# THE GEORGE WRIGHT FORUMA volume 22 number 3 · 2005





#### 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**

DWIGHT T. PITCAITHLEY, President • Las Cruces, New Mexico ABIGAIL B. MILLER, Vice President • Shelburne, Vermont JERRY EMORY, Treasurer • Mill Valley, California GILLIAN BOWSER, Secretary • Bryan, Texas REBECCA CONARD • Murfreesboro, Tennessee BRUCE M. KILGORE • Pocatello, Idaho SUZANNE LEWIS • Yellowstone National Park, Wyoming DAVID J. PARSONS • Florence, Montana JOHN J. REYNOLDS • Castro Valley, California WILLIAM H. WALKER, JR. • Herndon, Virginia STEPHEN WOODLEY • Chelsea, Quebec

#### **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-The World Conservation Union.

© 2005 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 FORUMA volume 22 number 3 · 2005

Society News, Notes & Mail • 2

Geodiversity and Geoconservation Vincent L. Santucci, guest editor

Geodiversity and Geoconservation: What, Why, and How? Murray Gray • 4

Application of Paleoecologic Methods to Coastal Resource Management: An Example from Biscayne National Park *G. Lynn Wingard* • 13

The Geological Foundation for Prescribed Fire in Mammoth Cave National Park Rick Olson and Caroline Noble • 22

> Historical Perspectives on Biodiversity and Geodiversity Vincent L. Santucci • 29

New Wildernesses Can Be Created: A Personal History of the Gaylord Nelson Wilderness at Apostle Islands National Lakeshore Bob Krumenaker • 35

> Contemplating One-Sided Clams: The Northern Abalone Quincunx N. A. Sloan • 50

The Moral Power of the World Conservation Movement to Engage Economic Globalization Ron Engel • 58

**On the cover:** Active volcanism, such as that displayed at Hawai'i Volcanoes National Park, is one of many geological processes that contribute to the world's geodiversity. *National Park Service photo* 

## SOCIETY NEWS, NOTES & MAIL

#### GWS to assist in revision of U.S. World Heritage preliminary list

As the result of a recent agreement with the National Park Service's Office of International Affairs, the Society will help carry out the first revision in more than twenty years of the United States' Tentative List for the World Heritage Convention. Each signatory country to the convention produces these lists, which indicate those properties that the national committee on World Heritage feels might be eligible for inscription as World Heritage sites. Inclusion of a property on the Tentative List does not guarantee inscription, but it is a mandatory first step toward a possible nomination. The GWS's role is to work with a consultant who will develop application materials, coordinate consultations with applicants and peer review evaluators, and generally shepherd the revision through the legal and bureaucratic process. It's envisioned that the newly revised Tentative List will contain as many as twenty properties, which may be primarly cultural, primarily natural, or "mixed" sites combining both elements. Once revised, the Tentative List will guide U.S. nominations to UNESCO, the World Heritage secretariat, for a decade or more. As part of the project, we are looking to add considerable material on World Heritage to the GWS website. If you represent a park or other site that you believe might be worthy of the U.S. Tentative List, contact the GWS office and we can put you in touch with the consultant for more details.

#### Revision of GWS by-laws open for comment

As part of a periodic review, the GWS Board is currently reviewing a number of changes to the Society's by-laws. The proposed changes update the by-laws to reflect recent operating changes, to eliminate inconsistencies in wording, etc. Members are invited to review the changes and comment on them. You can access the red-lined document on the GWS website at www.georgewright.org/bylaws\_amendments.html.

#### New and noteworthy

- Antiquities Act book slated for 2006. Next year marks the 100th anniversary of the Antiquities Act, the U.S. law which provides the foundation for public archaeology in America, contributed intellectual momentum to the historic preservation movement, and resulted in dozens of important national monuments. To celebrate the act, a group of scholars and monument managers have contributed chapters to *The Antiquities Act: A Century of American Archaeology, Historic Preservation, and Nature Conservation.* The book, which will be published by the University of Arizona Press in the spring, is co-edited by Dave Harmon (GWS executive director), Frank McManamon (NPS chief archaeologist and GWS member), and Dwight Pitcaithley (recently retired NPS chief historian and current GWS president). There will be more on the Antiquities Act centennial in issues of *The George Wright Forum* next year.
- Most endangered historic, cultural places named. In June the National Trust for Historic Preservation released its 2005 list of the most endangered histotic places in America. The list runs the gamut of places important to the American story, from a fash-

ionable hotel to a Revolutionary War prison camp, and from Ernest Hemingway's house in Cuba to Boston's Catholic churches. Information on-line at www.nationaltrust.org/ 11Most/2005/index.html. Also in June, the World Monuments Fund announced its biennial list of the 100 most endangered historic architectural and cultural sites. The 2006 World Monuments Watch list includes sites in more than 50 countries. The U.S. sites listed are 2 Columbus Circle (New York, N.Y.), Bluegrass Cultural Landscape of Kentucky, Cyclorama Center (Gettysburg National Military Park, Pa.), Dutch Reformed Church (Newburgh, N.Y.), Ellis Island Baggage and Dormitory Building (Ellis Island National Monument, N.Y.), Ennis Brown House (Los Angeles, Calif.), Hanging Flume (Montrose County, Colo.), and Mount Lebanon Shaker Village (New Lebanon, N.Y.).

• An American Family in World War II. Long-time GWS member Harry Butowsky, an NPS historian, has co-edited this new volume of letters of a family headed by a combat pilot. The letters from the family members, woven together with commentary by the editors, present a vibrant picture of the reality of the home front—rationing, bond drives, and the daily tension of war—through the people who lived it. Ordering information from Word Association Publishers, 1-800-827-7903.

## GEODIVERSITY & Geoconservation

**GUEST EDITOR: VINCENT L. SANTUCCI** 

### Geodiversity and Geoconservation: What, Why, and How?

Murray Gray

#### Introduction

JUST 100 MILES NORTH OF PHILADELPHIA, the location of the 2005 George Wright Society conference, and straddling Interstate Highway 476, the Northeast Extension of the Pennsylvania Turnpike, lies Hickory Run State Park. Through this protected area runs the outer limit of the last ice-sheet to flow southwards into the USA about 20,000 years ago. As a result, the park displays two very different landscape types that in turn have produced two distinctive sets of wildlife habitat.

The undulating nature of the western part of the park reflects the glacial deposition associated with the end moraine of the ice-sheet and the valley erosion associated with glacial meltwater rivers. The eastern part of the park is higher and was not covered by the ice, but was affected by periglacial processes. These included the frost disturbance of rock outcrops, the frost weathering of boulders, and the downslope movement of these boulders to accumulate in the famous Hickory Run Boulder Field, a National Natural Landmark and State Park Natural Area (Figure 1).

On the glaciated western side of the park, the end moraine is dominated by thin and moist soils, evergreen trees, and sphagnum moss bogs. Blackburnian warbler, redbreasted nuthatch, and northern water thrush inhabit this area, and in the spring spotted and Jefferson salamanders and wood frogs flock to the bogs to breed. On the other hand, the unglaciated eastern side of the park is dominated by beech and chestnut oak trees inhabited by the American redstart, red-eyed vireo, and Louisiana water thrush (Commonwealth of Pennsylvania 2004).

