North Shore of Minnesota (www.cbnorthshore.com, accessed February 2007) and Michigan's Upper Peninsula near Houghton and Copper Harbor (www.c21-nca.com/, accessed February 2007). Minnesota land can be purchased for as little as \$86,900 for ten undeveloped acres on a remote lake, but most prices were closer to \$50,000-\$100,000 per acre for undeveloped land that is zoned for development. If we assume that a privatized Isle Royale National Park will be zoned for development, then its 132,000 terrestrial acres are worth about \$6-12 billion. Because undeveloped and more remote land is much cheaper, than figure may be high by a factor of ten, so an alternative estimation would be about \$0.6-1.2 billion.

Using Michigan real estate prices yields similar estimates. Typical examples of undeveloped land for sale were: without a lakefront, 50 acres, \$70,000 (\$1,400 per acre); with a lakefront, 20 acres, \$150,000 (\$7,500 per acre). Obviously some Isle Royale parcels will include a lakefront, while others will not. These prices are much closer to the low estimate from the North Shore, or again, about \$0.6–1.2 billion for the entire island. To give ISROCO the best possible price for this thought experiment, I will use this low figure and round it off to \$1 billion. In this case ISRO-CO would need revenues in the ballpark of \$100 million a year to make its investment work.

To put these numbers in perspective, suppose that Isle Royale's 14,000 backcountry users were instead to form a cooperative to buy the island for their own recreational use. Because of the high revisitation rate, such a cooperative might be more feasible here than in other destinations. Using the lowest range of estimates above, purchasing the land would require about \$43,000-86,000 per person, or \$170,000-\$350,000 for a family of four. If ISROCO purchased the island instead of the cooperative, it would require an annual return equal to about 10% of this-tens of thousands of dollars for each family of four to use the island.

As a going business, ISROCO would also have to take over the operating expenses of Isle Royale. In FY2002, the NPS budgeted about \$3.2 million for Isle Royale, of which \$1.1 million went to visitor services, \$1.7 million to facility operations and maintenance, and \$450,000 for resource preservation and management (NPS 2005; Isle Royale budget, www.nps.gov/archive/isro/ pr-budge.htm, accessed February 2007). Each category might be subject to some cost savings if provided by private firms on a competitive market. Spread among 17,000 total visitors, these operational expenses amount to a little less than \$200 per person each year. Since the NPS currently charges

only \$4 per person per day in user fees for an average visit of five days, the U.S. Treasury currently subsidizes about 90% of the operational cost of each recreational visitor.

Looking at these figures as a whole, the cost of buying Isle Royale would require annual profits on the order of \$100 million in order to provide a reasonable return on investment for a private firm. Operating costs make up only a minor sum against this requirement, a few million dollars a year. It would be unreasonable for a private firm not to pay for the cost of land purchase. However, a conservation trust running a government-owned island in the public interest might only need to cover the operating costs if Congress wrote appropriate authorizing legislation. In this case, charging each visitor several hundred dollars each for a wilderness experience would suffice to cover expenses. This would represent a significant increase in the costs to visitors, but the price would not be out of line with those for other recreational opportunities.

Current revenue sources

Having examined costs, I now ask whether ISROCO might achieve the revenue it needs. Because existing revenue is privately held information, I use visitation and price data to estimate revenue.

Visitation is highly concentrated in Rock Harbor on the northeast side of Isle Royale. This port receives daily passenger service from the *Isle Royale Queen IV* out of Copper Harbor, Michigan, and service two times a week from the NPS boat, the *Ranger III*, out of Houghton, Michigan. The *Ranger III* can carry private boats such as cabin cruisers, sparing them a potentially dangerous trip from the mainland. Rock Harbor

also hosts the Voyageur II on its thriceweekly trip around the island out of Grand Portage, Minnesota. To service visitors, NPS employees, and concessionaires, Rock Harbor has extensive facilities, including the Rock Harbor Lodge, gas pumps, two stores, showers, laundry facilities, sewage pump-out services, a campground, and NPS services such as a ranger station, visitor center, and auditorium. There is also a seaplane dock and further boat facilities at Tobin Harbor, a short walk across the narrow peninsula on which both harbors are located. The lodge employs about 60 workers in the peak season, who live in nearby dormitories (NPS 2005:142).

The lodge and each of the transportation services are run by different concessionaires, each of which the NPS regulates for quantity and price. Presumably NPS regulation leaves some revenue on the table, though any increase in transportation price would lead to some reduction in visitation, depending on the price elasticity of demand.

Of the 17,000 visitors to the park each year, let us suppose that 16,000 use the existing transportation concessionaires. Round-trip travel to Isle Royale is about \$160, varying a bit by vendor and itinerary. (Air transportation costs about twice as much, but volume is small enough not to affect the estimates here.) Thus, transportation revenue is about \$2,560,000. In addition, the company operating the Voyageur II has a contract to deliver the U.S. mail, and this boat also provides intra-island transportation for visitors and for some park employees and concessionaires. The boats also generate revenue from shipping excess baggage, kayaks, and canoes, and, in the case of the Ranger III, cabin cruisers. Finally, the Ranger III transports NPS personnel to and from the island; if privatized, this would generate revenue not included in the above total (the NPS currently owns the *Ranger III*). The transportation services also earn some revenue from shipping supplies to employees, volunteers, scientists, and other seasonal residents. Adding these sources brings transportation revenue above \$3,000,000 but probably not above \$4,000,000.

Lodge revenue is comparable. Peak season runs from July 5 to September 7, or 65 days. The lodge has 60 rooms and charges \$360 per night for two adults, all meals included (additional adults are \$120, children \$57). Full occupancy for the entire season with two adults per room would yield \$1.4 million in gross revenue. Adding people would move revenue toward \$2 million, while less-than-full occupancy would lower revenue toward \$1 million.

The lodge's non-peak season runs from May 25 to July 4, or 40 days. Rates are \$336 per night, with additional adults \$114 each and each child \$56. Full occupancy would yield \$800,000, but that is very unlikely in the non-peak season. Combined with the peak season and incidentals, total lodge revenue may approach \$3 million.

The lodge also offers 20 cottages at \$232 per night in the peak season, with each additional person \$49. Let us assume that these are attractive to families of four, and enjoy 100% occupancy during the peak season, yielding \$429,000 in sales. Meals are not included in the cottages, and some visitors will take meals in the lodge restaurants, while others will prepare them in their cottage. Cottages cost \$209 per night in the non-peak season, with each additional person \$44. Assuming again a family of four and 75% occupancy, this yields \$267,300 in revenue for the non-peak season. Throwing in some restaurant meals for cottage guests means that the full-season revenue is in the ballpark of \$1 million.

Putting all those numbers together does not yield lodging and meals revenues in excess of \$5 million. The lodge also offers a variety of other services, including water taxi, charter fishing trips, a snack bar, dining room, a general store, and a marina. Since meals are included in the cost of most lodge rooms, and most non-lodge visitors eat in the backcountry, additional revenue there will be relatively small. The water taxi and fishing charter can each yield hundreds of dollars a day for the 100-day season if kept busy; the marina and general store probably each yield comparable revenue. The lodge also offers daily boat excursions, charging \$33 per adult with children halfprice. These boats hold a couple of dozen passengers, so daily revenue from this program is likely \$500-\$1,000. Putting these revenue sources together adds up to perhaps \$500,000 a year. To account for the possibility that I have grossly underestimated general store and marina revenues, let us call the revenues here \$1 million.

All said, then, Isle Royale businesses currently generate something on the order of \$10 million a year in revenue. At a rate of 10% of sales, these businesses would earn about \$1 million a year in profit. Recall that the previous section suggested that a profitable ISROCO would require profits two orders of magnitude greater than this, or about \$100 million a year.

Most of that requirement comes from the capital costs of purchasing the land, and the U.S. government could make privatization work by giving the land away. However, it is hard to justify such a giveaway in any public policy terms because it would give away profits to one firm without competitive bid. Alternatively, the U.S. government could continue to own the land while leasing it to a private firm or to a conservation trust. However, a market rate for leasing the land would have a clear relation to the underlying value of the land—and that value is just too great for a profit-making enterprise. Any lease cheap enough to make ISROCO a going concern would entail large implicit or explicit subsidies.

A similar analysis applies to any conservation trust. The U.S. government would be allocating some set of property rights to the trust, including the right to determine how assets are used and a claim on the residual earnings from those assets. (Another aspect of property rights, the right to sell the assets, would presumably be constrained by the terms of the trust.) Could such a giveaway be justified, or should the U.S. government be required to consider rival bids for management of a conservation trust?

If the government considers rival bids, then the value of the asset and its ability to generate revenue again enter into play, since this would distinguish rival bids. Moreover, the taxpayer public might reasonably request payment of some lump sum or annual fee in exchange for the right to manage the asset. Because the highest and best commercial use of Isle Royale is probably the building of lakeside vacation homes on very large lots, the value of the property as estimated above is again a reasonable point of reference-even for a conservation trust. If the government does not allow vacation homes when assigning the land to a conservation trust, then it is subsidizing that trust by the value of such development foregone.³ These subsidies are no different in principle from the existing subsidy of backpackers and scientists.

Completeness requires discussion of a final existing revenue source. Like most other national parks, Isle Royale has a nonprofit cooperating association affiliated with the park. The association provides some volunteer and paid staff in stores and ranger stations in the park, and also sells books and similar items on-line and on the mainland. Revenue generated from these and other sources, including donations, can be used for park projects. In financial terms, this group provides park management with some revenue usable for discretionary purposes that would go directly to the U.S. Treasury if the NPS ran the bookstore itself.

If the island were turned over to ISRO-CO, presumably these volunteers, donations, and revenues would become unavailable to a profit-making firm, except for bookstore sales. However, a not-for-profit conservation trust running the park would probably be able to continue to call on the volunteers and donations. The numbers involved are not large, smaller than the existing general store, but must be included in any full accounting.

In summary, the key question remains what to do about the land, which is the major commercial asset of the park and whose purchase would represent the main expense for any business. A conservation trust allows greater flexibility in design but would essentially lie between two extremes. At one end, a conservation trust would work more like a business and would therefore be subject to the same challenges as ISROCO. At the other end of the spectrum, a conservation trust would be encumbered by many restrictions on its activities, making it look more like existing NPS management. The more restrictions, such as conservation easements, imposed on the trust, the greater the government subsidy of those users who are allowed to remain. In short, the trust would let us determine the mix of subsidies to backpackers, scientists, vacation home owners, and businesses more precisely, but any conservation trust entails an implicit or explicit subsidy to someone.

New revenue sources for ISROCO

The previous section suggests a large gap between the revenue needed for a privatized park and the actual revenue available, with a similar gap faced by any reasonable conservation trust. Several new sources of revenue would be available with relatively small changes to the current management philosophy. Beyond this, further revenue enhancements would fundamentally change the nature of the resource, raising serious questions of values. In short, expanding revenue sources would likely not solve the basic revenue problem.

First, ISROCO could try to recover income from the wolf-moose study (see Mech 1969 [2002]; Allen 1993; Peterson 1993; Wockner 1997). It is not clear what a reasonable fee for scientific access should be, but let us suppose that ISROCO sets a fee in a manner similar to indirect cost recovery (ICR) on other grants. The principal investigators of the Isle Royale wolf-moose study (on-line at www.isleroyalewolf.org), located at Michigan Technological University, claim that they need \$150,000 a year to continue the study. For discussion, consider an ICR rate of 30%. This implies that the wolf-moose study would have to pay ISROCO about \$45,000 a year for access. This roughly equals existing secondary sources of income such as the gift shop-a help to cover operating expenses but a drop in the bucket if ISROCO has to buy the land.

Given the steady decline of federal

funding, and the unpredictable level of private donations, it seems unlikely that the wolf-moose study would be able to pay this rate out of existing funds. Alternatively, the wolf-moose study could simply raise the funding that it seeks from the National Science Foundation (NSF) and other sources by this amount. However, such an increase would obviously entail a federal subsidy to ISROCO out of the NSF budget, mediated by the wolf-moose study. For consistency, FME advocates should oppose any such on-going subsidy to support a privatized concern.

The more problematic aspect of the wolf-moose study is the externalities that it imposes on other uses of the island. For example, one long-standing trail was erased from the map (and is now well overgrown) to keep hikers from exploring a known pack denning location. Prohibitions on non-scientific uses of some areas would lower ISROCO's potential value, once again requiring implicit or explicit subsidy.

Higher user fees represent another possibility. I suggested above that it would take about \$200 per backpacker per visit to cover existing management costs, or about \$40 per day. This is probably a reasonable price, given that Disney parks charge about twice that much for admission. However, this fee would be much too low to cover the cost of the land.

Increasing usage would also generate more revenue. ISROCO might expand backcountry use by adding campgrounds, especially since many sites are already full during the peak season. The NPS has designed its trails and campgrounds to move overnight use to the shoreline, with a few exceptions along the Greenstone Ridge trail. ISROCO could revisit this decision and develop inland backcountry use.

ISROCO could also increase both visitation and revenue by offering guided backcountry tours for people who currently lack the equipment and skills to hike without a guide. Guided trips are popular in some parks, such as Glacier National Park, and can cost several hundred dollars a day. Adding backcountry cabins, as in the Porcupine Mountains Wilderness State Park in Michigan's Upper Peninsula, would also attract a different class of user. Guided kayaking trips, perhaps with cabin development near existing kayak campgrounds, would provide another possible source of revenue. However, based on experiences at these other locations, it is difficult to envision a doubling of visitation.

Similarly, ISROCO might also develop the small tour business currently found on the island. A few organizations such as Elderhostel already take groups to the island on tours. More modern resort facilities might attract more such groups, especially if transportation times could be shortened with the use of larger float planes or the addition of hydrofoil service.

ISROCO could also increase usage by opening the park to winter use. This would create opportunities for cross-country skiing, dog sledding, and snowmobiling. All these activities are growing in popularity in comparable regions such as parts of northern Wisconsin and Superior National Forest in Minnesota. However, ISROCO would be challenged to offer opportunities that warrant the much greater cost of reaching Isle Royale as compared with these alternatives. In addition, winter use would increase harassment of the wolves, who are much easier to see in winter. Indeed, visitor harassment of wolves was the reason why the park was closed for the winter in 1981 (Wockner 1997:134-137).

ISROCO could also open the park to wilderness hunting experiences. These experiences are not so common in the Midwest, despite the popularity of hunting in the region. However, wilderness hunting experiences are found in the U.S. Rockies and in large parts of Canada. Because hunters in these latter markets are willing to pay significant costs for access to remote locations, the cost of transportation would not pose the same challenges as it would for skiing. However, a significant harvest would essentially destroy the scientific value of the resource, which rests on a "natural" predator–prey system without human predation.

Finally, ISROCO could develop resort accommodations on Isle Royale. Many national parks have distinctive lodges with amenities such as swimming pools, tennis courts, and golf courses. Each of these existed on Isle Royale before park establishment (see Poirier and Taylor 2007), suggesting the existence of a latent market. The existing lodge at Rock Harbor, with a one-star rating from AAA, does not currently meet the standards for a luxury destination.

The NPS is already planning some additional development, namely the rehabilitation of two historic properties on the island (Isle Royale National Park 2007). Crystal Cove was originally a summer retreat in the 1920s, and served as the site of a commercial fishery from the 1950s to the 1980s. Wright Island was a commercial fishing base from the 1860s though the 1970s. The park's new general management plan proposes to use both sites for overnight camping (but not for lodging). Interestingly, the park proposes to pay for development of these sites in partnership with the Isle Royale Boaters Association and the Lake Superior Fund. Such subsidies for recreational site development would probably not be available to a private business owner, though they would likely be on offer to a conservation trust.

All these options have significant negative implications for the nature of the resource. Dog sledding would expose the wolves to rabies and canine parvovirus. (Domestic animals have been excluded from the park since 1980.) Snowmobiling generates significant noise pollution and has various effects on wildlife, as debates in Yellowstone National Park have illustrated. Greater backcountry use in the interior could affect wildlife. Wilderness hunting would mark a significant change in views toward the wildlife resources. Snowmobiling and resort accommodations would damage or destroy the wilderness experience. Preserving wildlife resources would require that ISROCO locate sites carefully to reduce the effects of greater human impact-a mission that already guides NPS decision-making.

Clearly the NPS could sell Isle Royale to ISROCO with conservation easements and similar covenants to prevent such developments. Such restrictions would lower the value of the asset to investors. The size of that diminution of value makes clear the size of the subsidy that the status quo enjoys. Not imposing such restrictions would represent an effective transfer of consumer surplus from current users, scientists, and wildlife to ISROCO and currently excluded users such as hunters.

All such developments would not only damage existing wilderness and scientific resources but would also require a significant rebranding of Isle Royale. The NPS currently markets the park in terms of wilderness, wolves, and moose, and constructs a particular image of wilderness around these totems (Wockner 1997). If
Isle Royale were privatized, the recreational experience on the island could no longer be packaged in the same way. The Minnesota mainland near Isle Royale already provides an extensive "North Woods" experience in resorts, hunting lodges, and the BWCAW. If Isle Royale were open to similar development, its remoteness would make it hard to compete with these other recreational opportunities on price.

The NPS does not seem to be missing out on large sources of revenue. Even if all the opportunities discussed in this section were to increase visitor revenue tenfold, ISROCO would not be able to cover the cost of the land. It could cover operating expenses, but these expenses would also increase with greater visitation. ISROCO would also need to pay taxes to the state of Michigan, taxes that the NPS need not pay. A conservation trust might avoid paying such taxes, but in that case Michigan would strongly resist providing police and other services to the island.