Hickory Run State Park therefore illustrates how the geological evolution of a landscape has produced a diversity of landforms and materials that in turn have provided a range of habitats in which biodiversity has evolved. We do not have to think too hard to understand that Hickory Run is only one example of these types of relationships. For example, think of the range of physical habitats within any one of the large Alaskan national parks, such as Denali, Glacier Bay, or Wrangell–St. Elias. And then contrast these glaciated mountain parks with others such as Hawaii Volcanoes,



Figure 1. Hickory Run National Natural Landmark. Note the graffiti on some stones. Photo courtesy of the author

Grand Canyon, Carlsbad Caverns, and Death Valley, and add in any national seashore and national river. This issue of *The George Wright Forum* contains papers outlining in detail several other examples illustrating similar physical/biological relationships. From this and other studies across the world, it can be argued that the Earth's biodiversity is largely due to the diversity of the geological world (geodiversity), and that for land management to be fully effective a holistic understanding and approach is necessary.

#### What is geodiversity?

"Geodiversity" can be defined simply as "the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (land form, physical processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems" (Gray 2004:8). The term first

appears in articles from Tasmania, Australia, in the mid-1990s (Sharples 1993; Dixon 1995; Kiernan 1996) and it is no coincidence that this immediately followed the adoption by many countries of the U.N. Convention on Biodiversity at the Earth Summit in Rio de Janeiro in 1992. The Tasmanian geoscientists realized that there are many parallels between biological diversity and diversity in the abiotic world. Using the terms "biodiversity" and "geodiversity" helps to indicate that nature consists of two equal components, living and non-living, and which, taken together, could help to promote a more holistic approach to nature conservation than the traditional biocentric focus.

Subsequently, the use of the term "geodiversity" has spread, particularly in Australia, where it is an integral part of the Australian Natural Heritage Charter (Australian Heritage Commission 1996, 2002), in Scandinavia (Johansson 2000), and in the United Kingdom (Gray 2004), where several local geodiversity action plans (LGAPs) mirror their biological equivalents (LBAPs) and where a report titled *State of Nature*— *Geodiversity* has been published (English Nature 2005). However, the term has yet to be adopted in the USA.

Geological diversity is illustrated by the 5,000 or so minerals known to exist in the world, some of which are very rare and could easily be lost. These diverse minerals, when combined with other factors, such as crystal or particle size, shape, and structure, create thousands of different named rock types. About a million fossil species have been identified, but probably millions more await discovery. There are 19,000 named soil series in the USA alone (Brady and Weil 2002). Less easily classified are landforms and topography. Some landform names, such as canyons, end moraines, and arches, are used widely, but much of the Earth's surface form does not fall neatly into a named landform category. There are also many commonly used names for physical processes, e.g., coastal erosion, landsliding, and glacial abrasion, but, when examined in detail, these processes become increasingly complex. Given the above brief discussion, the conclusion must be that there is as much geodiversity in the world as biodiversity.

#### Why should we conserve geodiversity?

Geodiversity ought to be conserved for two reasons. First, geodiversity is valuable and valued in a large number of ways, and second, it is threatened by a huge variety of human activities. It is a measure of a civilized and sophisticated society that it should want to conserve elements of the planet that are both valued and threatened (Gray 2004).

Values. Table 1 gives a summary of over 30 recognizable values of geodiversity with examples where appropriated from protected areas in the USA. These could be referred to as "geosystem services" to indicate equivalence with the common approach of ecosystem services often used to justify wildlife conservation. Many of them are included in the classification of intangible values given by Harmon and Putney (2003) and Harmon (2004), though here we focus specifically on the values of geodiversity.

Intrinsic or existence values are those associated with things simply for what they are rather than what they can be used for by humans *(utilitarian values)*. There is a large philosophical and ethical discussion on this topic in the literature, and interested readers are referred to, for example, Attfield (1999) and Beckerman and Pasek (2001).

Cultural values may originate from folklore associated with the origin of rock formations or landforms. For example, the columnar jointing of the Devils Tower National Monument in Wyoming is reputed to be the claw marks of a giant grizzly bear trying to reach a group of people on the summit. Cultural values are also associated with links between rock sites and archaeology. Obvious examples here are the Alibates Flint Quarries, Canyon de Chelly, Gila Cliff Dwellings, and Petroglyph National Monuments. Similarly, some geological features may have spiritual value. Examples include the sacred vision quest sites of North American Indians, such as Chief Mountain within Glacier National Park, Montana (Gulliford 2000) or the nearby Writing-on-Stone Provincial Park in Alberta, Canada. Many other present-day societies also feel a strong bond with their physical surround-

Intrinsic Value	1. Intrinsic value	Abiotic nature free of human valuations	
Cultural Value	2. Folklore	Devils Tower NM; Sleeping Bear Dunes NL	
	3. Archaeological/Historical	Alibates Flint Quarries NM; Petroglyph NM	
	4. Spiritual	Chief Mountain, Glacier NP	
	5. Sense of Place	John Muir at Yosemite	
Aesthetic Value	6. Local Landscapes	Sea views; sound of waves; touch of sand	
	7. Geotourism	Grand Canyon NP; Yellowstone, NP	
	8. Leisure Activities	Rock climbing; caving; skiing; hiking	
	9. Remote Appreciation	Nature in magazines and TV	
	10. Voluntary Activities	Footpath construction; mine restoration	
	11. Artistic Inspiration	Moran & Jackson at Yellowstone	
Economic Value	12. Energy	Coal; oil; gas; peat; uranium	
	13. Industrial Minerals	Potash; fluorspar, rock salt; kaolinite	
	14. Metallic Minerals	Iron, copper; chromium; zinc; tin; gold	
	15. Construction Minerals	Stone, aggregate; limestone; bitumen	
	16. Gemstones	Diamond; sapphire; emerald, onyx; agate	
	17. Fossils	Tyrannosaurus "Sue"; fossil & mineral shops	
	18. Soil	Food production; wine; timber; fiber	
Functional Value	19. Platforms	Building and infrastructure on land	
	20. Storage & Recycling	Carbon in peat and soil; oil traps; aquifers	
	21. Health	Nutrients & minerals; therapeutic landscapes	
	22. Burial	Human burial; nuclear waste chambers	
	23. Pollution Control	Soil and rock as water filters	
	24. Water chemistry	Mineral water; whisky; beer	
	25. Soil functions	Agriculture; horticulture; viticulture; forestry	
	26. Geosystem functions	Operation of fluvial, coastal, glacial processes	
	27. Ecosystem functions	Habitats and biodiversity	
Scientific Value	28. Geoscience Research	History of Earth; evolution; geoprocesses	
	29. History of Research	Early identification of unconformities, etc.	
	30. Environmental Monitoring	Climate change; sea-level change; pollution	
	31. Education & Training	Field studies; professional training	

Table 1. Summary of geodiversity values with some examples.

ings, allowing local inhabitants to develop a sense of place. John Muir developed a famously strong relationship with Yosemite, and today the parks are "a lifelong source of awe" for many (Pritchard 1995:xvi).

Aesthetic values relate to the valued impact on the senses instilled by many protected areas. John Muir (1901:56) invited us to "climb the mountains and get the good tidings. Nature's peace will flow into you as sunshine flows into trees." Today tourists are drawn to the stunning scenery of Glacier Bay, the grandeur of the Grand Canyon, the geothermal wonders of Yellowstone, or the rock colors of Zion. Geotourism is at least as popular as ecotourism. We also use the physical landscape for recreational activities. Skiing, rock climbing, caving, canyoneering, whitewater rafting, glacier hiking, all require specific landscapes or geological environments. Many valued landscapes have inspired painters, sculptors, poets, and musicians to create important works. Harmon (2004) notes the contribution of the landscape painter Thomas Moran and the photographer William Henry Jackson in bringing the scenic wonders of Yellowstone to the attention of the U.S. Congress and the general public.

*Economic values* of geodiversity include fuels such as coal, gasoline, and uranium; industrial minerals such as limestone, gypsum, and phosphates; metallic minerals; gemstones; and construction minerals such as building stone, aggregate, sand, clay, and bitumen. Most of these are non-renewable resources and their use and limits ought to be better understood than they are. Oil is an obvious example, leading to debates over the need for oil exploration in Alaska's Arctic National Wildlife Refuge.

Functional values include geosystem services of subsurface rocks as stores of

water, oil, and gas; as burial sites for nuclear waste and potentially for carbon dioxide; and as filters for water as it moves downwards to the water table. Soils are vital for agriculture, viticulture, and forestry, and are an important source of minerals vital for health, such as magnesium, zinc, calcium, selenium, and chromium. River channels perform the function of transporting water and sediment from land towards the sea and their capacity is adjusted to stream discharge. Beaches and sand dunes act to protect the coastline and inland low ground from coastal flooding. Many of these physical systems are in dynamic equilibrium and their continued functioning is vital to environmental systems. As outlined in the introduction, the physical environment also plays a huge role in providing diverse environments, habitats, and substrates that create and nurture biological diversity.

Finally, the physical world also provides opportunities for *research and education*. Research has given us a huge amount of knowledge about the history of the planet, the processes that shape it, the way in which climates have changed, and the evolution of life through time. It is important that the physical evidence for further research is conserved and to ensure that further studies and opportunities to train and educate professional geoscientists, university students, schools, and the general public are not lost.

**Threats.** Butcher and Butcher (1995) included a long discussion on threats to the U.S. national parks. These threats included dams and diversions, water pollution, geothermal drilling, air pollution, noise pollution, urban impacts both within or adjacent to parks, excessive numbers of cars, visitor use impacts, a science shortfall, and an "et cetera" category that included the impact of concession structures and operations, inap-

propriate recreational activities, and poaching.

These and other threats continue to have an impact of the georesources of the parks. River and coastal engineering works disrupt the operation of natural geomorphological processes. Leaching of polluted agricultural, mine, or sewage water continues to affect a number of parks. The threat of geothermal resource exploitation in Idaho on the Yellowstone system is still a concern. Urban impacts and car numbers have continued to increase and are a serious threat to several parks, as are visitor and recreational pressures, such as rock climbing at Devils Tower National Monument in Wyoming. And unauthorized fossil collecting is a continuing concern (Santucci 1999).

These human impacts may result in loss of, or damage to, important rocks, minerals, or fossils, remodelling of natural topography, loss of access or visibility, interruption of natural processes, pollution, or visual impacts. Figure 1 illustrates the problem of graffiti on the national natural landmark boulder field at Hickory Run.

As touched upon above, the sensitivity and vulnerability of georesources vary. "Sensitivity" refers to how easily features can be damaged. Some features, such as many cave deposits, are highly sensitive and very easily damaged even by merely walking on or touching them (Gray 2004). Others are much more robust with much higher thresholds of energy required to damage or remove them, and some can repair themselves, such as footprints on a beach which are removed by the next high tide. "Vulnerability" refers to the likelihood of damage given public access or lack of it. Obviously the greatest threats are to highly sensitive and vulnerable features and systems.

#### How should we conserve geodiversity?

Different elements of geodiversity need to be protected and managed in different ways. Table 2 is a possible general scheme. It distinguishes between rare and common occurrences since it is argued that geodiversity, and indeed the environment in general, should be respected both within and beyond protected areas. With these aims in mind we can then consider the detailed approaches required to meet the aims.

Clearly, creating a protected area with the supporting legislation and penalties is one approach but does not guarantee protection due to infringement of regulations or changes in political attitudes or funding. Fines are rarely substantial enough to deter commercial collectors. One of the most secure methods is to physically restrain visitors from reaching sensitive sites by fencing or even by placing them within specially constructed buildings. For example, the remaining easily accessible petrified tree at Yellowstone National Park is surrounded by a high fence to prevent illegal collecting (Figure 2). In other places at Yellowstone, boardwalks and fences encourage visitors not to stray onto delicate formations. At Craters of the Moon National Monument in Idaho, notices inform visitors that they are not permitted to stray from the paths because of the easily cracked lava surface. If we are dealing with rare fossils, minerals, or rocks, an effective means of protecting is burial *in situ* or removal and curation in a museum. This is often the approach taken with dinosaur and other fossils. A third effective way of conserving nature is for a nature conservation charity to buy sites with the remit of retaining them for their nature conservation value in perpetuity. An example is The Nature Conservancy, which owns Egg Mountain in Montana, famous

Category	Occurrence	Geoconservation Management Objective
Rock	Rare	Maintain integrity of outcrop and subcrop. Remove samples for curation.
	Common	Maintain exposure and encourage responsible collecting and curation.
Mineral	Rare	Maintain integrity of outcrop and subcrop. Remove samples for curation.
	Common	Maintain exposure and encourage responsible collecting and curation.
Fossils	Rare	Wherever possible, preserve in situ. Otherwise remove for curation.
	Common	Encourage responsible collecting and curation.
Landforms		Maintain integrity of landforms and restore/encourage authentic contouring.
Landscape		Maintain contribution of topography, rock outcrops and active processes to landscape and restore/encourage authentic contouring.
Processes		Maintain and restore integrity of operation.
Soils		Maintain soil quality, quantity and function.
Other georesources		Encourage sustainable use, and value that use in historic and modern contexts

Table 2. Geoconservation aims for the eight elements of geodiversity.

for its Maiasaur dinosaur finds (Horner and Dobb 1997).

Education has an important role to play in helping to conserve features. At Devils Tower National Monument, a climbing management plan has been introduced to monitor climbing impacts, educate climbers, retain rock faces that are currently free of bolts, and investigate whether some bolt holes can be repaired. Interpretation boards, leaflets, and trails can carry educational messages about nature conservation interests and the correct behavior in conserving them, as can ranger-led talks and walks.

Part of conservation should also include adequate scientific documentation about the geological interest of protected areas, promotion of further research as necessary, and a conservation management plan that is regularly updated. The latter should include a program for monitoring the con-

Figure 2. Fencing to protect a remaining petrified tree at Yellowstone National Park. *Photo courtesy of the author* 



dition of geoheritage assets within the protected area and an enhancement and restoration program to upgrade facilities and repair damage. The U.S. National Park Service's abandoned mineral lands program is an example of the latter, and successful land restoration schemes have been carried out at Redwood and Joshua Tree National Parks in California. Land management in general should aim to retain the integrity of landforms, landscapes, and active processes, and restore them authentically where possible.