Summary and implications

Many readers' initial reactions to the title of this article will be that the very idea of privatizing Isle Royale is preposterous. In some ways, it is. As far as I know, no one has ever suggested privatizing Isle Royale National Park. On the other hand, at least 34 units of the national park system have been delisted over the years (Hogenauer 1991; Rettie 1995, chap. 5). Many remain public lands of one sort or another, such as state parks or national wildlife refuges. One such unit, Michigan's Mackinac Island, is a highly developed miniature Isle Royale. Castle Pinckney National Monument, opposite Fort Sumter, was delisted in 1956 and is now privately owned. The city of Cody, Wyoming, took over Shoshone Cavern National Monument in 1954. It was run privately until 1966, when it closed. Lake Texoma National Recreation Area failed as a recreational destination under NPS management and is now managed by the U.S. Army Corps of Engineers. It now has two state parks, 40 campgrounds and 20 private resorts. Mar-a-Lago National Historic Site was never used by the NPS and is now owned by Donald Trump.

Privately held nature reserves are common around the world. TNC is the most well-known private owner, and could certainly manage Isle Royale as it does many other properties. In some countries, most nature preserves are privately owned, as in Costa Rica (Brown 2001). In addition to servicing tourists, many of these reserves support scientific research and sustainable agriculture of various kinds.

Another option would be to establish a conservation trust to manage the current park. Karl Hess (1993:111-116), a strong critic of NPS elk management, proposes such a trust for Rocky Mountain National Park. He suggests that the trust be mandated to preserve the montane-to-alpine ecosystem of the central Rocky Mountain chain. In his plan, the original trustees would consist of current park staff and professors from the University of Colorado and Colorado State University. Interested persons and groups could buy shares in the trust, receiving participation rights and perhaps seats on the board of trustees. The trust's income would largely depend on entrance fees from the park's three million visitors a year.

In the case of Isle Royale, there are essentially three options. First, we might decide to destroy existing resources by developing the park for vacation homes, resorts, motorized recreation, and what little extractive activity it can support. The resulting property still might not be selfsupporting. The pre-park history of the island suggests that money-making opportunities are constrained by transportation costs.

Second, we might privatize the island with two provisos: (1) conservation easements limiting impact on existing scientific and wilderness resources; and (2) a significant subsidy, which would include not asking either ISROCO or a conservation trust to pay the true cost of the resource.

Third, we could maintain the status quo of NPS management, with continued subsidy of recreational and scientific users of the resource. This overlaps with the trust option because the NPS currently holds use rights in the island and its management is constrained by de facto conservation easements written into park legislation and the NPS Organic Act of 1916. If it received most or all of the revenue the park generates, it would look more like the conservation trust option. Conversely, the more conservation easements placed on any private actor, and the more conditions imposed on its management choices, the more that ISROCO would look like a licensee of the U.S. government, which is essentially what the NPS already is.

Two factors make the case for privatization difficult. The first would characterize any national park: parks represent a significant subsidy of existing users. Privatizing the park would mean that the seller (the U.S. government) would need to subsidize the purchaser. Subsidizing a private buyer instead of the public users is normatively very difficult to defend.

Second, Isle Royale has a set of attributes that make privatization difficult: its remoteness, moderately large size, and low visitation. This made it possible to make heroic assumptions within only an order of magnitude or so and still demonstrate the core point that privatization is not financially feasible. In addition, Isle Royale's core attributes, its wilderness and its scientific value, are difficult to exploit for greater revenue. These attributes characterize many other distinctive parks. Concerns for distinctive resources might not constrain heterogeneous units such as urban parks and national recreational areas, which probably represent more attractive targets for novel management arrangements.

In short, Isle Royale is not a good candidate for privatization or for a conservation trust. This may not surprise many people. Those with philosophical objections to FME in general will doubtless find this paper a reductio ad absurdum that proves the error of FME's ways. This is not my intention. Instead, by acknowledging that every mode of analysis has its limits, I seek to explore a relatively extreme case to delineate the issues that arise in a wider range of FME applications. Once we move beyond a few parks with commercial resources that could be exploited without changing the character of a park's resources, the case for privatization or creating a conservation trust for many other national parks would not withstand close scrutiny.

Conclusions

Free-market environmentalists argue that existing policy in national parks and forests involves many subsidies that favor some activities over others. To end such subsidies, they recommend privatizing lands and management to the extent possible.

This article finds that the first claim is correct. Current management on Isle

Royale does subsidize some activities, including backpackers seeking a wilderness experience, basic scientific research, and probably also the business operations of the park's concessionaires. After working through a thought experiment, this article also argues that privatization would entail many subsidies of its own if the new owners were to make a profit. The question then becomes, Whom would we rather subsidize as a matter of policy? Subsidizing current users has a stronger democratic rationale than subsidizing private business owners on a privatized Isle Royale.

Isle Royale is in many ways a distinctive national park, though every national park is by definition distinctive in some way. Isle Royale's distinctiveness makes visible the important distributional questions associated with FME, issues that are less obvious when privatizing campgrounds on national forests as part of a program to increase the quality and quantity of the recreational visitor experience.

The Isle Royale case also raises questions about the cases that advocates of FME and conservation trusts bring forth, such as the Presidio Trust in Golden Gate National Recreation Area, Grand Staircase-Escalante National Monument, or Rocky Mountain National Park. These too are pretty exceptional, with opportunities for revenue generation that would not be found in, say, Nebraska's NPS units-Scotts Bluff and Agate Fossil Beds national monuments, Niobrara National Scenic River, or Homestead National Monument of America. Though some NPS units could probably be better managed by a private firm or conservation trust, many others will face the same financial obstacles as Isle Royale.

While emphasizing the money questions, this paper has not examined the politics of privatization legislation. FME is built on a critique of political intervention in effective land management in national parks and forests, yet it assumes that reform efforts will be politics-free. Experience at Golden Gate suggests some of the dangers. The park's founding legislation provides for a Citizens' Advisory Committee (CAC), consisting of federal and local officials and citizen advocates, which plays an important role in supporting NPS management. In the Presidio district, however, the Presidio Trust dominates decisions. It gives a dominant role to large business interests in the San Francisco area, yielding very different outcomes than the CAC in other Golden Gate units (see Rothman 2004). Advocates of privatization or conservation trusts need to explain how they will keep their enabling legislation from being made the target of non-environmental political interventions.

FME advocates should also ponder a political problem suggested by the analysis here. I have suggested that privatization or trusts may make sense for some NPS units but not for others. FME partisans may reasonably conclude that privatization (or trusts) should be pursued when economic conditions are favorable but should not be attempted in cases such as Isle Royale National Park. Though this seems reasonable, private businesses will seek privatization of the exact same set of NPS units because those are the units where profits can be made. In other words, sincere FME advocates might be observationally indistinguishable from business interests, and vice versa. In this setting, FME will have trouble establishing its credibility with the public at large, a public whose support will be essential if the enabling legislation for conservation trusts is to remain true to its conservationist principles.

Endnotes

- 1. Isle Royale is about 540,000 acres, 75% of it water; Rocky Mountain is 265,000 acres; Great Smoky Mountains, 520,000; Yosemite, 760,000; Yellowstone, 2,200,000.
- 2. I use here the dates of formal establishment, not legislative authorization or initial land purchase, though the sequence is the same no matter which dates are used.
- 3. For reference, TNC recently set aside \$6.25 million to buy conservation easements on 75,000 acres of second-growth forest in Minnesota (www.nature.org/wherewework/ northamerica/states/minnesota/presspress1997.html, accessed February 2007). At that price, conservation easements on Isle Royale would be worth about \$11 million.

References

- Allen, Durward L. 1993. Wolves of Minong: Isle Royale's Wild Community. Ann Arbor: University of Michigan Press.
- Anderson, Terry L., and Holly Lippke Fretwell. 1999. A Trust for Grand Staircase-Escalante. Policy Series no. PS-16. Bozeman, Mont.: Political Economy Research Center.
- Anderson, Terry L., and Peter J. Hill. 2004. *The Not So Wild, Wild West: Property Rights on the Frontier*. Palo Alto, Calif.: Stanford University Press.
- Anderson, Terry L., and Donald R. Leal. 1992. Free market versus political environmentalism. *Harvard Journal of Law & Public Policy* 15:2, 297–310.
- ———. 1996. Free Market Environmentalism. San Francisco: Pacific Research Institute for Public Policy.
- Baden, John A., and Donald Leal, eds. 1990. The Yellowstone Primer: Land and Resource Management in the Greater Yellowstone Ecosystem. San Francisco: Pacific Research Institute for Public Policy.
- Baden, John, and Richard Stroup. 1981. Saving the wilderness: A radical proposal. *Reason* (July), 28–36.
- Beder, Sharon. 2001. Neoliberal think tanks and free market environmentalism. *Environmental Politics* 10:2, 128–133.
- Blumm, Michael C. 1992. The fallacies of free market environmentalism. *Harvard Journal* of Law and Public Policy 15:2, 371–389.
- Brown, Cory R. 2001. Visitor Use Fees in Protected Areas: Synthesis of the North American, Costa Rican and Belizean Experience. Ecotourism Program Technical Report Series no. 2, April. Arlington, Va.: The Nature Conservancy.
- Cordato, Roy E. 1997. Market-based environmentalism and the free market: They're not the same. *The Independent Review* 1:3, 371–386.
- DuFresne, Jim. 2002 [1991]. Isle Royale National Park: Foot Trails & Water Routes, 3rd ed. Seattle: The Mountaineers.
- Hendee, John C., George H. Stankey, and Robert C. Lucas. 1990. *Wilderness Management*. 2nd ed. Golden, Colo.: North American Press.
- Hess, Karl, Jr. 1993. Rocky Times in Rocky Mountain National Park. Niwot: University Press of Colorado.
- Hogenauer, Alan K. 1991. Gone, but not forgotten: The delisted units of the U.S. national park system. *The George Wright Forum* 7:4, 2–19.

- Huber, Peter. 1999. Hard Green: Saving the Environment from the Environmentalists—A Conservative Manifesto. New York: Basic Books.
- Isle Royale National Park. 2005. Wilderness and Backcountry Management Plan and Environmental Impact Statement. July.
- ——. 2007. First Annual Centennial Strategy for Isle Royale National Park. August.
- LeRoy, Sylvia. 2005. Beyond the public park paradigm. *The George Wright Forum* 22:2, 32-42.
- Lowry, William R. 1994. The Capacity for Wonder: Preserving National Parks. Washington, D.C.: The Brookings Institution.
- Manning, Robert E. 1986. Studies in Outdoor Recreation: Search and Research for Satisfaction. Corvallis: Oregon State University Press.
- Mech, L. David. 2002 [1969]. The Wolves of Isle Royale. Honolulu: University Press of the Pacific. (Originally published by the National Park Service, Fauna Series no. 7.)
- National Park Service. 2005. Isle Royale: Wilderness and Backcountry Management Plan and Environmental Impact Statement. July.

- North, Douglass C. 1984. Structure and Change in Economic History. New York: W.W. Norton.
- Peterson, Rolf O. 1995. The Wolves of Isle Royale: A Broken Balance. Minocqua, Wis.: Willow Creek Press.
- Poirier, Jessica, and Richard Taylor. 2007. *Images of America: Isle Royale*. Charleston, S.C.: Arcadia Press.
- Rettie, Dwight F. 1995. Our National Park System: Caring for America's Greatest Natural and Historic Treasures. Urbana and Chicago: University of Illinois Press.
- Rothman, Hal K. 2004. The New Urban Park: Golden Gate National Recreation Area and Civic Environmentalism. Lawrence: University Press of Kansas.
- Runte, Alfred. 1987 [1979]. National Parks: The American Experience. 2nd ed. Lincoln: University of Nebraska Press.
- Shelton, Napier. 1997. *Superior Wilderness: Isle Royale National Park*. Houghton, Mich.: Isle Royale Natural History Association.
- Smith, Tony. 1995. The case against free market environmentalism. *Journal of Agricultural* and Environmental Ethics 8:2, 126–144.
- Snyder, Pamela, and Jane S. Shaw. 1995. PC oil drilling in a wildlife refuge. *The Wall Street Journal*, 7 September.
- Stavins, Robert N., and Bradley W. Whitehead. 1992. The Greening of America's Taxes: Pollution Charges and Environmental Protection. CSIA Discussion Paper no. 92-03. Cambridge, Mass.: Kennedy School of Government, Harvard University.
- Wockner, Gary. 1997. National Park Conundrums: The Wolves of Isle Royale. Fort Collins, Colo.: B-Store Press.

Robert Pahre, Department of Political Science, University of Illinois, 362 Lincoln Hall, 702 South Wright Street, Urbana, Illinois 61801; pahre@uiuc.edu

Volume 25 • Number 3 (2008)

^{—. 2007. 2006} recreation visitors ranked by number of visitors. On-line at www2.nature.nps.gov/stats/repspecial.htm.

Identifying and Protecting the Interpretive Potential of Setting at Cultural Heritage Sites

George N. Wallace and Christopher C. Mayer

Introduction

THE INTERPRETIVE POWER OF SETTING IS PARTICULARLY IMPORTANT for cultural heritage sites such as ancient ruins. Most protected areas must sooner or later contend with increasing external and internal development pressures, which tend to be particularly intense at smaller, near-urban cultural sites. The level of restoration within a site as well as the types of land use and human activity adjacent to the site can affect its interpretive potential, which might be defined as: the best possible physical, social, cultural, and historical milieu for transmitting and receiving the emotional and intellectual meanings of a place. The themes and messages of programmatic interpretation are derived from the setting. Nature, landscape features, human works—past and present—work together as a *de facto* form of interpretive media that protect the *genius loci*, or spirit of the place, and provide a wider diversity of possible interpretive messages and experience opportunities. Visitors experience a seamless landscape that is both within and adjacent to the site. Some combination of setting attributes that optimize interpretive potential can be recognized and planned for. Interpreters can provide information essential to the planning process that is typically lacking.

There is a variety of opinions on how cultural sites and their surroundings should be developed. It is worth asking how altering internal and external setting attributes will affect interpretive potential, the quality of the visitor experience, and, ultimately, the sustainability of the site. We know that visitor expectations about a site shape the experience they have there (Burde and Mayer 1996; Knudson et al. 2003). Paint peeling off the walls in a visitor center or museum may signal lack of maintenance or institutional financial difficulties, but visitors to an abandoned mining camp in a U.S. park or to a Mayan ruin in Mexico or Central America expect and even want to see things in a state of abandonment and disrepair and being reclaimed by nature. This juxtaposition of restored ruins and those being reclaimed by nature allows the visitor to ponder the relationship between humans and nature—a much-needed analysis in today's world. As the level of internal restoration passes some optimal point, and urbanization or land use intensifies near a cultural site, there appears to be a concomitant decline in charm, authenticity and interpretive potential from the visitor's point of view (Figure 1).

The case of Copan Ruins

At Copan Archaeological Park and World Heritage site in Honduras, most visitors currently leave the town of Copan



Figure 1. Photo taken from inside Pizza Hut illustrates how the level of development on adjacent lands threatens experiences available at UNESCO World Heritage sites such as the Pyramids of Giza, Egypt. Photo by Adam Bernstein.

Ruins and walk through a pastoral landscape for 15 minutes before reaching the park. Along the way, they witness a mixture of small-scale farming and remnant woodlands not too far removed from the Mayan agricultural landscape of the past and one which is cultivated by descendents of the ancient Maya that built the pyramids, stele, and ball courts within the park (Figure 2). Some un-restored ruins are visible en route. Once inside the park, one finds a visitor center replete with exhibitions as well as trails allowing one to walk among skillfully restored ruins and interpretative sites. Nearby are un-restored areas where one can wander by ruins with trees growing on top of ancient mounds or past carved stone inextricably tangled with roots and vines. In these areas, an abundance of birds, reptiles, bats, and insects make their home and deer browse early and late, adding another dimension to the experience. The interpretive potential of Copan emanates from all of these settings. This became apparent while conducting several studies that asked visitors to evaluate current and future management scenarios advocated by some archeologists, and officials in the town of Copan Ruins. Visitors responded to questions about tree removal, increased restoration of ruins, and the expansion of the town of Copan Ruins and placement of tourist accommodations closer to the park, among others (Mayer and Wallace 2007, 2008).

The land around the site primes the experience

Results from the studies indicated that the external setting at Copan is a transition zone between modernity and antiquity that



Figure 2. The external setting of Copan Archaeological Park, Honduras, with scenes ranging from reforestation and agriculture to residences and businesses such as modest and luxury hotels. Visitors appreciated a green buffer of farm and forest between the park the nearby town.

primes the visitor experience by increasing the sense of anticipation and stimulating inquiry. It provides raw material for interpretive themes, which are tied to the "extant" natural and cultural contexts present since the time the ancient civilization thrived. The setting affords visitors an opportunity to better understand local history and to envision the scope and scale of the area-thereby providing context and extending the experience. The Copan studies and other related studies in Mesoamerica suggest that when adjacent landscapes give way to hotels, vendors, and automobiles, there is often a sharpening of both ecological and aesthetic gradients and a loss of context that reduces the effective size of the area and the breadth of available experience opportunities (Wallace et al. 2005).