#### Conclusions

Geoconservation should be driven by the need to conserve geodiversity, given its value and the real and potential threats to it. Without geodiversity there would be little biodiversity, and an integrated approach to nature conservation and sustainable land management ought to be obvious. Too many nature conservation organizations and objectives are riddled with institutional biocentrism. But geoconservation is at last being taken more seriously because it is impossible to have a sensible land management strategy that ignores the physical aspects of the environment, e.g., topography, soils, and physical processes. The concept of geodiversity provides a fundamental basis for geoconservation and deserves to be more widely adopted in North America. I hope this volume of *The George Wright Forum* helps to stimulate interest in and debate on these new ideas.

#### Acknowledgments

I am very grateful to Bob Higgins and Vince Santucci for inviting me to participate in the 2005 GWS conference and for their encouragement to develop and apply the concept of geodiversity. Matthew Bennett, Cynthia Burek, Lars Erikstad, and Jonathan Larwood kindly helped develop Table 2.

#### References

Attfield, R. 1999. *The Ethics of the Global Environment*. Edinburgh: Edinburgh University Press.

Australian Heritage Commission. 1996. *Australian Natural Heritage Charter*. 1st ed. Canberra: Australian Heritage Commission.

Australian Heritage Commission. 2002. *Australian Natural Heritage Charter*. 2nd ed. Canberra: Australian Heritage Commission.

- Beckerman, W., and J. Pasek. 2001. Justice, Posterity and the Environment. Oxford: Oxford University Press.
- Butcher, D., and R. Butcher. 1995. *Exploring our National Parks and Monuments*. 9th ed. Boulder: Roberts Rinehart Publishers.
- Commonwealth of Pennsylvania. 2004. A Recreational Guide for Hickory Run State Park. Philadelphia: Commonwealth of Pennsylvania.
- Dixon, G. 1995. Aspects of Geoconservation in Tasmania: A Preliminary Review of Significant Earth Features. Report to the Australian Heritage Commission, Occasional Paper no. 32. Hobart, Tasmania: Parks and Wildlife Service.
- English Nature. 2005. State of Nature—Geodiversity. Peterborough, U.K.: English Nature.
- Gray, M. 2004. Geodiversity: Valuing and Conserving Abiotic Nature. Chichester, U.K.: John Wiley & Sons.
- Gulliford, A. 2000. *Sacred Objects and Sacred Places: Preserving Tribal Traditions*. Boulder: University Press of Colorado.
- Harmon, D. 2004. Intangible values of protected areas: What are they? Why do they matter? *The George Wright Forum* 21:2, 9–22.
- Harmon, D., and A.D. Putney, eds. 2003. The Full Value of Parks: From Economics to the Intangible. Lanham, Md.: Rowman & Littlefield.
- Horner, J.R., and E. Dobb. 1997. *Dinosaur Lives: Unearthing an Evolutionary Saga*. San Diego: Harcourt Brace & Co.
- Johansson, C.E., ed. 2000. *Geodiversitet I Nordisk Naturvård*. Copenhagen: Nordisk Ministerråad.
- Kiernan, K. 1996. The Conservation of Glacial Landforms. Hobart, Tasmania: Forest Practices Unit.
- Muir, J. 1901. Our National Parks. Boston: Houghton, Mifflin.
- Santucci, V.L. 1999. *Palaeontological Resource Protection Survey Report*. Washington, D.C.: National Park Service, Ranger Activities Division and Geologic Resources Division.
- Sharples, C. 1993. A Methodology for the Identification of Significant Landforms and Geological Sites for Geoconservation Purposes. Hobart, Tasmania: Forestry Commission.
- Murray Gray, Department of Geography, Queen Mary, University of London, Mile End Road, London E1 4NS, United Kingdom; j.m.gray@qmul.ac.uk

### Application of Paleoecologic Methods to Coastal Resource Management: An Example from Biscayne National Park

#### G. Lynn Wingard

#### Introduction

THE NATION'S COASTAL ECOSYSTEMS HAVE CHANGED PROFOUNDLY during the last century due to human activities. The Estuary Restoration Act was passed by Congress in 2000 and a component of the act was to develop a *National Strategy to Restore Coastal and Estuarine Habitat* (NOAA 2002). The national strategy identifies the importance of establishing historical or baseline conditions within estuarine ecosystems "to determine rates of loss, evaluate threats and predict future trends for various habitat types and areas within the system" (NOAA 2002:2). The report continues: "The availability of historical information varies greatly from place to place. For some estuarine systems, historical maps ... along with anecdotal information on previous centuries may be available. For other systems, only limited anecdotal information may be available."

Understanding natural patterns and cycles of change that have occurred in a system prior to significant human disturbance is a critical component of restoration; however, land managers do not have to rely on historical maps or anecdotal information, as the above report suggests. Changes in ecosystems take place at many time scales, from diurnal to millennial, and it is not practical or even possible to directly observe change at these longer time scales. Basic paleoecologic methods have been successfully used in ecosystems around the country to determine short- and long-term patterns of change in the physical and biological components of ecosystems. In South Florida, these methods have been utilized to establish the ecosystem history of the Everglades, and those of the downstream estuaries of Biscayne Bay and Florida Bay.

#### Approach

An integrated approach to interpreting ecosystem history provides significant benefits. Data from different groups of plants and animals enhance the reliability of the results and provide an averaging effect to smooth out species-level responses. Data from different scientific disciplines allow researchers to derive information on many aspects of an ecosystem and to determine if synchronous changes have occurred in different components of the system. For example, if sediment geochemistry analyses detect an increase in nitrogen, paleoecologic assemblage analyses of the same sample will indicate if a corresponding change occurred in the fauna. While these data do

not prove cause-and-effect relationships, they point to areas where observation or experimentation in the living system might be worthwhile.

The process begins by locating areas that have sufficient sedimentary cover and as little bioturbation, storm disruption, and erosion as possible, within the area being evaluated. Once sites are identified, cores are collected using methods that minimize sediment disruption. Cores are x-rayed and described, then cut into samples 1 to 5 cm thick.

An age model for each core is derived using three methods, where possible. Lead-210 analysis establishes the chronology of the upper portions of the cores (see Holmes et al. 2001 for explanation of the methodology). Radiocarbon ages on shells or wood fragments provide data points for the lower portion of the cores. Additional confirmation of the age model comes from pollen of exotic flora with documented dates of introduction into the system. For South Florida, the first occurrence of Casuarina (Australian pine) pollen, an exotic introduced around the beginning of the 20th century (Langeland 1990), provides an excellent stratigraphic marker for the early 1900s.

The basic principles of paleoecology are utilized to interpret the faunal and floral assemblages in the core samples. Modern sites are established within the ecosystem for routine observation and sampling. Environmental parameters such as temperature, salinity, and pH of the water and the nature of the substrate are recorded along with information on the faunal and floral species living at each site. These data are entered into a database that is utilized for downcore interpretations. Comparison of the living biota to the core assemblage data allows us to develop a general picture of the environment at the time of deposition, including the range of salinities that existed, substrates, and availability of freshwater. (See Brewster-Wingard et al. 2001; Cronin et al. 2001; Ishman et al. 1998; Willard, Holmes, and Weimer 2001; and Willard, Weimer, and Riegel 2001 for examples of paleoecologic studies in South Florida.)

Biogeochemical analyses of the calcium carbonate tests of ostracodes, mollusks, or forams provide another method for deriving numerical salinity values for each segment of a core. A combination of ostracode and mollusk shell analyses can provide a powerful tool to reconstruct seasonal and annual salinity variations. Ostracode adult tests represent essentially instantaneous secretions recording the salinity and temperature at that point in time. Mollusks provide a nearly continuous record throughout the span of the individual's life. Experiments to calibrate molluscan shell chemistry to water chemistry are currently ongoing; however, calibration curves for the ostracodes have been successfully developed and utilized for South Florida (Dwyer and Cronin 2001; Dwyer et al. 2002).

Geochemical analyses of sediments are conducted to examine historical changes in nutrients, primarily carbon, nitrogen, phosphorous, and sulfur. Information on historical changes in nutrient elements in sediments reflects changes in nutrient load to the watershed from both natural and anthropogenic sources (Orem et al., 1999; Zielinski et al. 2000).

#### **Biscayne Bay**

**Setting.** Biscayne National Park is a unique subtropical preserve, sitting on the edge of the metropolis of Miami and containing part of the only living barrier reef in North America and the third-longest barri-

er reef in the world. The majority (95%) of the park's 172,924 acres is underwater, making Biscayne the largest underwater park in the national park system. The park itself contains four distinct environments: the mangrove coastline, the shallow waters of Biscayne Bay, the northernmost islands of the Florida Keys, and the reef tract.

The Greater Everglades Ecosystem encompasses most of southern Florida from the Kissimmee River southward, through Lake Okeechobee, into the freshwater marshes of Everglades National Park, and eventually into the estuaries of Biscayne Bay, Florida Bay, and the southwest coast.

Since the beginning of the twentieth century, Biscayne Bay and the Greater Everglades Ecosystem have undergone dramatic changes as the population of Miami-Dade County has grown from 4,955 residents in 1900 to 2,253,362 in 2000 (U.S. Census Bureau). As the population increased, so too did demands for protection from seasonal flooding and for potable water for the residents and for the growing agricultural area. A complex series of canals and water control structures, built throughout the 20th century, have altered the natural flow of freshwater through the wetlands and into Biscayne Bay. Along the shores of Biscayne Bay, power plants, water treatment plants, solid waste sites, and large-scale developments have stressed the ecosystem.

During the 1980s and 1990s, momentum began to build for restoration of a more natural freshwater flow throughout South Florida (National Research Council 2003), which led to the development of the Comprehensive Everglades Restoration Plan (CERP; USACE 1999). The primary goal of the CERP is to restore the timing, quantity, quality, and distribution of freshwater to the ecosystem so that it approximates the predevelopment conditions as closely as possible. The role of the U.S. Geological Survey (USGS) ecosystem history projects is to provide information on the pre-development conditions of the Everglades.

**Ecosystem history results and discussion.** Nine sites within Biscayne Bay, Card Sound, and Barnes Sound have been cored. Four of the locations are within the park boundaries; the other five are located at sites selected to examine changes in freshwater flow into the estuary (Figure 1). Paleoecologic, biochemical, and geochemical analyses on these cores provide information on historical changes in salinity and nutrient influx into the bay. Details of the core analyses are available in Wingard et al. (2003; 2004), but a brief summary is provided here.

Faunal and floral assemblages from cores at Middle Key and Manatee Bay (Figure 1) indicate that the southern end of the Biscayne system (Card Sound and Barnes Sound), had significantly more freshwater influx prior to 1900 than in the later half of the 20th century. Figure 2 illustrates changes in percent abundance of key indicator species throughout the core and over time. The fauna in the lower portion of Middle Key core, deposited prior to 1900, are predominantly freshwater gastropods (Figure 2, #1), but the environment begins to shift around 40 cm and increasing numbers of species typical of an upper estuarine environment appear (Figure 2, #2-4). Between 30 and 20 cm (approximately 1900), freshwater species begin to decline (Figure 2, #5), and concurrent increases occur in all estuarine species: mesohaline (upper estuary; 5-18 parts per thousand (ppt) dissolved salts), polyhaline (middle to lower estuary; 18-30 ppt), and euryhaline



Figure 1. Satellite image map of Biscayne Bay, Florida, showing sites where USGS cores were collected (circles) and the boundary of Biscayne National Park (dashed line). Source: Jones et al. 2001.

(tolerant of wide fluctuations in salinity from 10 to >40 ppt). At approximately10 cm, (Figure 2, #6) the freshwater and lowsalinity species (<10 ppt) almost disappear at the site, and the euryhaline species, tolerant of wide ranges in salinity from 10 to >40 ppt, become increasingly abundant. Similar changes are seen at the Manatee Bay core site, located 2.8 km (1.7 miles) to the south of the Middle Key core site (Figure 1).

Card Sound Bank is a shallow mudbank that extends from the mainland just north of Card Sound Bridge, over to the northern portion of Key Largo, effectively separating Card Sound and Barnes Sound (Figure 1). The lower portion of cores from Card Sound Bank indicate that the area has been transitional between a more restricted upper estuarine environment and a more open estuarine environment, fluctuating between these conditions over time (Figure 3, below dashed line). During the later part of the 20th century, however, more marine species and fewer euryhaline species are present (Figure 3, above dashed line). This shift in the faunal assemblage indicates a shift from an estuarine environment subject to frequent salinity fluctuations, to a more

Figure 2. Changes in salinity in Middle Key Basin (see Figure 1 for location), as indicated by percent abundance of key ostracode and mollusk indicators plotted against depth in cm, from Middle Key core (GLW603-MKA). Calendar year is indicated on right. Numbers on plots are referenced in text discussion; ppt is a measure of salinity in parts per thousand dissolved solids. Note different percent abundance scales.



Volume 22 • Number 3 (2005)

stable marine environment with fewer salinity fluctuations.

Moving north in Biscayne to the more open waters of the mid-bay, the faunal assemblages in cores from Featherbed Bank and No Name Bank (Figure 1) also show shifts from more fluctuating estuarine environments in the lower portions of the core (Figure 3, below dashed line) to more stable marine environments in the 20th century (Figure 3, above dashed line). Figure 3 compares indicator species at Card Sound Bank and at No Name Bank. The trends are very similar at the two sites, but based on our current age models, the environment at No Name began to shift towards more marine sooner than the environment at Card Sound Bank.