Restoration can create or remove interpretive potential

At Copan as well as many other cultural sites, it is common to find those who feel that more restoration will attract more

tourists. There are, however, positive and negative consequences of restoring ruins and increasing tourism at cultural sites. The welcome consequences include increased understanding and local economic activity (Pedersen 2003). Many ruins are enigmatic, having been reclaimed by nature or severely deteriorated; they are, therefore, rendered more comprehensible by some degree of restoration. Once some mounds at Copan are restored, it allows the mind's eye to see beneath other un-restored mounds. A negative consequence of restorations is that they initiate an accelerated rate of physical deterioration of a non-renewable resource once exposed to the natural elements, sunlight, and rain. New restorations can also dramatically add to the fixed cost of operation, to the need to increase staff presence, and to monitor. An overemphasis on tourism volume can lead to unjustified reconstructions (Feilden and Jokilehto 1998). Sustainable visitation in Copan was linked to the maintenance of setting integrity by visitors. They indicated that having both restored and un-



Figure 3. The internal setting of Copan Archaeological Park, Honduras, with scenes ranging from nonrestored to totally restored ruins. Visitors appreciated aspects of each level of restoration.

restored ruins helped to define the essence of a *ruins*; it provided them access to a longer historical period, provoked reflection about sustainability, and helped to retain the mystery and enchantment of that which is still undiscovered (Mayer et al. 2007; Figure 3). The combined setting also provided a wider diversity of visitor experiences. The un-restored areas in this relatively small park were seen as more hospitable and relaxing, and the trees, natural vegetation, and fauna permitted nature observation to be integrated into the cultural experience.

Identifying interpretive potential

The interpretive potential inherent in the settings at Copan began to emerge as the visitor perceptions about internal and external development were probed. Surveys, interviews, focus groups, and participant observation were used with more than 600 visitors and local residents over two years to better understand the experiences and settings that visitors were seeking and to test internal settings would affect the visitor experience. Most of the people who visited Copan were well-educated, motivated, and predisposed to learn. Salient experience outcomes sought by visitors included being able to imagine Copan at its zenith, to better understand ancient and contemporary Mayan culture, to learn through observation, and to have some opportunities for solitude and reflection. The hundreds of specific comments gathered and categorized slowly helped us to develop the concept of interpretive potential inherent in specific settings at Copan (Mayer et al. 2008). As a result, we suggest that similar and less complex studies are one means of uncovering the interpretive potential of any cultural site.

how proposed changes to external and

The interpretive potential of setting is not an entirely new idea. Tilden (1968) acknowledged that a well-preserved monument "speaks for itself" but does so partially in a language not understood by all visitors, thus requiring the help of interpreters

to "give life to the ideas and images of material remains" (Silberman 2006). Others have long acknowledged that protected area visitors seek out the settings that will make the achievement of desired experience outcomes more likely (Manning 1999). Since the 1970s, it has been suggested that to optimize visitor experience satisfaction, protected area managers should understand visitor motives, provide some diversity of management zones, and pay attention to the integrity of setting of each (Brown et al. 1978; Clark and Stankey 1979). If the Copan studies are any indication, the link between setting and experience quality is pronounced for cultural sites and the notion of "well preserved" requires attention to the combination of both internal and external settings and the interpretive potential they hold-and which could be lost otherwise.

Participation in site and local planning

The internal setting integrity and the interpretive potential that Copan currently holds can only be protected during the planning process. Likewise, maintaining the favorable external setting is dependent on land use decisions made by local or regional jurisdictions on lands outside the protected area. Even in the case of Copan, where there is a designated buffer zone where managers are legally enabled to participate in local land use decision-making, the case for the importance of setting has not been advanced by interpreters. Interpreters have traditionally had a limited role in the development of management plans and only vary rarely, if at all, are assigned to provide information to local government land use decision-makers. Recent U.S. National Park Service planning models, such as the Visitor Experience and Resource Protection (VERP) framework, do include the identification of important interpretive themes as a part of the planning process. In general, however, interpreters focus on designing interpretive programs, media, exhibits, and publications for delivery to the public.

Merriman and Brochu (2005) do suggest that interpretive planning should also encompass landscape features. They advocate examining the "mechanics" that influence the visitor experience, such as how the site, facilities, and interpretation "work together to create design balance and physical spaces that function as well as look good" (p. 44).

The expanded role of interpreters and interpretive planning suggested here goes a step further. It asks that interpreters now become more involved in site and local land use planning as they are the ones best able to provide a voice for the importance of setting and appropriate levels of internal and external development. When planned for and optimized, setting can both serve as interpretive media in and of itself as well as being the source "from which" traditional interpretation arises.

Both internal and external development pressures must be addressed by zoning (which prescribes the type and intensity of use), design standards, and performance criteria. Maintaining or enhancing external setting compatibility is likely to require a combination of land use regulations and incentives for adjacent landowners. Testimony from interpreters about the interpretive themes that particular settings provide and the relation of setting to experience quality and sustainable visitation can be compelling to planners and decision-makers who must make controversial decisions about land use.

What happens during site and regional

planning largely determines the extent to which interpreters can later practice their art. This form of interpretive planning is proactive and might be thought of as "experience design" that is informed by visitor research. To suggest that the conscious planning for, or design of, setting is a form of interpretation by no means reduces the importance of the programmatic efforts that follow. Interpreters might, as a part of programmatic efforts, preface the description of specific interpretive themes and activities with supporting information from visitors about the experiences and settings they seek. Cultural heritage sites such as Copan are often magnets for unplanned development. Interpreters are a voice for the resource; they must now use that voice along with those of archeologists and other professionals, site managers, and local communities—during the planning process and beyond to inform the day-to-day management decisions that affect settings and their interpretive potential.

References

- Brown, P.J., B.L. Driver, B. L., and C. McConnell. 1978. The Opportunity Spectrum Concept and Behavioral Information in Outdoor Recreation Resource Supply Inventories: Background and Application. General Technical Report no. RM-55. Fort Collins, Colo.: U.S. Department of Agriculture–Forest Service.
- Burde, J.H., and C.C. Mayer. 1996. Marketing cultural resources: Visitor expectations, perceptions, and satisfaction. In *Proceedings of the National Interpreters Workshop*, Billings, Montana, 297–302.
- Clark, R.N., and G.H. Stankey. 1979. The Recreation Opportunity Spectrum: A Framework for Planning, Management, and Research. Portland, Ore.: U.S. Department of Agriculture–Forest Service, Pacific Northwest Forest and Range Experiment Station.
- Feilden, B.M., and J. Jokilehto. 1998. Management Guidelines for World Cultural Heritage Sites. 2nd ed. Rome: ICCROM [International Centre for the Study of the Preservation and Restoration of Cultural Property].
- Knudson, D.M., T.T. Cable, T. T., and L. Beck. 2003. Interpretation of Cultural and Natural Resources. 2nd ed. State College, Pa.: Venture.
- Mayer, C.C., and G.N. Wallace. 2007. Appropriate levels of restoration and development at Copan Archeological Park: Setting attributes affecting the visitor experience. *Journal of Ecotourism*, 23:1, 91–111.
- ———. 2008. The interpretive power of setting. *Journal of Interpretive Research* 13:1. (In press.)
- Merriman, T., and L. Brochu. 2005. Management of Interpretive Sites: Developing Sustainable Operations through Effective Management. Fort Collins, Colo.: InterpPress.
- Pedersen, A. 2003. *Managing Tourism at World Heritage Sites*. Paris: United Nations Environment Programme.
- Silberman, N. 2006. The ICOMOS-Ename Charter Initiative: Rethinking the role of heritage interpretation in the 21st century. *The George Wright Forum* 23:1, 28-33.
- Tilden, F. 1968. *The Fifth Essence: An Invitation to Share in Our Eternal Heritage*. Washington, D.C.: The National Park Trust Fund Board.
- Wallace, G.N., J.R. Barborak, and C. MacFarland. 2005. Land use planning and regulation

Volume 25 • Number 3 (2008)

in and around protected areas: A study of legal frameworks, best practices and capacity building needs in Mexico and Central America. *Natureza Conservação, The Brazilian Journal of Nature Conservation* 3:2, 147–167.

- George N. Wallace, Colorado State University, Warner College of Natural Resources, Center for Protected Area Management and Training, 231 Forestry Building, Fort Collins, Colorado 80523; georgew@cnr.colostate.edu
- Christopher C. Mayer, Colorado State University, Warner College of Natural Resources, Center for Protected Area Management and Training, 233 Forestry Building, Fort Collins, Colorado 80523

Holding the High Ground: Interpreting the Civil War in National Parks

Robert K. Sutton

IN 2000, CONGRESS RECOGNIZED THAT THE NATIONAL PARK SERVICE "does an outstanding job of ... describing the particular battle at any given site, but in the ... multi-media presentations, it does not always do a similarly good job of documenting and describing the historical social, economic, legal, cultural and political forces and events that originally led to the [Civil War] which eventually manifested themselves in specific battles. In particular, the Civil War battlefields are often weak or missing vital information about the role that the institution of slavery played in causing the American Civil War." Congress further directed "the Secretary of the Interior to encourage Civil War battle sites to recognize and include in all of their public displays and multimedia educational presentations the unique role that the institution of slavery played in causing the Civil War and its role, if any, at the individual battle sites."

National Park Service Civil War battlefield superintendents had already begun to expand interpretation in their parks starting with a meeting in Nashville, Tennessee, in 1998, in which they asked themselves the question, "How do we go about expanding the scope of interpretation on Civil War battlefields, giving visitors the opportunity to explore the fundamental contexts and meanings of the resources that comprise Civil War battlefields?" In the ten years since, we have made great progress in meeting our charge from Congress, by interpreting not only the issue of slavery, but other causational themes as well. As we approach the Sesquicentennial of the Civil War, our goal is to make our parks laboratories for exploring and understanding this critical period in our history.

"After four years of arduous service marked by unsurpassed courage and fortitude, the Army of Northern Virginia has been compelled to yield to overwhelming numbers and resources."

With this farewell address to his troops at Appomattox Courthouse in April 1865, General Robert E. Lee started what we have since called the conception, or the myth, of the "lost cause" of the Civil War. Simply stated, the lost cause was a viewpoint of the war, perpetuated by Confederate veterans, that the Confederacy was engaged in a noble war, fought by honorable men, to defend the cause of states' rights. The South lost, not because the cause was wrong—the proponents believed it was just—nor because the officers and soldiers were inferior—in their eyes, they were superior. They lost because they faced insurmountable odds of more manpower and more industrial might—in fact, more of virtually everything.

Lee's Farewell Address and the body of literature that ensued, beginning with Edward Pollard's 1865 book *The Lost Cause: A New Southern History of the War of the Confederates*, followed by a second volume in 1866, *The Lost Cause Regained*, perpetuated and engrained the lost cause in the Southern and, later, Northern psyche. Pollard and others influenced the content of textbooks, and by adopting an activist approach to curricular planning these Confederate sympathizers were able to perpetuate the lost cause for generations beyond the end of the Civil War.¹

In many ways, the idea of the lost cause made perfect sense. Indeed, there were more Northerners than Southerners. There were more factories in the North than in the South. There were more railroads in the North. Indeed, the North had more of most everything. So, was General Lee correct in his assessment?

Throughout history, there have been many instances in which the smaller army defeated the larger army. In the American Revolutionary War, the Americans defeated Great Britain, which outnumbered and outproduced them, and, in fact, had more of just about everything, but still lost the war. In the 1860s, Paraguay fought a war with Argentina, Uruguay, and Brazil and nearly won, but lost not only the war, but much of its male population, and about half its entire population. Americans are still trying to come to grips with the fact that we lost the war in Vietnam, despite the fact that we were the richest nation in the world.² Smaller armies certainly do not win all of the time, but often enough to be noteworthy.

Although the Confederate states had the smaller population and army, they had many advantages, such as fighting much of the war on their home ground, with the critical advantage of internal supply lines. The South had some of the most fertile land in the country, yet the government was never truly able to shift its cotton-growing economy to large-scale food production, with an adequate distribution system from areas of abundance to areas of need. Further, the Confederate government was a true confederacy, in which each state was sovereign. States were asked to contribute money, rather than there being a mandatory taxing system, so money was scarce and highly inflated.

For years, historians have debated why the North won. In a new book, This Mighty Scourge, leading Civil War historian, James M. McPherson, examines recent scholarship on why the North won. Multiple reasons from social, economic, political, and military perspectives contributed to the Southern loss and the Northern victory.3 As one example, recent scholarship suggests that the desertion rate, especially among Confederates, drained the army and provided strong evidence that many Confederates lost the will to fight. Tied to that, many wives implored their husbands who were off fighting to come home. Many heard the siren calls, and came home.4

Another significant factor was the addition of African American troops on the Union side at the critical juncture late in the war. Toward the end of the war, over 200,000 black troops swelled the numbers in the Union army at a time when both armies were in desperate need of more soldiers. For these African American soldiers, the stakes were high. Many were former slaves, and nearly all saw their mission as bringing an

end to the institution of slavery. The risks were higher for these men than their white colleagues. If they surrendered, they would face being sold into slavery, or, worse yet, massacred, such as what happened at Fort Pillow in Tennessee, an incident in which 80% of the black soldiers were killed.5 Because the Confederates refused to consider blacks as prisoners of war, the prisoner exchange system that prevailed early in the war broke down, leading to the establishment of the infamous prisoner-of-war camps. As the war progressed, however, an important philosophical shift became evident. White soldiers began to understand the risks black soldiers faced, and when they saw how they fought-like furiesmany who were indifferent to slavery now came to accept the cause of ending the institution.6

For generations, National Park Service interpreters and managers have deftly skirted such issues as why the North won the Civil War. Some academic historians have criticized us for telling "symbolic history" or "institutional" history, rather than wrestling with substantive issues such as why the North won.7 Historians in the academy and the Park Service present their work to different audiences and for different purposes. Academics disseminate their work primarily to their peers, while Park Service historians present their work to millions of visitors with a wide variety of interests, knowledge, and educational backgrounds. Both academic and Park Service historians, however, seek to enlighten their audiences with the most accurate and insightful information available.

Park Service historians sometimes have a further restraint on what they present to their audiences. Many of our military parks, starting with the first one created by Congress—Chickamauga–Chattanooga in Georgia and Tennessee—were set aside with specific legislation that directed the War Department, which was the first manager of this park, to commemorate the battles fought there and the brave soldiers who gave their lives on that sacred ground. Furthermore, these parks were to be used as laboratories to study the military actions that took place there.⁸ Thus, when this and other military parks were transferred to the National Park Service, staff avoided both the issue of why the North won, and a great deal of controversy, by focusing on the military history of the Civil War.

"Chit-Chat," as we call Chickamauga-Chattanooga National Military Park, is actually a wonderful park for discussing military history. On the final day of the battle of Chickamauga, General William S. Rosecrans, the Union commander, moved a division from his line to cover what one of his aides thought was a hole in another part of the line. As it turned out, there really was not a gap; the aide simply could not see the Union troops in the tree cover. But by moving this division, Rosecrans created a real hole in the line, which, under normal circumstances, would have been plugged within minutes. Commanders and their aides always checked to make sure that there were no gaps in the line, or, to use the terminology of the day, to ensure that none of the regiments or divisions were "in the air." Yet, at that moment, at that very spot, and by total coincidence, Confederate General James Longstreet unleashed an attack, not knowing that the point of attack was uncovered. In the ensuing melee, and in what could have been a disastrous Union defeat, Union General George Thomas held his strong defensive position behind the front lines, allowing most of the Union

army to retreat north to Chattanooga. Thomas' stand, and the fact that he averted a complete disaster, earned him the nickname of the "Rock of Chickamauga."⁹

The discussion of commanders is an important topic of traditional military history National Park Service interpreters have covered with excellence over the years. For example, we have looked at General Rosecrans, whose career went into a downward spiral after the battle. The blame for the defeat was heaped on his shoulders, while Confederate General Longstreet was considered a hero for breaking through the Union line. Ultimately, he was a flawed hero because he was not able to capture the Union army. General Thomas, on the other hand, achieved heroic status because he held off the Confederates long enough for the Union army to retreat. George Thomas actually deserved attention beyond his military prowess, and is one of the most fascinating officers in the Civil War. He was one of the few U.S. Army officers from before the Civil War who opted to stay with the Union Army, although he was from Virginia. In fact, as a teenager, he helped his family escape the Nat Turner Slave Revolt in Southampton, Virginia.10 By deciding to stay in the Union, however, his family disowned him, turned his pictures to the wall, and refused assistance from Thomas before his death in 1870, and from his friends later. Thomas' family, who owned more than 20 slaves, was among the elite of Southern slave-holding families. Yet, after the war, Thomas became a strong advocate for African Americans, having seen how the black soldiers under his command fought. Thomas Circle, a national park area in Washington, D.C., is named for him, with a monument in his honor.11

National Park Service historians and interpreters will never stray from the core mission of discussing the strategies, tactics, and results of the battles, as well as the commanders on each side. These stories are and will always be popular and important with our visitors. Over 11 million visit our Civil War parks each year, and most are there to learn about the fighting that took place there. But, we also need to keep current with the evolving military historiography to best serve our visitors, and while it is important to understand the successes and failures of the commanders, it is equally important to know about the participants on the ground-the common soldiers-who were far more concerned about killing or being killed in the battle than whether or not their commanders were effective. Thirty years ago, the brilliant British military historian, Sir John Keegan, wrote The Face of Battle, which focused attention on common soldiers and their perceptions of battle, and how these often differed from the perceptions of their commanders.¹²

To illustrate this point, let's return to Chit-Chat for a moment. Ambrose Bierce, one of our most important literary figures from the 1800s, participated in the battle at Chickamauga, having recently been promoted to first lieutenant in the Union army. After the war, Bierce would write a fictional short story-Chickamauga-describing in graphic detail the horrors of war. Much later, in 1898, after Chickamauga became a military park, Bierce reflected that "on that historic ground occurred the fiercest and bloodiest of all the great conflicts of modern times-a conflict in which skill, valor, accident and fate played each its important parts; the result a tactical victory for one side, a strategic one for the other."13 In

describing the carnage of the battle, Bierce never mentioned the commanders.

In some battles, it seemed that the commanders were describing entirely different battles than their soldiers. For example, as General William T. Sherman was marching through Georgia, there was a small, strategically unimportant battle in the town of Milledgeville, the state capital of Georgia at the time. Sherman barely discusses the battle in his reports and Memoirs, but he wrote a humorous piece about some of his young officers who took over the state House of Representatives. After a spirited debate, they repealed the ordinance of secession, and called for the governor and Jefferson Davis to appear to receive kicks in their rear ends.14

Yet, the soldiers who actually fought in this battle had quite different descriptions of Milledgeville. Union soldiers marched into town and saw a heavy column of infantry marching toward them. They fired, the Confederate column retreated, then attacked again and again. The Union soldiers fired again and again, resulting in about 600 Confederate casualties. But. what the Union soldiers discovered was that most of the soldiers were old men or young boys. One Union soldier wrote: "I was never so affected at the sight of dead and wounded before. I hope we will never have to shoot at such men again." Another wrote, "There is no god in war. It is merciless, cruel, and vindictive, un-Christian, savage, relentless. It is all that devils could wish for."15

Providing a broader interpretation of military history is an area we believe provides an important service to our visitors. The military history, however, is only one aspect of the Civil War era. Many of us who manage National Park Service Civil War battlefields began to recognize that we were doing our customers a disservice by only telling the military part of the Civil War story. At a meeting of National Park Service superintendents in Nashville, Tennessee, in 1998, we wrestled with how we interpret battles along with other management issues, such as roads in the parks, managing resources, and dealing with the land surrounding parks. In part, we looked at expanding our interpretation at the behest of Congressman Jesse Jackson, Jr., who had recently visited a number of our parks and was troubled by the focus on military history to the exclusion of other topics, such as slavery.¹⁶

We decided a new goal would be to address slavery as the main cause of the Civil War. Now, let's return for a moment to the comparison we made earlier between academic and National Park Service historians. Academic historians generally can write or stand in front of a class and say that slavery was the cause of the Civil War, without worrying about any repercussions. One of our superintendents, on the other hand, reported that he gave a speech in which he mentioned that slavery "might" have been a cause of the Civil War, and within a few weeks, 1,100 cards and letters were sent to the secretary of the interior demanding that he either resign or be fired. Another superintendent reported that a modern pro-Confederate group, which at one time had owned the park he managed, was raising money to bring a lawsuit to regain ownership of the park from the "corrupt and anticonfederate National Park Service." This reaction was a result of expanded interpretation at his park, addressing slavery and other causes of the Civil War. Not everyone

agrees with the notion that slavery caused the war; thus, we need to strike a balance among the 300 million "shareholders"—the American public—who own our parks. We need to make absolutely sure that when we make a statement like "slavery was the principal cause of the Civil War," we are basing that statement on the best scholarship available, because some of our "owners" aren't going to like it.

It is important to ensure the accuracy of our stories; it is equally important that we provide our interpreters with the best tools available to present this information. To that end, in 2000, we obtained a grant to sponsor a symposium at Ford's Theater, to which we brought the leading scholars of the Civil War period, to discuss the most recent interpretations of this era with our superintendents, interpreters, and the general public. All 700 seats in Ford's Theater were full for most of the sessions, C-Span broadcast most of the presentations, and we published the papers. Several months later, we sponsored an intensive two-week institute to train interpreters from our Civil War parks on how to expand their programs.¹⁷

One of the most important questions we explored at Ford's Theater and at our institute was the causes of the Civil War, encouraging our interpreters to draw their own conclusions. Obviously, there were many causes-political, economic, and social-which are all correct. But, why was the political cause such that it would lead to a civil war? Why was the economic issue so important? Or, why was the social cause of such consequence that it would lead to the Civil War? Nearly everyone concluded that all of these causes had a root cause, and that was the institution of slavery. In many ways, the causes of the Civil War were like peeling an onion. One layer of the onion was politics; another was economics; and yet another was social issues. Once all of these layers were removed, the core was the institution of slavery. If slavery was the root cause of the Civil War, what was the institution like?

One of the historians who spoke at our symposium, Ira Berlin, from the University of Maryland, said slavery had two parts. On the one hand, it was the most inhumane, shameful, demeaning, and sadistic treatment ever meted out to any Americans. Husbands were separated from wives, and children were removed from their parents. It brutalized people, physically and psychologically. But, as Professor Berlin notes, slaves did not surrender to their plight. They created niches for family life, religious worship, education, and formal and informal associations, as well as a unique culture, cuisine, language, and music. "Indeed," as Professor Berlin said, "the creative legacy of slavery is so great that we must concede that if slavery is the darkest part of America's past, it may also be the most creative part of America's past."18

The economy of slavery was an important part of the equation. In 1860, there were approximately four million slaves in the United States. About 30%, or 385,000, of the white population in slave states owned slaves, and of that number 12% owned 20 or more slaves. About 30% of the nation's population lived in the South, but 60% of the wealthiest individuals were concentrated in the South. Further, the per capita income in the South was nearly double that in the North. To place these figures in more modern terms, in the 1950s only 2% of American families owned corporation stocks equal to the value of one slave in 1860.19 To carry these statistics a little further, the value of slaves in the United States-again in 1860-was valued at about \$3 billion, which was greater than the combined value of railroads, factories, and banks in the entire country, and greater than all land, cotton, and goods in the South. So, the economic value of slaves on the eve of the Civil War was considerable.

As much as the economics of slavery were important, slavery also created a very tight social caste system with large plantation owners at the top, and slaves at the bottom, and little opportunity for movement in any direction. Slavery also had a powerful impact on local and national politics.

So, it's not surprising that when the South left the Union, in nearly all of the secession documents a principal reason listed was the protection of the "peculiar institution." Yet, the Confederate government seldom made any reference to slavery in its official documents. After the war, lost cause advocates always said liberty, rights, and justice were the reasons for the war, and never mentioned the protection of slavery as a cause. Given the tremendous value of slaves, it made perfect sense that the primary reason for the war would be to protect property.

The American Civil War had a tremendous impact on families. Women, especially in slave-owning families in the South, assumed the responsibilities of feeding their families and managing their slaves while their husbands were away at the war. After the war, over 600,000 men did not come home, and many who did return were missing limbs, sick with diseases they contracted during battle, and suffering from poorly understood psychological impediments, now known as post-traumatic shock.

Many of us have stories in our families of ancestors who were participants in the war. A large number of our visitors come to our battlefields to walk on the sacred

ground where their ancestors fought. Others use the tools we have available in our parks and on the Internet to trace their family stories.20 In my family, a story was passed down that my great-grandfather, who was in the Kansas cavalry, died at a young age from complications of four bullet wounds sustained during the war. Digging a little deeper, I found that his regiment actually was never engaged in a battle, that he was never shot, and that, instead, he contracted dysentery while in the army. His family was able to collect a pension when he died. Yet, even though the family collected a pension, the loss of the principal breadwinner must have been difficult.

Equally, what made soldiers, most of whom had never fired a gun at anything but game, become killers of other men? From the descriptions of soldiers who fought, we know that early in the war most believed they were fighting for either the cause of preserving the Union (in the North) or protecting their rights (in the South). As the war dragged on, especially after the Emancipation Proclamation, war aims in the North changed. When one reads the letters and diaries of soldiers, it is not uncommon to read early in the war that many Union soldiers wanted nothing to do with fighting a war to end slavery. But after they saw how slaves were treated, and actually met slaves who escaped to the Union lines, many realized that the cause of ending slavery was just and worth the fight.²¹

Again, returning to the comparison between academic and National Park Service historians, we have an enormous advantage that academics can never duplicate. We tell our stories on the ground where the stories happened, and over the years, we have become very skilled at transporting our visitors back in time to the events that took place on that ground. Not every issue is appropriate for every park. For example, African American soldiers did not fight at either First or Second Manassas, so we probably would not focus on that story there. But, since slavery was the principal cause of the Civil War, and since First Manassas was the first major land battle of the war, the park's interpretation deals with slavery as the reason this battle and the war took place. Further, a slave from a farm near Manassas escaped to Union lines, joined the Union Army, fought, then returned to the area as a free man, purchased land in what is now the park, and raised his family there.

A major story at Antietam has always been that the 23,000-plus casualties in the battle on September 17, 1862, was the greatest loss of life in one day in American military history. A huge photograph, taken the day after the battle, hangs on the wall in the visitor center, graphically depicting the carnage. Equally important as the military story of the battle of Antietam, however, was President Lincoln's issuance of the preliminary Emancipation Proclamation and the decision of Great Britain not to recognize the Confederacy, an action which was very close to fruition just before the battle.

Fort Pulaski, protecting the harbor of Savannah, Georgia, has an enormously interesting military story, in which Union forces fired on the fort with field artillery from a sand-spit across the harbor, forcing the Confederate surrender after the walls were breached, threatening the powder magazine in the fort. This demonstrated to the satisfaction of many military historians that masonry forts were obsolete. An equally compelling story is that once the Union controlled the fort, slaves escaped from the coastal Confederate states, and swarmed to the protection of the fort.

The most fascinating story that illustrates the value of site-based interpretation and the importance of going beyond military history comes from Fredericksburg. This story is shared by John Hennessy, the historian at Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park.

On April 18, 1862, the Union Army congregated near Fredericksburg, stayed there for four months, and never fired a shot in anger during that time. Two individuals observed exactly the same event on the same day, in the same place, but their perspectives could not have been more different. Their observations had nothing to do with the actual fighting. Helen Bernard was a white woman living just outside Fredericksburg; John Washington was a slave living in the town. David Blight recently published Washington's narrative in *A Slave No More*.²²

Helen Bernard, 1862. "I write while the smoke of the burning bridges, depot, & boats, is resting like a heavy cloud all around the horizons towards Fredcksbg. The enemy [the Union army] are in possession of Falmouth, our force on this side too weak to resist them.... We are not at all frightened but stunned & bewildered waiting for the end. Will they shell Fbg., will our homes on the river be all destroyed?... It is heartsickening to think of having our beautiful valley that we have so loved and admired all overrun & desolated by our bitter enemies, whose sole object is to subjugate & plunder the South...."

John Washington, April 18th, 1862. "Was 'Good-Friday,' the Day was a mild pleasant one with the Sun Shining brightly, and every thing unusually quiet ... until every body Was Startled by Several reports of [Yankee] cannon.... In less time than it takes me to write these lines, every White man was out the house. [But] every Man Servant was out on the house top looking over the River at the yankees, for their glistening bayonats could eaziely be Seen. I could not begin to express my new born hopes for I felt ... like I Was certain of My freedom now."²³

Most Civil War battlefields have stories similar to this one from Fredericksburg, stories that weave a rich fabric, and often have little to do with the actual fighting. Our parks are incorporating these stories into their interpretive programs.²⁴ We have not had the opportunity to gauge how many parks have expanded their interpretation,

nor how the public has received our new programs, by any scientific measurements. A number of our parks with new visitor centers or new exhibits have incorporated subjects such as slavery as a cause of the Civil War into their programs. Others have developed special interpretive stories that go beyond traditional military history. From letters and emails we receive, we know that many visitors like what we are doing, and that some do not. We have, however, started on a course from which we do not intend to deviate. Into the Sesquicentennial of the Civil War and beyond, we will continue to wrestle with issues, such as the causes of the Civil War, so that our visitors will contemplate and better understand who we are as a people.

Endnotes

- 1. For a discussion of Pollard's books and the perpetuation of the lost cause in Southern literature, see James M. McPherson, *This Mighty Scourge: Perspectives on the Civil War* (New York: Oxford University Press, 2007), pp. 93ff.
- Christopher C. Lovett, "A Walk in the Sun: Reflections on Teaching the Vietnam War," *The History Teacher* 31 (November 1997), pp. 77–92.
- 3. This Mighty Scourge, pp. 43-63.
- 4. Robert K. Sutton, ed., Rally on the High Ground: The National Park Service Symposium on the Civil War (Fort Washington, Pa.: Eastern National, 2001), p. xiv.
- 5. On April 12, 1864, Confederate Major General Nathan Bedford Forrest led his cavalry against Fort Pillow, a Union fort about 40 miles north of Memphis on the Mississippi River. The fort was defended by about 600 soldiers, evenly divided between whites and African Americans. In the ensuing battle, about 40% of white Union soldiers and about 80% of African American soldiers were killed.
- 6. There are a host of sources on African American soldiers in the Civil War. Among these are the collection of essays edited by National Park Service historian Marty Blatt, along with Thomas J. Brown and Donald Yacovone, *Hope and Glory: Essays on the Legacy of the Massachusetts 54th Regiment* (Amherst: University of Massachusetts Press, 2000). For a more complete list of sources, look at James M. McPherson and William J. Cooper, Jr., eds., *Writing the Civil War: The Quest to Understand* (Columbia: University of South Carolina Press, 1998), especially the chapter by Peter Kolchin, "Slavery and Freedom in the Civil War South," and the endnotes for that chapter.

- 7. In 1988, the journal *The Public Historian* published a roundtable discussion, "Government Sponsored Research: A Sanitized Past?", in which a panel of public historians within and outside of the National Park Service discussed an article by John Bodmer, in which he was critical of the histories published by the Park Service on the Statue of Liberty and Ellis Island. He argued that histories published by federal agencies were designed to "[erase] any record of social tensions or individual struggles" (p. 34). The discussion that followed, for the most part, defended Park Service histories, based on the context of their purposes, but one scholar suggested that sometimes these studies "are not placed within the proper context and thus their usefulness is diminished" (p. 52). David Thelen et al., "Government Sponsored Research: A Sanitized Past?" *The Public Historian* 10 (summer 1988), pp. 31–58.
- 8. Most military parks were managed by the War Department until 1933, when they were transferred to the National Park Service.
- 9. Chickamauga and Chattanooga National Military Park has a fine website with more detail, found at www.nps.gov/chch.
- 10. The Nat Turner revolt took place in August 1831. Nat Turner recruited some 50 enslaved and free African Americans who went on a two-day rampage in which they killed 57 whites, and brought terror to this area of Virginia. The Turner revolt was the largest slave uprising in antebellum America, and it terrified many Southerners who feared that a larger-scale revolt could occur at any time.
- 11. Christopher J. Einolf, *George Thomas: Virginian for the Union* (Norman: University of Oklahoma Press, 2007); Freeman Cleaves, *Rock of Chickamauga: The Life of George H. Thomas* (Norman: University of Oklahoma Press, 1986).
- 12. Sir John Keegan, The Face of Battle (New York: Viking Press, 1976).
- 13. In Donald T. Blume, *Ambrose Bierce's Civilians and Soldiers in Context: A Critical Study* (Kent, Ohio: Kent State University Press, 2004), pp. 141–142.
- 14. William Tecumseh Sherman, *Memoirs of General W. T. Sherman* (New York: Literary Classics of the United States, 1990), pp. 663–666.
- 15. Shelby Foote, *The Civil War: A Narrative, Red River to Appomattox* (New York: Vintage Books, 1974), pp. 646–647.
- 16. The proceedings from the conference were published in a report entitled "Holding the High Ground: Principles and Strategies for Managing and Interpreting Civil War Battlefield Landscapes (Proceedings of a Conference of Battlefield Managers, Nashville, TN, August 24–27, 1998)."
- 17. The papers from this symposium were published in Sutton, Rally on the High Ground.
- 18. Ira Berlin, "Slavery in American Life, Past, Present and Future," in Sutton, *Rally on the High Ground*.
- 19. "Selected Statistics on Slavery in the United States," compiled primarily from the Census of 1860, on-line at http://members.aol.com/Jfepperson/stat.html.
- 20. One of the services the National Park Service provides is its "Soldiers and Sailors System," a database that includes all of the known participants in the Civil War. You can access this site at www.civilwar.nps.gov/cwss/.
- 21. James M. McPherson, "Citizen Soldiers of the Civil War: Why They Fought," in Rally

on the High Ground; James M. McPherson, For Cause and Comrades: Why Men Fought in the Civil War (New York: Oxford University Press, 1997).

- 22. David W. Blight, A Slave No More: Two Men Who Escaped to Freedom, Including Their Own Narratives of Emancipation (New York: Harcourt, 2007).
- 23. Quoted in "Holding the High Ground: A National Park Service Plan for the Sesquicentennial of the Civil War" (2008).
- 24. The National Park Service, with a grant from the National Park Foundation and the National Endowment for the Humanities, has developed a website, the "War for Freedom," that features unit guides for students to do research with original historic documents, to re-create moments of drama and personal choice, to understand the relevance of the struggle for their own lives, and to synthesize their learning and imagination in creative collaborative projects. You can access this source at www.nps.gov/features/warforfreedom/.
- Robert K. Sutton, National Park Service, 1201 Eye Street NW, Washington, D.C. 20005; Robert_Sutton@nps.gov

Stepping Outside the Boundary: Community-Building at Yosemite National Park

Christopher C. Lever and J. Keith Gilless

BEFORE THE NATIONAL PARK SERVICE'S (NPS'S) NOVEMBER 2003 RELEASE of *Director's* Order 75A, Civic Engagement and Public Involvement (DO-75A), forward-thinking park managers were already finding ways to better communicate with local park constituencies and neighboring communities. This study explores the efforts of Yosemite National Park (YNP) managers to reach beyond the park boundaries and engage local publics outside of legislated mandates. It relies on three years of participant observation of community-building strategies and public meetings; 53 in-depth interviews of YNP managers, NPS executives, and local participants;¹ and document review.

After years of park management plans plagued by litigation, and contentious relations with local communities seemingly exacerbated by the formal public involvement process, YNP broadened attempts to engage their surrounding communities in 2003. In so doing they hoped to decrease conflict, increase communication, and build trust among the local communities.

One manager commented about these community-building efforts:

I want to go out [engage with local community members] when it's not just required [by NEPA, the National Environmental Policy Act]. So that, I get to know the people and I've talked to them and I've come to them and said, What are we doing right? What are we doing wrong? How can we improve?... so when we do have a NEPA compliance thing that we need to go and talk to them about officially, they know who I am, they know who the staff is, they know they've given us input about how best to reach out to people in their community. (NPS N-8 15-Feb-06)

YNP's community-building strategy relied on an organizational culture that openly engaged the local publics,² including personnel assignments, workshops, and meetings. This article will introduce the concept of community-building, briefly discuss personnel assignments and workshops that promoted it, and delve deeper into the Experience Your Yosemite (EYY) and Yosemite Gateway Partners (YGP) meetings.