#### Implications and importance to managers

All nine cores demonstrate a common trend—an increase in salinity in the Biscayne Bay ecosystem in the 20th century. The timing of the onset of increased salinity varies at different core sites, and the indicator species differ, but there are no exceptions to this trend. Our preliminary age models indicate that a combination of factors is at work. The earlier onset of increased salinity in the more open portion of the bay at No Name and Featherbed

Figure 3. Comparison of changes in salinity from Card Sound Bank core (SEI297-CB1) and No Name Bank Core (GLW402-NNB)(see Figure 1 for locations) as indicated by percent abundance of key ostracode, mollusk, and foram indicators plotted against depth in cm. Calendar year is indicated on right for No Name Bank core; age model for Card Sound Bank has not been completed. Dashed lines are referenced in text discussion; ppt is a measure of salinity in parts per thousand dissolved solids. Note different percent abundance scales.



The George Wright Forum

Banks, compared with Card Sound Bank and the southern portion of the ecosystem, implies a rise in sea level. The more rapid and dramatic shifts seen in nearshore cores (for example at the top of the Middle Key core) indicate other factors are involved. A number of potential factors could explain the increase in salinity in Biscayne Bay: decreases in runoff entering the bay due to canal construction and water management practices, decreases in rainfall, decreases in groundwater upwelling, increases in evaporation, and a rising sea level. We are currently working on refining our age models and correlating results to known events affecting the bay.

The trend of increasing salinity has immediate and long-term implications for resource managers at Biscayne National Park. In the park's science overview document (NPS 2000), it is stated that "science aids in stewardship of resources" by answering questions such as "How does the condition of our resources change over time?" As Biscayne Bay becomes increasingly marine, the biodiversity and, ultimately, the distribution of the environments within the park will shift.

From the restoration perspective, it is important to understand what component of the increased salinity is due to natural patterns (sea level rise, climate change), and what is anthropogenically induced. Although the goal of restoration is to return to a predisturbance state, this may not always be possible. If a system has undergone sig-

nificant natural change, such as sea level rise, the effects cannot be reversed within the scope of restoration; however, the component of change due to anthropogenic factors, such as changes in freshwater influx, may be corrected. The results of this research can be used by the restoration managers to set realistic targets and performance measures for restoration. In setting target salinity values, the immediate implications of our findings are the following: (1) significant spatial and temporal variations occur within the system, so separate target values need to be established for different habitats; (2) targets must incorporate the natural range of variation (minimums and maximums) that has existed in the past, and not focus on mean values; and (3) nearshore sites are dramatically different from the mid-bay mudbanks and have been for hundreds of years, so changes in freshwater influx during restoration will have little effect on the central portions of the bay.

Natural systems are not static—they evolve and change over time. So as society attempts to manage and restore these systems, it is important to look at natural patterns of change. Examining decadal to centennial trends in a variety of habitats within an ecosystem using basic paleoecologic methods provides resource managers with the information necessary to make informed decisions and to enlighten the public on what the natural system of the bay looked like prior to significant human alteration of the environment.

#### References

Brewster-Wingard, G.L., J.R. Stone, and C.W. Holmes. 2001. Molluscan faunal distribution in Florida Bay, past and present: an integration of down-core and modern data. In *Paleoecological Studies of South Florida*. B.R. Wardlaw, ed. *Bulletins of American Paleontology* 361, 199–232.

- Cronin, T.M., C.W. Holmes, G.L. Brewster-Wingard, S.E. Ishman, H.J. Dowsett, D. Keyser, and N. Waibel. 2001. Historical trends in epiphytal ostracodes from Florida Bay: implication for seagrass and macro-benthic algal variability. In *Paleoecological Studies of South Florida*. B.R. Wardlaw, ed. *Bulletins of American Paleontology* 361, 159–198.
- Dwyer, G.S., and T.M. Cronin. 2001. Ostracode shell chemistry as a paleosalinity proxy in Florida Bay. In *Paleoecological Studies of South Florida*. B.R. Wardlaw, ed. *Bulletins of American Paleontology* 361, 249–276.
- Dwyer, G.S., T.M. Cronin, and P.A. Baker. 2002. Trace elements in ostracodes. In Applications of the Ostracoda to Quaternary Research. J.A. Holmes and A.R. Chivas, eds. American Geophysical Union Monograph 131, 205–225.
- Holmes, C.W., J. Robbins, R. Halley, M. Bothner, M.T. Brink, and M. Marot. 2001. Sediment dynamics of Florida Bay mud banks on a decadal time scale. In *Paleoecological Studies of South Florida*. B.R. Wardlaw, ed. *Bulletins of American Paleontology* 361, 31–40.
- Ishman, S.E., T.M. Cronin, G.L. Brewster-Wingard, D.A. Willard, and D.J. Verardo. 1998. A record of ecosystem change, Manatee Bay, Bay, Barnes Sound, Florida. *Journal of Coastal Research* 26, 125–138.
- Jones, J.W., J.C. Thomas, and G.B. Desmond. 2001. South Florida Everglades Satellite Image Map. USGS Miscellaneous Investigations Series Map no. I-2742, 2 sheets, scale 1:100,000. On-line at http://sofia.usgs.gov/projects/remonte\_sens/sflsatmap.html.
- Langeland, K. 1990. *Exotic Woody Plant Control*. Florida Cooperative Extension Service Circular no. 868.
- National Research Council. 2003. Science and the Greater Everglades Ecosystem Restoration: An Assessment of the Critical Ecosystem Studies Initiative. Washington, D.C.: National Academies Press.
- NOAA [National Oceanic and Atmospheric Administration]. 2002. National Strategy to Restore Coastal and Estuarine Habitat. Arlington, Va.: Restore America's Estuaries. On-line at http://era.noaa.gov/htmls/support/sup\_natstrat.html.
- NPS [National Park Service]. 2000. Science in the park [Biscayne National Park]. On-line at http://www.nps.gov/bisc/manage/science.htm.
- Orem, W.H., C.W. Homes, C. Kendall, H.E. Lerch, A.L. Bates, S.R. Silva, A. Boylan, M. Corum, M. Marot, and C. Hedgman. 1999. Geochemistry of Florida Bay sediments: nutrient history at five sites in Eastern and Central Florida. *Journal of Coastal Research* 15:4, 1055–1071.
- USACE [United States Army Corps of Engineers]. 1999. Central and Southern Florida Project Comprehensive Review Study: Final Integrated Feasibility Report and Programmatic Environmental Impact Statement. Jacksonville, Fla.: USACE. On-line at http://www.evergladesplan.org/about/rest\_plan.cfm.
- Willard, D.A., C.W. Holmes, and L.M. Weimer. 2001. The Florida Everglades Ecosystem: climatic and anthropogenic impacts over the last two millennia. In *Paleoecological Studies of South Florida*. B.R. Wardlaw, ed. *Bulletins of American Paleontology* 361, 41–55.
- Willard, D.A., L.M. Weimer, and W.L. Riegel. 2001. Pollen assemblages as paleoenviron-

mental proxies in the Florida Everglades. *Review of Palaeobotany and Palynology* 113, 213-235.