Community-building

Community-building, for the purposes of this paper, refers to two-way communication between park management and local publics that takes place outside of a mandated planning process, with the objective of creating transboundary networks and building relationships.³ Community-building is very different from the one-way public outreach to communities characteristic of mandated planning processes, though it may take place when a planning process is underway. One positive outcome of community-building is the accumulation of social capital.⁴

Community-building strategies at YNP

Community-building has flourished at YNP in response to the superintendent's and senior YNP managers' promotion of engagement with local publics. YNP managers did not design their communitybuilding strategies as part of a single strategic planning exercise. Program formats were dynamic and open; the local public was encouraged to participate in setting meeting agendas, timing, and format. As the community-building strategy was being implemented, the superintendent hired new personnel with experience in engaging local publics. These YNP personnel modified, adapted, and refined communitybuilding processes. The local publics provided feedback to YNP managers as they made changes to the community-building programs. Perceptions of local publics were taken into consideration when the superintendent selected at least one new senior YNP manager whose experience greatly affected community-building.5

All the community-building strategies employed by YNP include opportunities for direct question-and-answer time with YNP personnel. Additionally, these strategies are undertaken outside of NEPA planning processes, which allows transboundary networks to be created between YNP personnel and community members before a decision-making process or conflict begins. What follows are highlights of the YNP community-building program:

- Public involvement and outreach branch. This branch consists of a chief and three other YNP personnel who organize and conduct all YNP's community-building and NEPA public involvement efforts.
- **Community liaison**. The liaison reports directly to the superintendent and acts as a conduit to local community members. The liaison's interactions with local community members take place almost exclusively outside park boundaries.
- Monthly planning open houses. These meetings are open to the public and provide up-to-date park planning and management information, as well as schedules for on-going and future construction projects. Copies of all YNP approved and draft planning documents are available. YNP management personnel answer questions from the public at these meetings.
- "Balancing Nature and Commerce in **Yosemite Gateway Communities**" workshop. This three-day workshop, held in the park, was co-funded by local communities, NPS, YNP nonprofit partners, and the park concessionaire.6 At this workshop, local community members and YNP personnel learned about the socioeconomic realities of rural communities dependent upon natural resources and strategies for capitalizing on the communities' attributes and economic potential. Community participants and YNP personnel formed teams arranged by access corridor, and participated in sessions on: mapping your communi-

ty; creating a socioeconomic profile; sustainable tourism; developing a community vision; measuring the impacts of growth and development; building civic engagement; building long-term partnerships; and land conservation tools, strategies and case studies.

- **"Planning 101" workshops**. A series of workshops was conducted in surrounding communities in late 2005 to solicit feedback from community members and inform participants of the NPS's federally mandated planning processes.
- YNP employees living in local communities. YNP personnel began living in local communities as the park was locating administrative functions outside park boundaries in a NPS administrative area. YNP personnel who live in local communities report that interactions with local community members have provided deep friendships, respect, and a sense of community.
- YNP employees joining local civic associations. YNP personal who live in local communities have been encouraged to participate in a variety of civic organizations, including 4H, Rotary, and the Mariposa/Yosemite Forum. Civic associations are cited consistently in the literature as a way to build and maintain social capital (Putnam 2000; Bankston and Zhou 2002; Thomas 2003). What follows are comments by a senior YNP manager describing his experiences with belonging to local civic organizations:

... [The] big thing about the 4H is it was not unlike the other entities [civic organizations] where I became friends with, and mutually respected, a whole different group of people. You know, this was the ranchers and farmers and the cowboys. And we made a lot—and I made a lot of friends.... I found that almost immediately after I was in Rotary four or five months that, that someone would inevitably call me and say, "Is this true? I heard this...." (NPS N-6 25-Jan-06)

YNP personnel have also participated in the Mariposa/Yosemite Forum since 2000. The forum is an informal meeting between community members and YNP senior personnel.

- Experience Your Yosemite. This is a monthly behind-the-scenes tour of the park for local community leaders, defined in more detail below.
- Yosemite Gateway Partners meetings. These quarterly meetings allow local community leaders and park managers to discuss subjects important to the park and communities, and are also described in more detail below.

Experience Your Yosemite

They invite busloads of community groups into the park and give us a back scene view of what goes on at National Park ... like if you go to Disneyland and get the underground tour! (Local resident C-23 08-Mar-06)

Experience Your Yosemite (EYY) is an invitation-only event held in Yosemite Valley once a month between March and October where YNP managers invite leaders from surrounding communities to participate in a day-long, behind-the-scenes look at park operations (Figure 1). This program was adapted from the Experience Your Smokies program and was created at YNP after the superintendent hired the chief of interpretation from Great Smoky Mountains National Park. The program was designed to introduce community leaders to YNP senior personnel and provide opportunities for authentic dialogue in an attempt to dispel rumors in the community and reduce negative feelings toward park management by the local public.

EYY is structured as a field trip, combined with an extended ques-

tion-and-answer session with the superintendent. The program is hosted at the Ahwahnee Hotel, and a four-course lunch and continental breakfast are included. YNP relies on donations of in-kind services and funds to accommodate the meeting format.7 At its inception, YNP personnel invited participants from a single local community to attend EYY as a group. However, participant feedback and the realities of scheduling quickly led YNP to invite community leaders from multiple communities to attend EYY meetings. In the early meetings the superintendent would give a Power-Point presentation followed by a questionand-answer period. YNP personnel discovered that the questions asked by the participants usually covered all the major points addressed in the presentation and provided a more interactive format for participants to engage the superintendent. Based on participant feedback and these observations, YNP personnel discarded the PowerPoint presentation to emphasize a question-andanswer format.

Community members typically attend EYY once. Participants ride one of YNP's hybrid electric-diesel buses⁸ as park personnel provide lectures and hands-on activ-



Figure 1. Local community members on an informational tour through Yosemite Valley as part of an Experience Your Yosemite Program. Photo by Christopher C. Lever.

ities. Participants in different EYY sessions have learned about bear management, hydrology, wildfire management, archeology, park architecture, botany, meadow restoration, prescribed fire, park plans, Yosemite Valley history, non-profit park partners, and recycling. This program provides participants with specific communication channels to senior park managers; participants meet all the division chiefs, the superintendent, and the deputy superintendent as well as the entire Public Involvement and Outreach Branch. In the words of a YNP senior manager:

> [EYY] is another avenue of giving folks the chance to hear from the superintendent and the management team, to have a warm reception with park service staff, to experience a wonderful day in Yosemite National Park, have a killer lunch, one of a kind at the Ahwahnee Hotel.... [C]ombine that with the atmosphere of Yosemite and what Yosemite is and then if there was a barrier, a preconceived barrier or one that was put up through time for whatever rea

son—disagreements with the park in our planning. If they show up to a situation like that most people are going to put down those barriers. It's going to start breaking down. Where they're having oneon-one contact and dialogue and interaction and having their questions asked and answered on [the] spot, by a division chief or manager who can answer their question. (NPS N-4 16-Apr-06)

The EYY program has proven an excellent forum for introducing non-traditional and under-represented groups to YNP and park managers. This opens transboundary networks with individuals who were previously not visitors to the park.

As of June 2007, 648 individuals from 13 counties in California and Nevada have attended EYY. The following is an excellent example of both the power of authentic dialogue and the importance of YNP personnel participating in local civic organizations. This quote is from a YNP senior manager and Rotarian who describes an exchange between a community member and senior park manager at the first EYY meeting that dispelled a longstanding rumor:

And the best example I can give you was with two people in my Rotary that grew up in Yosemite Valley ... and they hate park management. We brought them into the very first [EYY], and they get a chance to sit down with the superintendent, and [senior park managers] and they start hammering these guys with questions. "How come you do this? How come you do that?" ... Jim Simpson,⁹ ...

said, "You want to tell me why you imported granite from out of state for that wall along Highway 140, when we've got granite quarries right here within five miles of the boundary." And the deputy superintendent, kind of pulled up so he could sit down more comfortably next to him and said, "Well you know, I heard that too and I don't know where that story came from.... You know, that's not granite at all, that's concrete that's formed to look like granite, and the reason we did it is because it was the cheapest way to go, and they say that it's going to last at least as long as the granite would have." Well, here's Jim, I mean he's deflated, and the deputy superintendent was really nice about it, and he understood somehow this bad information just was out there, and we [YNP] don't know why or how it got out there.... Anyway, that's the best thing that came out of the first Experience Your Yosemite. And then when I came back to Rotary, Jim said, well I guess they sure set me straight. And I said, "Well, were you crooked?" [A]nd he's a realtor, so everybody laughed and he and I are pretty much buddies.¹⁰ (NPS N-7 8-Feb-06)

Yosemite Gateway Partners meetings

The gateway partner meeting grew out of the frustration of all the negative conversations that were out in the community and an attempt to improve communications. (NPS N-11 31-Jan-06)

Yosemite Gateway Partners (YGP) meetings are also by invitation, with the opportunity for participants to invite others, and are held quarterly in the park. At these meetings, local community leaders (including government representatives) and senior park personnel participate in a continuing dialogue that focuses on issues of concern to all participants. Most community participants have attended numerous meetings, and some have attended every meeting. This program meets in the Mountain Room of the Lodge at Yosemite Falls in Yosemite Valley and lasts from 10:00 AM until 2:00 PM (Figure 2). The morning is devoted to YNP updates and a question-and-answer session with the superintendent; during the provided lunch and afternoon, the agenda is devoted to local public concerns.

YNP managers set the stage for who attends YGP meetings with their invitations to the first meeting.¹¹ The majority of community participants are local business owners, chamber of commerce members, and others from tourism-related fields; also in attendance are county supervisors whose districts include the park, legislative liaisons for national congressmen and senators, retirees, environmentalists, and representatives of non-profit organizations. Current

Figure 2. Local community leaders and senior Yosemite National Park staff at a Yosemite Gateway Partners meeting. Photo by Miguel A. Maldonado.



participants may invite others to attend YGP meetings, and this is the predominant way that participation has expanded. The community participants seem to focus on how the park and communities can work together to maintain or increase the economic prosperity of the local communities during the lunch and afternoon sessions.

YGP meetings were not designed as a replacement for NEPA public involvement. Park managers are not soliciting "group advice" or attempting to re-write or amend park plans in this forum. This allows the park to meet with these communities without fear of triggering Federal Advisory Committee Act¹² provisions or conflicting with YNP's legislated resource protection role. Current litigants against the park have not been invited by YNP to these meetings, and if they attended would probably be disappointed by the lack of community interest in the formal planning process.

The original goals for YGP meetings were quite modest: open communication channels, reduce negative images, dispel rumors, and provide facts outside of a specific planning process. The agenda included an update on current and upcoming park construction projects and plans, a questionand-answer session with the superintend-

> ent and senior park managers, and introducing attendees and senior park personnel to each other. All agenda items, whether from YNP personnel or recommended by community members, were approved by the superintendent. At the time of the interviews for this study in 2006, the goals for YGP had evolved well beyond the initial aspirations for the meetings. A senior YNP manager describes them:

Volume 25 • Number 3 (2008)

To work with our neighbors on regional issues, to look after each other's health and well-being because of our mutual interest, and to capitalize on our common efforts, and to have a forum to share information, and to have a forum to air differences and begin to work on resolutions to those where it would help us to have some kind of resolution. (NPS N-5 30-Jan-06)

The bulk of community participants in YGP are in business or tourism, which may account for the economic goals they perceived the meetings to serve:

... bringing people together from the different gateway communities to find common interests, ways to work together to bring tourism to the area. (Local Resident C-37 1-Mar-06)

However, other community participants envisioned a reciprocal relationship mutually beneficial to all participants:

I think communication has been a vital part of what the intention was, to see how we could help the park and how the park could help us. (Local Resident C-30 21-Feb-06)

Park personnel intended to hold YGP meetings twice a year. However, after the first meeting the participants asked that the meetings be scheduled at least quarterly and the park agreed. Between October 2003 and January 2008 the park hosted 15 YGP meetings. Attendance has remained high, with most meetings drawing over 40 people. YGP participants have noticed a change in attitudes since the inception of the meetings. Local community members responded to YNP managers' outreach, and even individuals with a history of tension with park managers participated earnestly in the process:

> People who are really opposed to the park service are at those [YGP] meetings, there used to be no communication until [the new superintendent] came aboard.... [T]hey're not, they're not as verbal at the [public] meetings and as angry at the [public] meetings like they once were. So there's a big difference. (Local Resident C-28 10-Feb-06)

And:

That tension, that conspiratorial tension that was here three years ago seems to be breaking down. Yes, we still have those people in our community who want to see the walls stay up, but I think those people are going to be shouted down by those who are more positive. (Local Resident C-3 9-Feb-06)

The original goal of increased communication and clarification of park goals was successful. Participants even began to express trust in YNP managers:

> I personally have developed a much higher level of trust with the current park administration. (Local Resident C-24 28-Feb-06)

And:

You know, with dialogue you eventually learn to develop that trust and that's certainly been the case here. (Local Resident C-26 20-Feb-06)

YNP shifted its role from being the "leader" to that of being one "partner" among many. However, YNP remains the lead partner in these meetings, as it sets the meeting agenda, albeit relying on input from community participants. The local community participants would be hardpressed to host the meeting in its current format. YNP has the resources to plan, organize, and administer the YGP meeting-and through the parks' partners, to provide facilities, continental breakfast, and lunch. YNP personnel have asked numerous times if community members would like to host a YGP meeting, community members have expressed interest, but have never committed to hosting the meeting.

Today, about 50% of the meeting time is devoted to collaboration and networking, with park updates and the question-andanswer period with senior park personnel making up the rest. Guest speakers, including academics, have presented on demographic trends, regional marketing, and video communication. The park's Public Involvement and Outreach Branch publishes a YGP quarterly newsletter that is mailed to all participants. After the YGP took a collaborative turn, the participants began to learn from each other, work together on projects, and challenge the status quo, benefiting the region as a whole.

The YGP meetings have been successful in dispelling rumors, providing facts, and creating transboundary networks between YNP managers and community participants. The access to YNP management that YGP participants gain by attending meetings can be measured in social networks and shared information. YGP participants have direct knowledge of, and personal contact information for, senior YNP personnel; they have met these individuals and formed relationships. They have gained shared knowledge as they explored community concerns and potential solutions. Just as important are the relationships that YGP community participants have formed with other community members from different access corridors. YNP managers better understand community concerns as a result of YGP meetings.

Specific accomplishments of the YGP meetings include:

- Regional marketing collaborative. A five-page advertisement featuring all four access corridors to the park, as well as the park's concessionaire, was designed collaboratively by local community members through the YGP Marketing Committee, and placed in the California state tourism guide. This was the first time that local communities had jointly advertised their region at this scale. This collaboration was a drastic departure from local communities advertising their individual access corridor while implying that no others existed.
- Yosemite Partners Advance Entrance Pass. This was an idea promoted by YGP participants and designed in collaboration with the park: a YNP pass, single-use or annual, that local businesses could purchase and then either sell to their customers at face value, or give to their guests as part of a promotional package. The single-day pass has a space for local businesses to insert their advertising logo.
- YGP Intranet website. This is a web-

site developed and maintained by YGP local community members that is accessible only to YGP participants. The site is used as an information source and calendar for the members. Participants may post events or information for all to share. Funding and maintenance for this site is provided through YGP participant donations and volunteering.

• Applying collaborative processes in other settings. YGP participants from the town of Groveland are using a collaborative process to develop a community vision:

[The YGP meetings] spawned an organization we've since put together called the Northern Yosemite Corridor Partners, Inc., and its mission is essentially to fulfill the visions of the community in a collaborative way. (Local Resident C-8 07-Mar-06)

• **Networking**. YGP attendees' network connections facilitated trust in a rural health care project analysis:

It turns out one of the gateway participants is Sierra Vallejos,¹³ and she happened to be associated with the hospital, and she came along and, by virtue of our relationship, any and all uncertainty about what we were trying to do fell, because she essentially vouched for us, vouched for me. (Local Resident C 4 09-Feb-06)

Lingering negative feelings toward the park

The community-building efforts of

YNP have been for the most part positively received. However, there is still a level of mistrust and negativity in the local communities surrounding YNP. Years of anger at an insular park management culture, senior personnel transfers, and a stultified planning process are hard to overcome.

In December 2005, YNP conducted "Planning 101" workshops in local communities to solicit feedback from community members on what YNP has "done right in the past and what they could do better in the future" and inform participants of the federally mandated planning processes the NPS follows. These meetings were held two years after the establishment of communitybuilding programs such as EYY and YGP, and the completion of the "Balancing Nature and Commerce in Yosemite Gateway Communities" workshop.

The community members' responses at these workshops offer insight into how local communities are responding to YNP's community-building efforts. When participants were asked "What works well?", they cited achievements directly related to the current community-building strategy, including the establishment of: good relationships between the superintendent and public; the EYY; an open dialogue; an openness towards interaction; a receptive, congenial staff; an approach that has brought gateway communities together; and a park administration that appears to be listening and receptive to input.

The meetings also yielded an overwhelming number of "What needs improvement?" comments, reflected in such comments as: "overcome history of lessthan-inclusive planning," "recognize distrust and apathy due to past experiences," "need ability to be involved throughout," "YNP players need to be consistent," "honesty," "power imbalances," "better incorporation of comments into plans," "connectivity between park and gateways—needs understanding and respect of differences," "cooperation," "credibility," "park not listening—hearing but not listening," "parent-child attitude by NPS—government knows best," "a predetermined agenda public doesn't have meaningful choices," "need to be creative instead of doing things the same way," and "respect and dialogue."¹⁴

The YGP and the "Balancing Nature and Commerce in Yosemite Gateway Communities" workshop were not mentioned, and EYY was mentioned in only one of the four "Planning 101" workshops. This situation reflects the difficulty that YNP personnel face as they attempt to overcome the history of negative feelings in local communities and the adversarial public involvement traditionally practiced by the park. Community members who have attended EYY, YGP, and the "Balancing Nature and Commerce in Yosemite Gateway Communities" workshop attended the "Planning 101" workshops; why did they not speak up on behalf of YNP's community-building efforts? The answer is, they did, but without mentioning the programs specifically.

Summary

I'm pretty well convinced that there's enough momentum now, people who think positively about our region, that they will usurp those who have chosen to take a negative path. (Local Resident C-4 09-Feb-06)

Community-building at YNP has emerged through a combination of the many strategies utilized by the park. It is

The community liaison and YNP personnel living in local communities and actively participating in civic organizations provide continual opportunities for interaction outside the parks boundaries. The Public Outreach and Involvement Branch oversee and coordinate all communitybuilding; this ensures consistency in performance and provides a central point of contact for local publics. The monthly planning open houses provide a forum in which YNP can provide up-to-date information on projects and planning to individuals interested in coming to Yosemite Valley. EYY provides YNP with an experiential and informative format for introducing community leaders to the behind-the-scenes operations of the park. This format is particularly useful in introducing non-traditional and first-time park visitors to the park. YGP provides a forum for a continuing dialogue between community leaders and senior park managers and the opportunity to collaboratively approach community and park concerns. All these strategies incorporate opportunities for authentic dialogue and the creation of transboundary networks and social capital.

Community-building strategies are positively affecting community-park relationships. It appears that YNP has been able to allay many community members' feelings of mistrust and negative attitudes toward the park by simply providing forums for dialogue, without any guarantees that these conversations will result in changes in YNP policy or actions. Building transboundary networks and creating social capital were the first steps in strengthening relationships between YNP and the local publics that provide access to the park. The community-building in place at YNP offers a positive example of how other land managers can become better neighbors with their local publics. However, not all community members have been satisfied with this form of involvement. Entrenched negative attitudes toward park management decisions will be difficult to overcome, and in the end some community members probably never will trust park managers.

If YNP managers continue to foster

authentic dialogue and genuinely and openly engage local community members, the social capital and transboundary networks they have developed will pay additional dividends over the long term. These dividends may potentially include: individuals who have participated in YNP communitybuilding taking an active role in the park planning process and NEPA-mandated public participation; more effective planning on the part of YNP because they better understand their organizational environment; and less litigation against park plans by local publics.

Acknowledgments

This study would not have been possible without the cooperation and generosity of current and former YNP personnel, community informants from the Yosemite region, and executives of the National Park Service.

Endnotes

- Interview informants for this study were granted anonymity to ensure validity of responses; NPS informants are identified as (NPS N-# date of interview) and local community informants are identified as (Local Resident C-# date of interview). This research was conducted under NPS Scientific Research and Collecting Permit no. YOSE-2006-SCI-0010.
- 2. The shift by YNP from a typical NPS insular management focus to one that openly engaged the parks local publics is significant. This subject is covered in Lever 2007.
- 3. YNP managers do not use the term "community-building." They refer to this process as "reaching out," "building trust," or "collaborating."
- 4. Fukuyama defined "social capital" as "a set of informal values or norms shared among members of a group that permits cooperation among them" (Bankston and Zhou 2002: 287). Social capital arises over time as individuals participate in community affairs, develop norms of reciprocity, and trust one another to follow through on commitments (Thomas 2003:47).
- 5. A facilitator for the "Balancing Nature and Commerce in Yosemite Gateway Communities" workshop who received positive community feedback was hired as the new YNP chief of planning.
- 6. The Yosemite Fund, Delaware North Corporation, Mariposa County, Sierra Business Council, Sonora Area Foundation, Pacific Gas and Electric Company, Madera County Economic Development Commission, Yosemite Sierra Visitors Bureau, Mammoth Mountain Ski Area, Groveland Community Services District, and the NPS all provided funding to support this workshop, which cost \$50,000.

- 7. The Yosemite Fund and National Parks Foundation provide funding for EYY, and Delaware North Corporation provides funding, facilities, and in-kind services.
- 8. Delaware North Corporation donates the use of the bus and driver.
- 9. Pseudonym to protect identity.
- 10. The senior author witnessed this conversation at the first EYY, and the deputy superintendent went on to describe YNP's attempts to educate the public during the road construction about the use of concrete retaining walls formed to resemble granite walls. YNP took a sample wall to local communities on a flatbed truck to advertise its use. This example illustrates the difficulty YNP faces with rumors in the community: even after YNP attempted to communicate the details of the concrete wall's construction, a rumor was formed and perpetuated.
- 11. The invitation list was compiled from contacts made by the community liaison and other YNP managers.
- 12. P.L. 92-463, October 6, 1972, 86 Stat. 770, as amended. In general, any panel, conference, or similar group established or utilized by a federal agency for the purpose of obtaining consensus advice or recommendations on issues or policies will likely fall within the purview of the act.
- 13. Pseudonym to protect identity.
- 14. Meeting notes for all "Planning 101" workshops were e-mailed to all participants by the Public Involvement and Outreach Branch chief.
- 15. In formal interviews with 11 YNP managers and countless informal interviews with NPS personnel, only the existence of DO-75A was mentioned; it was never cited as a reference for creating or maintaining community-building programs.

References

- Bankston, Carl L., and Min Zhou. 2002. Social capital as process: The meanings and problems of a theoretical metaphor. *Sociological Inquiry* 72:2, 285–317.
- Lever, Christopher C. 2007. Stepping outside the boundary: Organizational change and community building at Yosemite National Park. Ph.D. dissertation, Environmental Science, Policy, and Management, University of California–Berkeley.
- Putnam, Robert D. 2000. Bowling Alone: The Collapse and Revival of American Community. New York: Simon & Schuster.
- National Park Service. 2003. Director's Order 75A: Civic Engagement and Public Involvement. Washington, D.C. National Park Service.
- Thomas, Craig W. 2003. Bureaucratic Landscapes: Interagency Cooperation and the Preservation of Biodiversity, Politics, Science, and the Environment. Cambridge, Mass.: MIT Press.
- Christopher C. Lever, College of Natural Resources, University of California–Berkeley, Berkeley, California 94720; clever@nature.berkeley.edu
- J. Keith Gilless, College of Natural Resources, University of California–Berkeley, Berkeley, California 94720; gilless@nature.berkeley.edu

Volume 25 • Number 3 (2008)

Evaluating Potential Wildlife Impacts of Future Land Development Adjacent to Protected Areas

Tony Prato, Anthony S. Clark, and Yan Barnett

Introduction

GLOBAL CHANGE IS INCREASING BIODIVERSITY LOSS, changing climate and land use, modifying hydrological systems, and altering global biogeochemical cycles, all of which are significantly impacting human and natural systems, including protected areas and their gateway communities (Walker and Steffen 1997; McCarthy et al. 2001). Human-induced landscape change influences the ecological integrity of natural systems by altering the availability of energy, water, and nutrients, increasing the spread of exotic species, accelerating the natural processes of ecosystem change, and adversely affecting the structure and functioning of ecosystems (Adger and Brown 1994; Ojima et al. 1994; Vitousek 1994; Vitousek et al. 1997; IIASA 1998).

Global change is the result of the interactions among social, economic, and environmental processes that occur at numerous spatial scales. Of particular interest in this paper are the interactions that occur between protected areas and their gateway communities in Northwest Montana. Swanson et al. (2003:33) define a gateway community as "[a] town or group of towns that provides access to public lands such as national parks, as well as services for visitors to these natural areas" Howe et al. (1997:1) state that "gateway communities have become a magnet for millions of Americans [so-called equity exiles or amenity migrants] looking to escape the congestion, banality, and faster tempo of life in the suburbs and cities."

There are several interactions between gateway communities and protected areas. First, gateway communities provide food, lodging, and other visitor services. Second,

protected areas enhance the social and environmental amenities (e.g., quality of life, scenery, clean air, and clean water) available to gateway communities. Third, protected areas are often the economic engines for gateway communities. Fourth, economic and population growth and associated land development in gateway communities has the potential to decrease the quality of life in those communities and degrade the natural and cultural resources-including wildlife -of protected areas (Rasker and Hansen 2000; Swanson et al. 2003; Rasker et al. 2004; Prato and Fagre 2005). Gateway communities need to plan their development in a manner that achieves the socioeconomic benefits of economic growth and land development without threatening the quality of life and amenity values provided by nearby protected areas and other public land (Howe et al. 1997). Such planning requires a better understanding of the poten-
tial natural resource impacts of future economic growth and land development in gateway communities for protected areas.

The objectives of this paper are to assess the potential impacts of future land development on wildlife habitat adjacent to five protected areas in Flathead County, Montana, and to determine whether such impacts can be alleviated by implementing more restrictive land use policies. To the authors' knowledge, this is one of the first studies to examine the potential impacts of future land development on wildlife habitat adjacent to protected areas.

Wildlife impacts of land development

In describing the impacts of urban sprawl, Burchell et al. (2005) pointed out that "[e]ach year, development disrupts wildlife habitat by claiming millions of acres of wetlands and forests. This loss often results in habitat fragmentation, in which animals are forced to live in smaller areas isolated from other members of their own species and sometimes unable to forage or migrate effectively. Habitat destruction is the main factor threatening 80 percent or more of the species listed under the Endangered Species Act." The survival of many wildlife species depends on the quantity and quality of habitats surrounding protected areas (e.g., grizzly bear in Glacier National Park and bison in Yellowstone National Park). American Wildlands (2006) determined that: (1) habitat is lost when important areas for the feeding, shelter, or breeding of certain species are converted to residential development; (2) habitat is fragmented when roads, houses, and buildings disconnect parcels that are too small for the survival of many animals; (3) roads built through habitat areas contribute to wildlife mortality; and (4) wildlife migration corri-

Wildlife impacts in areas adjacent to protected areas are numerous. Consider these examples. As a consequence of the 400% increase in rural residential development that occurred in the Montana and Wyoming portions of the Greater Yellowstone Ecosystem between 1970 and 2000 (Williams 2001), current and potential grizzly bear habitat on private lands has been degraded and fragmented. If this trend continues, then grizzly bear recovery in the region will be more difficult (Johnson 2001). Double-digit growth in residential subdivisions adjacent to the National Elk Refuge in Jackson, Wyoming has diminished winter range for the 10,000 elk that use the refuge and displaced corridors that elk use to reach summer range in Yellowstone and Grand Teton national parks (Howe et al. 1997). Over twenty years ago, Keiter (1985) determined that the cumulative impacts of residential, timber, and energy development on lands surrounding Glacier threaten the park's natural resources. In an updated assessment, Sax and Keiter (2007: 36) concluded that "[w]hile the park is still at risk, things are not as bleak as we anticipated from the perspective of the mid-1980s," especially on the west and east sides of the park. However, Sax and Keiter found that residential development south of the park in the Flathead Valley and energy development northwest of the park in the Canadian Flathead threaten the park.

In a similar vein, the National Parks Conservation Association (2002) determined that residential, commercial, and resort developments on ranch, farm, and forest lands outside the western and southern boundaries of Glacier have encroached on important seasonal habitat for bear, elk, mountain lion, mule deer, and other wildlife species, and that rapid population growth and poorly planned development in gateway communities can adversely impact wildlife.

In addition to residential development, wildlife habitat can be lost or degraded by logging and energy development on private and public lands adjacent to protected areas. Most logging operations require the construction of roads and roads fragment and reduce the wildlife habitat security (e.g., American Wildlands 2006). Furthermore, existing or proposed energy developments near protected areas can degrade water quality, wildlife, and other natural resources (e.g., Humphries 1996; Thompson and Thomas 2007).

American Farmland Trust (no date) concluded that 11% of all prime ranchland in a region covering seven Rocky Mountain states is at risk of being converted to residential development between 2000 and 2020. In particular, 3.6 million ha in the top 25 at-risk counties in the region contain ranchland with a high likelihood of being developed. Most of the at-risk acreage is located in Montana and Idaho (over 2 million ha in each state), and considerable strategic and prime ranchland located west and southwest of Glacier in Flathead County is at risk of development.

The Yellowstone to Yukon (Y2Y) Conservation Initiative identified 17 critical areas that are essential for the survival of key wildlife species in the Y2Y region (Y2YCI 2006). One of the critical areas is the Northern Continental Divide Ecosystem (NCDE), which encompasses the Castle–Crown wilderness and Waterton Lakes National Park in Canada and Glacier and the Bob Marshall–Great Bear wilderness complex in the United States. The NCDE provides core habitat for a variety of species and contains the healthiest populations of bull trout, grizzly bears, non-reintroduced wolves, and westslope cutthroat trout in the lower 48 states. In addition, the American Wildlands' Corridors of Life program (American Wildlands 2007a) has developed a map of wildlife corridors in the U.S. Northern Rockies that is being used to promote, protect, and restore public and private lands within identified wildlife corridors.

Previous research

Land use change in rural and urban communities and its wildlife impacts have been assessed in many community and environmental settings. Bockstael (1996) and Geoghegan et al. (1997) modeled the conversion of forest and agricultural land to different densities of residential use in a sevencounty area of the Patuxent Basin in Maryland. Schumaker et al. (1997) simulated the potential impacts of future landscape change in the agriculturally dominated Willamette Basin in Oregon. White et al. (1997) examined impacts of landscape change on biodiversity in a recreational area. Maxwell et al. (2000) quantified changes in land use in Three Forks and surrounding areas in Gallatin County, Montana. Apps et al. (2002) and the Miistakis Institute for the Rockies (2002) identified habitat suitable for grizzly bear in the U.S. Northern Rockies. Hansen and Rotella (2002) examined whether intense land use outside of Yellowstone National Park degrades the viability of bird habitat inside and outside of the park. Irwin et al. (2003) modeled urban growth in eastern Maryland. Finally, Berube et al. (2006) evaluated the growth of exurban residential development around metropolitan areas of the United States. We could not identify any studies that evaluated the potential impacts of future economic growth and land development on wildlife habitat in areas adjacent to protected areas.

Study area

The study area is Flathead County in Northwest Montana (see Figure 1). The county encompasses 1.32 million ha or 13,204 sq km; an area that is approximately the size of Connecticut (Flathead County Planning and Zoning Office 2006). Flathead County is selected as the study area for four reasons.

First, the county has experienced rapid growth, which is expected to continue into the future. From 1990 to 2000, the total population of the county, most of which resides in the Flathead Valley, increased 25.8% compared with a 12.9% increase for the state of Montana as a whole and 13.1% for the nation (U.S. Census Bureau 2001). From 1990 to 2005, the total population of Flathead County increased 60%, making it the second-fastest growing county in Montana.

Population and economic growth and associated land development in Flathead County have caused widespread conversion of agricultural and forest lands to residential and commercial uses and increased landscape fragmentation. An on-going landscape change study (CARES 2007) used Landsat TM satellite imagery to estimate land cover in the county. Results indicate

Figure 1. Location of Flathead County, Montana.



Volume 25 • Number 3 (2008)

that from 1985 to 2002 the urban/built-up area more than doubled from 46 sq km to 94 sq km, the number of patches increased 40% from about 25,000 to 35,000, and average patch size decreased, particularly for deciduous forest (36% smaller) and cropland (78% smaller) in developable areas of the county (personal communication with R. Sugumaran). A "patch" is defined as "[a] continuous area of space with all necessary resources for the persistence of a local population [of a species] and separated by unsuitable habitat from other patches" (Turner et al. 2001:210). Increases in the number of patches implies greater landscape fragmentation, which has adverse effects on some wildlife species.

Second, Flathead County was chosen as the study area because it contains a highly diverse flora and fauna that are vulnerable to habitat loss and fragmentation from economic growth and land development. In particular, the Flathead region contains 300 species of aquatic insects, 22 native and introduced species of fish, and nearly all of the large mammals of North America (Norse et al. 1986; OTA 1987; Flathead Basin Commission 2000). The county is home to bald eagle, bighorn sheep, bull trout, Canada lynx, elk, gray wolf, grizzly bear, lynx, moose, mountain lion, mule deer, peregrine falcon, and wolverine. The bald eagle, bull trout, Canada lynx, Chinook salmon, gray wolf, grizzly bear, sockeye salmon, trumpeter swan, white sturgeon, and woodland caribou are on the federal list of threatened and endangered species (Mahr 2007).

Third, several of the wildlife species in Flathead County utilize habitat within and adjacent to protected areas in the county. This study evaluates potential impacts of future land development on wildlife habitat in buffer zones for five protected areas: (1) Glacier National Park; (2) the Great Bear wilderness and the northern portion of the Bob Marshall wilderness; (3) a northern unit of roadless areas west of Glacier; (4) a southern unit of roadless areas west of the Great Bear wilderness; and (5) the Lost Trail National Wildlife Refuge in the western area of the county. This delineation is based on three criteria: (1) the federal agency managing the protected area; (2) the objectives governing the management of the protected area; and (3) the location of the protected area relative to the human population. In particular, Glacier is part of the U.S. national park system and is managed by the National Park Service. Additionally, Glacier is a biosphere reserve, a World Heritage site, and part of the Waterton-Glacier International Peace Park. The Great Bear and Bob Marshall wilderness areas are units of the national wilderness preservation system and are managed by the U.S. Department of Agriculture-Forest Service (USFS). The two roadless areas are part of the national forest system and are managed by USFS. Lost Trail is a unit of the national wildlife refuge system and is managed by the U.S. Fish and Wildlife Service. Although the two roadless areas are managed by the same federal agency, they were treated separately because they are not contiguous (i.e., they are divided by the northern portion of the Flathead Valley).