- Wingard, G.L., T.M. Cronin, G.S. Dwyer, S.E. Ishman, D.A. Willard, C.W. Holmes, C.E. Bernhardt, C.P. Williams, M.E. Marot, J.B. Murray, R.G. Stamm, J.H. Murray, and C. Budet. 2003. Ecosystem History of Southern and Central Biscayne Bay: Summary Report on Sediment Core Analyses. U.S. Geological Survey Open File Report no. 03-375. Online at http://sofia.usgs.gov/publications/ofr/03-375/.
- Wingard, G.L., T.M. Cronin, C.W. Holmes, D.A. Willard, G.S. Dwyer, S.E. Ishman, W. Orem, C.P. Williams, J. Albietz, C.E. Bernhardt, C. Budet, B. Landacre, T. Lerch, M.E. Marot, and R. Ortiz. 2004. *Ecosystem History of Southern and Central Biscayne Bay: Summary Report on Sediment Core Analyses—Year Two*. U.S. Geological Survey Open File Report no. 2004-1312. On-line at http://sofia.usgs.gov/publications/ofr/2004-1312/.
- Zielinski, R.A., K.R. Simmons, and W.H. Orem. 2000. Use of U-234 and U-238 isotopes to identify fertilizer-derived uranium in the Florida Everglades. *Applied Geochemistry* 15:3, 369–383.
- G. Lynn Wingard, U.S. Geological Survey, MS 926A, National Center, Reston, Virginia 20192; lwingard@usgs.gov

### The Geological Foundation for Prescribed Fire in Mammoth Cave National Park

#### Rick Olson and Caroline Noble

#### Karst landscape overview

THE 52,830 ACRES OF MAMMOTH CAVE NATIONAL PARK are part of the South-Central Kentucky Karst, which is characterized by subterranean drainage to springs on major rivers. From the southeast to the northwest portion of the landscape (Figure 1), there is a gradient of decreasing maturity in karst development, which corresponds to the regional dip of the bedrock. The major cave-bearing limestones are barely exposed in the northwest part of the park, so cave development there is in the earliest stages. The Sinkhole Plain located south of the park is an example of highly developed karst, and the geology here had profound effects on fire propagation and vegetation until land use changes that came with settlement.

#### Surface habitat types in the park

A vegetation habitat classification was developed for Mammoth Cave National Park that combines bedrock geology, slope, and aspect in the park's GIS (geographic information system; Olson and Franz 1998). For a given climate, bedrock geology largely determines soil type, and whether surface or subsurface (karst) drainage prevails. Due to the tendency for subsurface drainage to develop in calcareous bedrock such as limestone, these sites will be more

Figure 1. Simplified geology map of Mammoth Cave National Park. Note the connectivity between the Sinkhole Plain and the major karst valleys within the park. Fires set by Native Americans on the sinkhole plain could have easily spread to the karst valleys, although there is no documentation of that. Note also that the habitat type in the valleys is the same as on the Sinkhole Plain, and the lack of water due to underground drainage can facilitate fire propagation.



xeric (dry) than an equivalent situation underlain by sandstone or shale. The magnitude of this general difference appears to be minimized on the steepest exposures due to rapid surface drainage.

One significant attribute of the habitat map is that natural physical influences on vegetation types are made clear in a quantitative way that is not attainable by direct study of geological quadrangle maps (see Table 1). This is especially important given the complex history of cultural disturbance over the past two centuries since settlement, and the profound impact on vegetation patterns seen today. The vast majority of coniferous forest stands in the park today are linked to pre-park agriculture. Local environmental conditions amenable or inimical to fire are controlled directly and indirectly by the factors that determine habitat type. For example, at over 9,000 acres, the calcareous mesic habitat type is important for two reasons: the change in fuel type on these shaded slopes (Tim Sexton, NPS national fire ecologist, pers. comm., 2000), and the fact that the great linear extent of these habitat patches will impede the progress of fire across the landscape.

Table 1. Areal extent of habitat classes in the park. Habitat types in regular typeface are capable of carrying fire during the spring and fall fire seasons. These habitat types account for approximately three-fourths of the park. Habitat types in bold, which account for approximately one-fourth of the park, do not support fire-dependent or -tolerant plant communities.

Habitat Type	Acreage	Percentage of park	
Calcareous xeric	150	<1	
Calcareous sub-xeric	$15,\!400$	30	
Calcareous mesic	9,050 18		
Calcareous supra-mesic	130	<1	
Acid xeric	60	<1	
Acid sub-xeric	2,500	5	
Acid mesic	20,000	40	
Acid supra-mesic	1,000	2	
Alluvium	2,700	5	

#### Park vegetation and fire regime in relation to geology

Vegetation in the park was classified into seven categories (Table 2) and mapped in the park GIS based upon individual sorting of 200 Landsat satellite spectral data channels using the habitat map as a guide (Olson et al. 2000). This vegetation classification was condensed in order to facilitate designation of fuel types for the park's fire management plan. Fuel model and fire regime group designations were completed by fire ecologist Caroline Noble of the National Park Service's (NPS's) Southeast Regional Office. Fire regimes groups were estimated based on current vegetation. The fire regime classification system utilized is that from Schmidt et al. (2002).

Vegetation	Habitat Type	Typical Species	Fire Regime Group
1. Subxeric deciduous	Acid subxeric	chestnut oak	I
forest / savanna		post oak	Frequent, 0–35
		-	years, surface and
	Calcareous subxeric	chinkapin oak	mixed severity
		blackjack oak	
		post oak	
2. Mesic upland	Acid Mesic	white oak	Ι
deciduous	Calcareous subxeric	pignut hickory	Frequent, 0–35
	(thin beds)	black oak	years, surface and mixed severity
3. Mesic hollow /	Calcareous mesic	sugar maple	V
floodplain	Acid mesic	beech	Rare, >200 years,
deciduous forest	Alluvium	box elder	stand replacement
		sycamore	severity
4/5. Mixed deciduous	Acid mesic	red maple	III
/ coniferous		tulip poplar	Infrequent, 35-100
Mixed coniferous /	Calcareous subxeric	dogwood	years, surface and
deciduous forest	Alluvium	sweetgum	mixed severity
		cedar/pine	
6. Coniferous forest	Acid xeric to mesic	Virginia pine	III
	Calcareous xeric to subxeric	eastern red cedar	Infrequent, 35–100 years, surface and
			mixed severity
7. Prairie/open area	Calcareous subxeric	native grasses	II
	Acid mesic	and forbs	Frequent, 0–35
		mown grass	years, stand
			replacement
			severity

Table 2. Vegetation, habitat types, and typical species. Habitat type nomenclature follows the system of the Kentucky State Nature Preserves Commission (Evans 1991). "Acid" refers to noncarbonate bedrock, which results in acid soil, and "calcareous" refers to carbonate bedrock, which results in more alkaline soil. "Xeric" refers to dry areas, "mesic" to moist, and "alluvium" to river-lain sediments. In subxeric deciduous forest, chestnut oak and chinkapin oak sort very distinctly with sandstone and limestone substrates respectively, whereas blackjack and post oaks are less selective. With periodic fire, these forest stands may have been a more open woodland or savanna in the past.

Within mesic upland oak-hickory forests, the chemical and hydrological influence of relatively thin limestone units interbedded with sandstone on the ridges is muted in comparison with the thick limestone beneath karst valleys. This is due to weathered sandstone residuum on top of the limestone, and the limited degree of karst development possible. Karst usually leads to drier surface conditions due to subsurface drainage, but (paradoxically) upland swamps perched on sandstone may have originated as sinkholes in these thinner carbonates, such as the Haney limestone.