Fourth, Flathead County was chosen as the study area because future land use change in the county has already been simulated in the on-going landscape change study (CARES 2007).

Methods

Alternative futures. The potential wildlife impacts of future economic growth and land development in areas adjacent to

the five protected areas are evaluated for nine alternative futures. These scenarios consist of combinations of low, moderate, or high annual growth rates for 2000 to 2024 (24 years) in demand for eleven major industries in the county, and current, moderately restrictive, or highly restrictive land use policies. The current land use policy approximates current land development and subdivision regulations in the county and is the least restrictive of the three policies.

Potential wildlife impacts of future land development are simulated using the Ecosystem Landscape Modeling System (ELMS), which was developed in an ongoing landscape change study (Prato 2005; CARES 2007). ELMS uses geospatial technologies (i.e., geographic information systems and remote sensing) to simulate future conversion of developable parcels to residential and commercial-institutional and industrial (CI&I) uses in Flathead County. It simulates the total acreage required for different housing units by combining the increase in housing units required by the additional workers estimated for each of the three growth rate scenarios, the distribution of houses among housing types, and the densities of housing types.

Average growth rates for the eleven major industries are 3.91%, 6.26%, and 8.78% (between 2000 and 2014) and 1.95%, 3.13%, and 4.39% (between 2014 and 2024) for the low-, moderate-, and high-growth rate scenarios, respectively. The percentage of housing units in the six housing types for the three land use policies are given in Table 1. Relative to the current policy, the moderately restrictive policy has a higher percentage of housing units in the high-density and urban categories and a lower percentage in the suburban category.

Housing type	Current	Moderately restrictive	Highly restrictive
High-density*	3	10	20
Urban ^b	18	20	25
Suburban ^c	42	34	30
Rural ^d	6	6	5
Exurban ^e	18	18	10
Agricultural ^r	12	12	10
^a 2.8 units per ha	L, I	^d 1 unit per 0.4 l	ia
^b 2.2 units per ha ^c 1 unit per 3 ha			
° 0.8 units per ha	ŭ - 11	^r 1 unit per 19 ha	

Table 1. Assumed percentages of housing units in six housing types for three land use policies.

Relative to the moderately restrictive policy, the highly restrictive policy has a higher percentage of housing units in the highdensity and urban housing types, and a lower percentage in the other housing types.

The three land use policies assume a setback of housing and CI&I units from water bodies of 6.1 m for the current policy, 10.7 m for the moderately restrictive policy, and 15.2 m for the highly restrictive policy. The current policy does not restrict the types of housing units constructed near environmentally sensitive areas (i.e., national parks, wildlife refuges, state parks, and county parks). The moderately restrictive policy allows only urban, suburban, rural, exurban and agricultural housing units, and the highly restrictive policy allows only suburban, rural, exurban, and agricultural housing units, in a 1.61-km wide buffer area around environmentally sensitive areas. None of the land use policies allow new CI&I units to be constructed in the buffer area for environmentally sensitive areas. Conversion of developable parcels to housing units and CI&I units is restricted based on whether or not parcels have access to sewer service. Construction of high-density, urban, and suburban housing units and CI&I units are allowed only on seweraccessible parcels. Construction of rural, exurban, and agricultural housing types is allowed on parcels both within and outside of sewer-accessible areas.

For each growth rate scenario, the number of additional housing units is determined by multiplying the increase in employment between 2000 and 2024 for that scenario (estimated using the IMPLAN regional economic model for Flathead County; Lindall and Olson 1993) and the estimated housing requirements per worker. The procedure for estimating future housing requirements takes into account vacant housing units and housing units occupied by non-permanent residents of the county. Acreage requirements for the six housing types are determined based on the total number of housing units required to achieve a particular growth rate scenario, the percentage of housing units in each of six housing types with each land use policy, and the area required by each housing type. For each growth rate scenario, the total acreage requirements for additional CI&I units are determined by multiplying the estimated increase in employment between 2000 and 2024 for that scenario and the CI&I acreage requirements per worker.

The order in which developable parcels are converted to housing and CI&I units is determined based on development attractiveness scores for parcels and other factors. The development attractiveness scores for parcels are calculated using a multiple attribute evaluation procedure (Herath and Prato 2006). Development attractiveness scores for housing units are calculated based on four parcel attributes: (1) the maximum acceptable distance from a major highway; (2) the maximum acceptable distance from the edge of town; (3) the maximum acceptable distances from seven amenities (i.e., lakes, rivers, preserve/parks, golf courses, ski resorts, forests, and the elevation from the valley floor); and (4) the minimum acceptable distances from five disamenities (i.e., industrial facilities, trailer parks, commercial centers, railroad tracks, and airports). Development attractiveness scores for CI&I units are calculated based on two parcel attributes: (1) the maximum acceptable distance from a major highway; and (2) the maximum acceptable distance from the edge of town. Parcel attributes are determined using a geographic information system.

Table 2 summarizes the simulated land requirements, land developed into housing units and CI&I units, and land surpluses or shortages for the nine alternative futures. For purposes of this study, the simulated land developed into the six housing types and CI&I units were aggregated into three land use classes: (1) low-density uses consisting of acreage developed into exurban and agricultural housing units; (2) moderate-density uses consisting of acreage developed into suburban and rural-density housing units; and (3) high-density uses consisting of acreage developed into high-density and urban-density housing units and CI&I units.

Delineating buffer zones. Buffer zones for protected areas are delineated based on the conceptual design for biosphere reserves. This design consists of a core area, a buffer zone for the core area (see Figure 2), and a transition area (Creswell and Thomas 1977). A core area is a legally protected area, such as a national park or wilderness area, in which human disturbances to land and water are kept to a minimum. Primary management objectives for core areas are long-term conservation of biological diversity, and low-impact research, educational, and recreational activities. The buffer zone is an area surrounding or adjoining the core area in which human activities compatible with the management objectives for the core area are allowed, such as environmental education and recreation. Outside of the buffer zone is a transition area (not shown in Figure 2) that contains human settlements, farms, and other human activities that are compatible with sustainable development. Only five of the 47 biosphere reserves in the United States have designated buffer zones and transition areas (UNESCO 2007b).

Lockwood (2006:93) points out that the zonation concept for biosphere reserves is "applied in many different ways, in order to accommodate geographical conditions, socioeconomic settings, available legal protection measures and local constraints." Li et al. (1999) indicate that specifying a uniform buffer width around nature reserves is not justified and that buffer width should be varied depending on the activities that occur in different areas of the buffer. Shafer (1999) contends that a protected area may require different buffer sizes. Since there no

Land use category	Low-growth	Moderate-growth	High-growth
	Gurrent	policy	
Required			
CI&I units	645	1,174	2,032
Total housing units	141,070	256,933	444,582
C1&I + housing			
units	141,715	258,107	446,614
Developed*			
CI&I units	647	1,174	2,035
Total housing units CI&I + housing	141,157	215,756	214,897
units	141,804	216,930	216,930
Surplus or			
shortage ^h	75,217	-41,176	-229,683
	Moderately res	trictive policy	
Required			
CI&I units	645	1,174	2,032
Total housing units	103,630	194,859	326,589
CI&I + housing			
units	104,275	196,033	328,620
Developed*			
CI&I units	645	1,232	2,093
Total housing units	103,709	194,894	214,837
CI&I + housing			
units	104,354	196,126	216,930
Surplus or			
shortage ^{be}	112,656	20,898	-111,690
	Highly restri	ictive policy	
Required	a		
CI&I units	645	1,174	2.032
Total housing units	62,152	113,199	195.873
CI&I + housing	Quarty.	Sector.	
units	62,797	114,373	197,904
Developed			
CI&I units	645	1,188	2.047
Total housing units	53,301	97,039	167.699
CI&I + housing	199 C. 17	0.4462.0	5 m2 # 20 C
units	53,946	98,226	169,746
Surplus ^b	154,134	102,558	19.026

* In some cases, the area developed exceeds the area required for development due to the discreteness of the parcels.

^b A surplus (positive acreage) indicates that the area available for development (216,931 ha) *exceeds* the area required for development. The surplus equals the area available for development minus the area developed.

"A shortage (negative acreage) indicates that the area available for development

(216,931 ha) is less than the area required for development. The shortage equals

the area developed minus the area required for development.

Table 2. Simulated land requirements and land developed into housing and commercial-institutional and industrial (CI&I) units, and land surpluses and shortages, for nine alternative futures, Flathead County, 2000-2024 (in ha).



Figure 2. Biosphere reserve design. Source: American Wildlands 2007b.

uniform guidelines for buffer widths, the choice of buffer widths is somewhat arbitrary. Two widths were evaluated in this study: 8 km and 16 km. A geographic information system was used to determine the areas covered by the two buffer zones for the five protected areas (see Figures 3 and 4). Since ELMS only simulates future land use changes in Flathead County, it is not possible to evaluate the potential wildlife impacts of future land development in areas of the buffer zones that fall outside of Flathead County.

Surrogate indicators of wildlife impacts of land use change. Potential wildlife impacts of future land development vary depending on: (1) the nature and extent of the built-up area (e.g., whether the development is low-density or high-density, and the total acreage converted to developed uses); (2) where development occurs relative to important wildlife habitat (e.g., whether development occurs in wildlife migration corridors); and (3) the habitat requirements for wildlife species (e.g., whether development fragments large roadless areas favored by grizzly bears).

Three approaches were considered for evaluating the potential wildlife impacts of future land development. First, there is the conventional approach, which determines land cover from satellite imagery, uses the land cover data to calculate landscape met-

rics (e.g., number of patches, area-weighted mean patch size, the relative size of a patch containing a particular cover type, etc.), and interprets the implications of the resulting landscape metrics for wildlife habitat based on existing knowledge of how different landscape patterns influence habitat suitability for species (e.g., Griffiths et al. 1993; Hansen et al. 1995; Hansen et al. 2001; Turner et al. 2001). It was not possible to use this approach in the current study because ELMS simulates future land use changes, not future land cover changes. Although it is possible to infer future land cover changes from land use changes, the procedures for doing so are problematic (Lambin et al. 1997; Brown et al. 2000).

Second, potential wildlife impacts of future land development can be assessed using landscape metrics calculated using simulated future land use changes in the buffer zones. Unfortunately, it is not straightforward to interpret what such metrics mean for wildlife habitat quality.

Third, potential wildlife impacts of future land development can be evaluated in terms of surrogate indicators calculated using simulated land use changes in buffer zones. This approach is used here. Three surrogate indicators are used: (1) the overall vulnerability of wildlife (V); (2) the extent of wildlife disturbance (E); and (3) the security of wildlife habitat (S). Increases in land development, more restrictive land use policies, and changes in buffer width can alter V, E, and S, and hence the potential future quantity and quality of wildlife habitat. Since the three surrogate indicators are generic, they cannot be used to draw inferences about the potential impacts of future land development on specific wildlife species.

Indicator V is measured by the per-





Figure 3 (top). Eight-km buffer zones for five protected areas in Flathead County, Montana. Figure 4 (bottom). Sixteen-km buffer zones for five protected areas in Flathead County, Montana.

Volume 25 • Number 3 (2008)

centage of the total area of a buffer that is developable. High (low) values of V imply high (low) overall vulnerability of wildlife to future development. Total developable area of a buffer equals the total area of a buffer, minus the area of public land (i.e., national, state, and local parks, wilderness areas, national forests, and national wildlife refuges) in the buffer, minus the area of private land in the buffer that is excluded from development by a particular land use policy. Total area of a buffer and the area of public land in a buffer do not vary across the nine alternative futures. Hence, variation in V results from variation in the area of private land in a buffer that is excluded from development by a land use policy. Parcels are excluded from development if: (1) less than half of the area of the parcel is in the portions of the buffers for the five protected areas that fall in Flathead County; (2) more than half of the area of the parcel is in slopes that exceed 30%; (3) more than half of the area of the parcel is in the designated 100year floodplain; and (4) the size of the parcel is too small for development after imposing a 6.1-m setback of structures from water bodies, In addition, parcels are excluded from development due to the restrictions imposed by the land use policies. Parcel boundaries and attributes are determined from the Montana Department of Revenue's (2006) CAMA (Computer Assisted Mass Appraisal System) database as of November 2005.

Indicator E is measured by the percentage of the total developable area in a buffer that is developed under an alternative future. High values of E imply that a large percentage of the total developable area in a buffer is developed, which implies less effective habitat for species that are intolerant to human disturbance. Effective habitat is the area of potential habitat for a species multiplied by the proportion of potential habitat that is useable by that species; it takes into account the impacts of human disturbances, such as roads, structures, logging, and recreation, on the occurrence and persistence of a species in a potential habitat area (Apps and Hamilton 2002). Potential habitat is the habitat area potentially available to a particular species; it does not consider impacts of human disturbances on habitat quality (Miistakis Institute for the Rockies 2002). In summary, high values of E portend detrimental effects on wildlife habitat.

High values of V and E imply that few patches of land are potentially or actually suitable for wildlife, respectively, and a greater likelihood that patches of humandisturbed land are interspersed with patches of public land or undeveloped private land. In other words, high values of V and E suggest smaller and less heterogeneous patches of suitable wildlife habitat, which has the potential to decrease the number of species and the number of individuals relative to what they would be with larger patches of the same habitat (Turner et al. 2001). In summary, high values of V and E imply less effective wildlife habitat.

Indicator S is measured by [(LD)/(LD + MD + HD)][100], where LD, MD, and HD are the acreages in low-density, moderate-density, and high-density housing units, respectively. Other things equal, high values of S imply that a high percentage of the total area developed is in less compact (i.e., lowdensity) housing units. Consequently, high values of S imply greater landscape fragmentation and less secure wildlife corridors. Lower corridor security increases the risk of injury or death to species that depend on migration corridors to travel between protected areas, such as grizzly bear and elk.

Results and discussion

The values of V, E, and S for the nine alternative futures and two buffer widths are summarized in Table 3. There is a substantial difference in the average V (calculated over the three land use policies and two buffer widths) between Lost Trail National Wildlife Refuge and the other protected areas. Average V over all three land use policies and two buffer widths is 61% for Lost Trail compared with 8% for the remaining

Table 3. Values of V, E, and S for nine alternative futures and 8- and 16-km buffers (percent).

Buffer width and	Va	$\mathbf{E}^{\mathbf{b}}$				S	
protected area		Growth Rates			es	Sector Sector Sector	
		Low	Moderate	High	Low	Moderate	High
S-km				Current p	olicy		
Glacier National Park	9	67	100	100	96	97	93
Lost Trail NWR	72	68	100	100	99	96	94
Northern Roadless Area	11	68	100	100	97	93	92
Southern Roadless Area	9	63	100	100	95	95	90
Bob Marshall-Great Bear NWA	2	64	100	100	95	.99	92
16-km							
Glacier National Park	9	65	100	100	93	92	86
Lost Trail NWR	53	69	100	100	99	96	95
Northern Roadless Area	13	67	100	100	94	91	87
Southern Roadless Area	11	64	100	100	94	93	89
Bob Marshall-Great Bear NWA	2	61	100	100	93	96	90
			Moder	ately restr	ictive poli	icy	
8-km							
Glacier National Park	.9	44	89	100	96	98	95
Lost Trail NWR	67	53	84	100	96	98	97
Northern Roadless Area	9	41	88	100	96	96	92
Southern Roadless Area	9	46	.91	100	92	.94	90
Bob Marshall-Great Bear NWA	2	55	93	100	97	98	98
16-km							
Glacier National Park	9	47	92	100	91	90	86
Lost Trail NWR	53	51	87	100	97	99	97
Northern Roadless Area	13	45	9	100	91	91	86
Southern Roadless Area	11	48	92	100	90	91	87
Bob Marshall-Great Bear NWA	2	49	91	100	94	95	89
			Hig	ly restrict	ion policy		
8-km							
Glacier National Park	9	28	51	91	97	.96	95
Lost Trail NWR	67	26	59	92	100	98	100
Northern Roadless Area	9	21	53	91	91	90	93
Southern Roadless Area	9	33	54	90	91	91	90
Bob Marshall-Great Bear NWA	2	33	48	92	96	94	98
Classing National Park	0	29	57	0.9	95	95	99
Giacter Ivational Fark	50	95	57	92	100	00	65
Northan Readlass Area	10	20	55	09	26	90	95
Condena Deallan Ann	13	29	53	92	80	85	65
Poly Mandrell Cara Rass NWA		34	.94	91	01	80	00
Bob Marshall-Great Bear NWA	2	32	51	91	91	.90	90

* Higher values of V imply higher vuluerability of wildlife to development.

^b Higher values of E imply less effective habitat for human-intolerant species.

¹⁶ Higher values of S imply greater landscape fragmentation and less secure wildlife habitat.

four protected areas. Buffers for the latter have values of V that range from 2% to 13%. Potential buffer vulnerability to future land development is substantially lower for the Bob Marshall–Great Bear wilderness complex than for Lost Trail (average V values of 2% for the former versus 61% for the latter), and moderately lower for Bob Marshall– Great Bear than for the Glacier–Northern Roadless Area–Southern Roadless Area complex (average V values of 2% for the former versus 10% for the latter). The average potential vulnerability of the five protected areas does not vary much with respect to land use policy and buffer width.

The five protected areas are ranked from highest to lowest overall potential vulnerability of wildlife to future land development (i.e., highest to lowest V) based on the sum of ranks for V (see Table 4). Rankings indicate that the buffer zone for the Lost Trail is the most vulnerable and that for Bob Marshall–Great Bear is the least vulnerable to future development.

Table 5 tabulates the average percentage point increases in E between the growth rates for each land use policy and buffer width. The average extent of potential wildlife disturbance due to future development in the buffer zones (1) increases substantially between the low and moderate growth rates and remains the same between the moderate and high growth rates for the current policy; (2) increases more between the low and moderate growth rates than between the moderate and high growth rates for the moderately restrictive policy; (3) increases more between the moderate and high growth rates than between the low and moderate growth rates for the highly restrictive policy; and (4) increases by similar amounts for the 8- and 16-km-wide buffers.

Table 4 (top). Ranking of the buffers for five protected areas according to the overall vulnerability of wildlife to development (V). The lower the ranking, the higher the wildlife vulnerability. Table 5 (bottom). Average percentage point increases in E between growth rates for the three land use policies and two buffer widths.

Protected area		Sum of Ranks	Ranking
Glacier National Park		19	4
Lost Trail NWR		6	1
Northern Roadless Area		12	2
Southern Roadless Area		16	S
Bob Marshall-Great Bear	NWA	25	5
Change in growth rates	8-km b	uffer	16-km buffer
		Current polic	у
Low to moderate	34		35
Moderate to high	0		0
	M	loderately restrictiv	e policy
Low to moderate	35		35
Moderate to high	26	81	25
		Highly restrict	ive
Low to moderate	21		20
Moderate to high	32		31

For both buffer widths, the potential future increase in human disturbance to wildlife between the low and moderate growth rates is smaller with the highly restrictive policy than with either the current or moderately restrictive policies. In contrast, the potential future increase in human disturbance to wildlife between the moderate and high growth rates is greater with the highly restrictive policy than with the current or moderately restrictive policies.

Table 6 tabulates the average percentage point decrease in E between the current and moderately restrictive policies and between the moderately and highly restrictive policies for the low-, moderate-, and high-growth rate scenarios for each buffer width. The potential impact of future land development on the extent of wildlife disturbance decreases moderately as the land use policy becomes more restrictive. With an 8-km buffer, decreases in the extent of wildlife disturbance between the current and moderately restrictive policies become smaller as growth rates increase. This is not the case between the moderately restrictive and highly restrictive policies. The decreases in the extent of human disturbance to wildlife are similar for the two buffer widths at the low- and high-growth rates, but dissimilar at the moderate-growth rates.

Table 3 indicates relatively high values of S ($\geq 85\%$) for the nine alternative futures and two buffer widths. This result suggests a high future potential for habitat fragmentation and low future potential for habitat security for human-intolerant species in the buffer areas. S is high because a high percentage of the additional land developed under all alternative futures goes for lowdensity housing units (i.e., MD + HD is small compared with LD). Averaged over all alternative futures and buffer widths, the buffers for Lost Trail have the highest future potential for fragmentation and lowest future potential for habitat security (average S of 98), and the buffers for Bob Marshall-Great Bear have the lowest future potential for fragmentation and the highest future potential for habitat security (average S of 94). The ranking of the five protected areas from lowest to highest future potential for landscape fragmentation and wildlife habitat security based on S was the same as the

Table 6. Average percentage point decreases in E from the current land use policy to the moderately restrictive land use policy, and from the moderately restrictive land use policy to the highly restrictive land use policy, for the low-, moderate-, and high-growth rate scenarios and 8- and 16-km buffers.

Buffer width	Current to moderately restrictive	Moderately restrictive l highly restrictive	
	Low-growth	n-rate scenario	
8 km	18	20	
16 km	17	17	
	Moderate-grow	vth-rate scenario	
8 km	11	36	
16 km	26	19	
	High-growth	n-rate scenario	
8 km	0	9	
16 km	0	8	

ranking of the five protected areas from highest to lowest future potential for vulnerability to development based on V. In general, S varies only moderately across alternative futures and buffer widths.

Summary and conclusions

This study is one of the first to systematically evaluate the potential adverse impacts of future economic growth and land development on wildlife habitat adjacent to protected areas. It was not possible to use the conventional approach to evaluate wildlife habitat suitability in the study area. Hence, three surrogate indicators were constructed and used to evaluate the potential impacts of future economic growth and land development on wildlife habitat in 8and 16-km-wide buffer zones around five protected areas.

The overall vulnerability of wildlife to land development is the highest in the buffer zones for Lost Trail National Wildlife Refuge and lowest in the buffer zones for the Bob Marshall–Great Bear wilderness complex. Potential human disturbance to wildlife in the buffer zones is substantial for all three land use policies and two buffer widths. However, the magnitude of disturbance decreases as the future economic growth rates decrease and land use policy becomes more restrictive. The latter suggests that land use policy may be effective in alleviating the adverse wildlife impacts of

future land development. For all nine alternative futures and two buffer widths, habitat fragmentation is high and the security of wildlife habitat is low in the buffer zones because a large percentage of the newly developed land is in low-density housing units. This result suggests that future land development in the county could have potentially negative impacts on wildlife unless the density of new housing units is substantially reduced. The buffer zone for Lost Trail, which is the smallest of the five protected area evaluated, has the highest potential habitat fragmentation and the lowest potential habitat security in the future. The buffer zone for the Bob Marshall-Great Bear wilderness complex, which is a relatively large protected area, has the lowest potential habitat fragmentation and the highest potential habitat security. An interesting follow-up study would be to determine how sensitive the results and conclusions stated above are to changes in these assumptions.

The results and conclusions of this study apply to the protected areas in Flathead County and the assumptions underlying the alternative futures and ELMS. However, the alternative futures approach, ELMS, and surrogate indicators used in this study can be used to evaluate the potential wildlife impacts of future land development in buffer zones for other protected areas.

Acknowledgments

The study was supported by the National Research Initiative of the U.S. Department of Agriculture Cooperative State Research, Education and Extension Service, grant number 2006-55101-17129.

References

Adger, W.N., and K. Brown. 1994. Land Use and the Causes of Global Warming. New York: John Wiley & Sons.

- American Farmland Trust. N.d. Strategic ranchland in the Rocky Mountain West: Mapping the threats to prime ranchland in seven western states. On-line at www.farmland.org/ resources/rockymtn/default.asp (accessed January 4, 2007).
- American Wildlands. 2006. Lands program: Human development threatens cores and corridors. On-line at www.wildlands.org/l_development.html (accessed December 22, 2006).
- ———. 2007a. Corridors of Life Project: Wildlife corridors of the U.S. Northern Rockies. On-line at www.wildlands.org/corridor/corridor.html (accessed January 4, 2007).
- -----. 2007b. Lands program: Introduction-----what are wildlife corridors? On-line at www.wildlands.org/l_intro.html (accessed January 4, 2007).
- Apps, C.D. 2002. Grizzly Bear Habitat Suitability Modeling in the Central Purcell Mountains, British Columbia. Victoria, B.C.: Ministry of Water, Land and Air Protection.
- Apps, C.D., and A.N. Hamilton. 2002. *Grizzly Bear Habitat Effectiveness and Connectivity in Southwestern British Columbia*. Victoria, B.C.: Aspen Wildlife Research and Ministry of Water, Land and Air Protection.
- Berube, A., A. Singer, J.H. Wilson, and W.H. Frey. 2006. Finding Exurbia: America's Fast-Growing Communities at the Metropolitan Fringe. Living Cities Census Series. Washington, D.C.: The Brookings Institution.
- Bockstael, N. 1996. Economics and ecological modeling: The importance of spatial perspective. American Journal of Agricultural Economics 78, 1168–1180.
- Brown, D.G., B.C. Pijanowski, and J.D. Duh. 2000. Modeling relationships between land use and land cover on private lands in the Upper Midwest, USA. *Journal of Environmental Management* 59, 247–263.
- Burchell, W., A. Downs, B. McCann, and S. Mukherji. 2005. Sprawl Costs: Economic Impacts of Unchecked Development. Washington, D.C.: Island Press.
- CARES [Center for Agricultural, Resource, and Environmental Systems]. 2007. Assessing ecological economic impacts of landscape change in Montana's Flathead County. Online at www.cares.missouri.edu/montana/ (accessed May 23, 2007).
- Creswell, I.D., and G.M. Thomas. 1977. *Terrestrial and Marine Protected Areas in Australia*. Canberra: Environment Australia.
- Flathead Basin Commission. 2000. *Biennial Report, 1998–1999.* Helena, Mont.: Governor's Office.
- Flathead County Planning and Zoning Office. 2006. About the Flathead area. On-line at www.co.flathead.mt.us/fcpz/bckgrd.html (accessed December 29, 2006).
- Geoghegan, J., L. Wainger, and N. Bockstael. 1997. Spatial indices in a hedonic framework: An ecological economics analysis using GIS. *Ecological Economics* 23, 251–264.
- Griffiths, G.H., J.M. Smith, N. Veitch, and R. Aspinall. 1993. The ecological interpretation of satellite imagery with special reference to bird habitats. In *Landscape Ecology and GIS*, R. Haines-Young, D.R. Green, and S.H. Cousins, eds. Bristol, Pa.: Taylor & Francis, 255–272.
- Hansen, A.J., W.C. McComb, R. Vega, M.G. Raphael, and M. Hunter. 1995. Bird habitat relationships in natural and managed forests in the West Cascades of Oregon. *Ecological Applications* 3, 481–496.

Volume 25 • Number 3 (2008)

- Hansen, M.J., S.E. Franklin, C.G. Woudsma, and M. Peterson. 2001. Caribou habitat mapping fragmentation analysis using Landsat MSS, TM, and GIS data in the North Columbia Mountains, British Columbia, Canada. *Remote Sensing of Environment* 77, 50–65.
- Hansen, A.J., and J.J. Rotella. 2002. Biophysical factors, land use, and species viability in and around nature reserves. *Conservation Biology* 16, 1111–1122.
- Herath, G., and T. Prato, eds. 2006. Using Multi-criteria Decision Analysis in Natural Resource Management: Empirical Applications. Aldershot, U.K.: Ashgate.
- Howe, J., E. McMahon, and L. Propst. 1997. *Balancing Nature and Commerce in Gateway Communities*. Washington, D.C.: Island Press.
- Humphries. M. 1996. New World Gold Mine near Yellowstone: A Project Abandoned. Environment and Natural Resources Policy Division, 96-693 ENR. Washington, D.C.: Congressional Research Service.
- IIASA [International Institute for Applied Systems Analysis]. 1998. Modeling land-use and land-cover changes in Europe and Northern Asia. On-line at www.iiasa.ac.at/Research/ LUC/docs/LUC_Description.html (accessed December 23, 2006).
- Irwin, E.G., K.P. Bell, and J. Geoghegan. 2003. Modeling and managing urban growth at the rural-urban fringe: A parcel-level model of residential land use change. *Agricultural and Resource Economics Review* 32, 83–102.
- Johnson, V.K. 2001. Trends in rural residential development in the Greater Yellowstone Ecosystem since the listing of the grizzly bear, 1975–1998. *Yellowstone Science* 9, 2–9.
- Lambin, E.F. 1997. Modelling and monitoring land-cover change processes in tropical regions. *Progress in Physical Geography* 21, 375–393.
- Li, W., Z. Wang, and H. Tang. 1999. Designing the buffer zone of a nature reserve: A case study in Yancheng Biosphere Reserve, China. *Biological Conservation* 90, 159–165.
- Lindall, S., and D. Olson. 1993. MICRO IMPLAN 1990/1985 Database Documentation. St. Paul: Minnesota IMPLAN Group.
- Lockwood, M. 2006. Global protected area framework. In *Managing Protected Areas: A Global Guide*, M. Lockwood, G.L. Worboys, and A. Kothari, eds. London: Earthscan, 73–100.
- Mahr, M.H. 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. Fagre, eds. Washington, D.C.: RFF Press, 229–248.
- McCarthy, J.J., O.F. Canziani, N.A. Leary, D.J. Dokken, and K.S. White, eds. 2001. Climate Change 2001: Impacts, Adaptation, and Vulnerability. Intergovernmental Panel on Climate Change. New York: Cambridge University Press.
- Maxwell, B., J. Johnson, and C. Montagne. 2000. Predicting land use change in and around a rural community. In *Spatial Information for Land Use Change*, M.J. Hill and R.J. Aspinall, eds. Amsterdam: Gordon and Breach Science Publishers, 173–187.
- Miistakis Institute for the Rockies. 2002. Transboundary Cumulative Effects Analysis for Grizzly Bear. Calgary: University of Calgary.
- Montana Department of Revenue. 2006. Montana cadastral mapping, Computer Assisted

Appraisal Data (CAMA). On-line at www.cadastral.mt.gov (accessed December 29, 2006).

- Montana Wilderness Association. 2006. Montana's maps. On-line at http://wildmontana.org/montanamaps.html (accessed December 28, 2006).
- NPCA [National Parks Conservation Association]. 2002. State of the Parks, A Resource Assessment: Waterton–Glacier International Peace Park. On-line at www.npca.org/stateoftheparks/glacier/glacier.pdf (accessed December 22, 2006).
- Norse, E.A., K.L. Rosenbaum, D.S. Wilcove, B.A. Wilcox, W.H. Romme, D.W. Johnston, and M.L. Stout. 1986. *Conserving Biodiversity in Our National Forests*. Washington, D.C.: The Wilderness Society.
- OTA [Office of Technology Assessment]. 1987. *Technologies to Maintain Biodiversity*. OTA-F-330. Washington, D.C.: U.S. Government Printing Office.
- Ojima, D.S., K.A. Galvin, and B.L. Turner. 1994. The global impact of land-use change. *BioScience* 44, 300–304.
- Prato, T. 2005. Modeling ecological impacts of landscape change. *Environmental Modelling* & Software 20, 1359–1363.
- Prato, T., and D. Fagre. 2005. National Parks and Protected Areas: Approaches for Balancing Social, Economic and Ecological Values. Ames, Iowa: Blackwell.
- Prato, T., D. Fagre, and R. Sugumaran. 2007. Economic growth and landscape change. In Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem, T. Prato and D. Fagre, eds. Washington, D.C.: RFF Press, 55–66.
- Rasker, R., and A. Hansen. 2000. Natural amenities and population growth in the Greater Yellowstone region. *Human Ecology Review* 7, 30–40.
- Rasker, R., B. Alexander, J. van den Noort, and R. Carter. 2004. Prosperity in the 21st Century West: The Role of Protected Public Lands. Tucson, Ariz.: Sonoran Institute.
- Sax, J.L., and R.B. Keiter. 2007. Glacier National Park and its neighbors: A twenty-year assessment of regional resource management. *The George Wright Forum* 24, 23–40.
- Schumaker, N.H., T. Ernst, D. White, J. Baker, and P. Haggerty. 1997. Projecting wildlife response to alternative future landscapes in Oregon's Willamette Basin. *Ecological Applications* 14, 381–400.
- Shafer, C. 1999. US national park buffer zones: Historical, scientific, social, and legal aspects. *Environmental Management* 23, 49–73.
- Swanson, L.D., N. Nickerson, and J. Lathrop. 2003. Gateway to Glacier: The Emerging Economy of Flathead County. Washington, D.C.: National Parks Conservation Association.
- 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. Fagre, eds. Washington, D.C.: RFF Press, 285–301.
- Turner, M.G., R.B. Gardner, R.V. O'Neill. 2001. Landscape Ecology: In Theory and Practice. New York: Springer-Verlag.
- UNESCO [United Nations Educational, Scientific and Cultural Organization]. 2007a. Volume 25 • Number 3 (2008) 87

People, biodiversity and ecology. On-line at www.unesco.org/mab/faq_br.shtml#zones (accessed December 29, 2006).

- ———. 2007b. The UNESCO Man and the Biosphere Program: What's it all about? On-line at www.georgewright/org/mab.html (accessed December 29, 2006).
- U.S. Census Bureau. 2001. State and County Quick Facts. On-line at http://quick-facts.census.gov/qfd/states/30000lk.html (accessed December 23, 2006).

. 2007. State and County QuickFacts. Montana County Selection Map. Online at http://quickfacts.census.gov/qfd/maps/montana_map.html (accessed January 2, 2007).

- Vitousek, P.M. 1994. Beyond global warming: Ecology and global change. *Ecology* 75, 1861–1876.
- Vitousek, P.M., H.A. Mooney, J. Lubchenco, and J.M. Melillo. 1997. Human domination of the earth's ecosystems. *Science* 277, 494-499.
- Walker, B., and W. Steffen. 1997. An overview of the implications of global change for natural and managed terrestrial ecosystems. *Conservation Ecology* (on-line at www.ecologyandsociety.org/vol1/iss2/art2/; accessed December 29, 2006).
- White, D., P.G. Minotti, M.J. Barczak, J.C. Sifneos, K.E. Freemark, M.V. Santelmann, C.F. Steinitz, A.R. Kiester, and E.M. Preston. 1997. Assessing risks to biodiversity from future landscape change. *Conservation Biology* 11, 349–360.
- Williams, F. 2001. Between towns and wilderness: Protecting the buffer zones. In *Return of the Wild: The Future of Our Natural Lands*, T. Kerasote, ed. Washington, D.C.: Island Press, 73–86.
- Y2YCI [Yellowstone to Yukon Conservation Initiative]. 2006. Conserving critical cores and corridors in the Y2Y region. On-line at http://www.y2y.net/action/default.asp (accessed December 22, 2006).
- Tony Prato, Center for Agricultural, Resource, and Environmental Systems, University of Missouri-Columbia, 212 Mumford Hall, Columbia, Missouri 65211; pratoa@missouri.edu
- Anthony S. Clark, Department of Agricultural Economics, University of Missouri– Columbia, 327 Mumford Hall, Columbia, Missouri 65211
- Yan Barnett, Center for Agricultural, Resource, and Environmental Systems, University of Missouri-Columbia, 130A Mumford Hall, Columbia, Missouri 65211



P.O. Box 65 Hancock, Michigan 49930-0065 USA

www.georgewright.org

caring for protected areas