Mesic hollow deciduous forests are most prominent in ravines directly connected with the Green and Nolin River floodplains, but small outliers exist in karst valleys in the bottoms of large sinkholes. In addition to beech and maple, black cherry and black walnut can be locally prevalent. Floodplain forests are characterized by sycamore, silver maple, and river birch near streams, and box elder slightly further from the water. Mesic hollows were left relatively undisturbed due to the rugged terrain, which cannot be said for the once heavily farmed floodplain. Being superbly adapted to the highly disturbance-prone gravel bar habitat, sycamore trees are also found wherever significant disturbance has occurred, such as along roads. In exceptionally moist sandstone hollows, mostly found in the northwest extremity of the park, relict stands of hemlock and yellow birch are found. None of these stands are considered to be fire adapted.

Mixed deciduous/coniferous (and vice versa) forests in the park are overwhelmingly successional after pre-park pasture and row crop use. These old fields are generally found in three habitat types: (1) on relatively level uplands with interbedded sandstone and limestone, (2) in subxeric limestone habitats found in karst valleys, and (3) on floodplain alluvium. The nonsuccessional mixed stands are found in sunny, xeric habitat types with the plant community specific to the geologic substrate. Virginia pine associated with chestnut oak is found at the tops of tall sandstone cliffs, and eastern red cedar with chinkapin oak is found on relatively steep limestone slopes. Many of these stands appear to be virgin in contrast to the profoundly disturbed old fields. On xeric limestone sites, solutional features called *rillenkarren* indicate that the thin soil and exposed bedrock is not due to post-settlement erosion.

Coniferous forests in the park, like the mixed stands previously discussed, are overwhelmingly successional after pre-park agriculture. Stands in karst valleys are dominated by eastern red cedar, and those on sandstone uplands are mostly Virginia pine, but considerable mixing occurs.

Prairie in the park is limited to small areas, each no greater than 40 acres, and none can be considered actual remnants from presettlement times. Even so, these areas are rich in prairie grasses and forbs, such as big bluestem, Indian grass, goldenrod, and tall coreopsis. They serve as refuges for species marginalized by conversion of former prairie on the sinkhole plain to agriculture, and by fire suppression within and beyond park boundaries (Seymour 1997). Other open areas in the park are largely mown roadsides, cemeteries, and lawns around developments maintained in fescue.

#### Selection of prescribed fire areas

The process for selection of prescribed fire areas with ecological criteria was GISbased and is shown graphically in Figure 2. Only habitat types that would naturally support fire-dependent or -tolerant vegetation communities were included. Next, vegetation was considered, and the overwhelming majority of prescribed fire areas consisted of vegetation mature enough to benefit from fire. Limited areas of successional vegetation were included as part of an adaptive management strategy, and fire should be

**Geodiversity & Geoconservation** 



Figure 2. Prescribed fire areas (lettered areas at upper right) were selected on the basis of habitat types (lower left) and vegetation types (center) that are ecologically appropriate for application of fire. GIS-based screening for cultural resources was also conducted.

applied in these areas with caution and careful study of what the restoration goals should be for each habitat and vegetation type.

## Setting fire restoration targets for park vegetation communities

Geology and archaeology provide clues to past vegetation and the role of fire. Miles of cave passages within the park contain abundant artifacts left by Native Americans, mostly between 2,000 and 3,000 years ago. Much of this ancient material consists of plant remains from various uses, and these artifacts provide insight into some presettlement vegetation characteristics under similar climatic conditions (Watson 1969; Watson et al. 1974; Olson 1998). These plant remains preserved in park caves indicate that vegetation conditions other than closed-canopy forest existed since light intensity on the ground beneath a closed canopy would have been inadequate. Given this evidence from park caves, it would not be unreasonable to set a restoration target for some portion of the mesic upland deciduous forest to be open woodland or savanna.

#### The question of presettlement vegetation in karst valleys

Historically and prehistorically, barrens bordered by savanna covered large portions of the Sinkhole Plain. Barrens are similar to prairie, and botanist Francois Michaux made some geological observations while studying vegetation in the summer of 1802: "It appears there are a great number of subterraneous caverns in the Barrens, some of which are very near the surface.... We remarked in these meadows several holes, widened at the top in the shape of funnels, the breadth of which varies according to depth" (Michaux 1805). In doing so, he noted both caves and sinkholes, which are the geological foundation for fire-dependent barrens vegetation on the Sinkhole Plain. The lack of surface streams and relatively level terrain facilitates propagation of fire. Karst valleys within the dissected upland of the Mammoth Cave Plateau offer an identical habitat type to the Sinkhole Plain in smaller parcels (see Figure 1), but no historical descriptions of presettlement vegetation have been found.

The ecology of shingle oak (Quercus imbricaria) offers some insights into presettlement vegetation. Locally, shingle oak is common and almost exclusively found in karst valleys and the Sinkhole Plain in and near the park, especially at the edge of forest openings (Olson 2003). The fidelity of this species with karst valleys is remarkable. It is rare at any location up on Mammoth Cave Plateau lands that surround all of these vallevs. If the occurrence of shingle oak were simply linked to forest openings, then we would expect to find this species up on the plateau since forest openings are common. Shingle oak was historically reported on the Sinkhole Plain near the edges of sinks where fire would be less intense (Baskin and Baskin 1981). In a study of savanna restoration, shingle oak was found to be more fire-resistant than black cherry, and less resistant than bur oak (Hruska and Ebinger 1995). Significantly, this mediumsized tree is an edge species found at transitions between grassland and forest vegetation. The high frequency of shingle oak in karst valleys within the park, the virtual absence of this species on the surrounding Mammoth Cave Plateau even at forest edges, and the presence of shingle oak out on the Sinkhole Plain where prairie maintained by fire was documented, all lead to the hypothesis that presettlement vegetation in the park's karst valleys was at least a mosaic of grassland and forest. Therefore, consideration should be given to pursuing this as a working hypothesis with restoration goals set limited in scale.

## Fire effects monitoring and adaptive management

The park has been implementing a fire effects monitoring program utilizing the NPS standard fire monitoring protocol methodologies since 2002. While limited sample size precludes statistically conclusive evidence, the general trend appears to be toward achieving stated objectives in target prescribed-fire communities. A limitation of the fire effects monitoring program is that monitoring is not currently occurring in nontarget communities, primarily due to staffing and funding constraints.

These nontarget communities have been a source of struggle for park staff as they try to balance the application of prescribed fire in previously agreed-upon areas while limiting the application of fire in adjacent nontarget mesic sites. The park fire management plan states that "portions of these very moist habitat types will be included within a prescribed fire unit to make the fire line safer and easier to manage, but this fire-intolerant vegetation will not be forced to burn." Balancing these operational and ecological goals is best achieved through collaborative planning and communication prior to burn implementation. The fire effects data and ecologists play a key role in facilitating this adaptive management process.

#### Acknowledgment

Many thanks to NPS fire ecologist Lisa McInnis for critical review of the manuscript.

#### References

- Baskin, J., and C. Baskin. 1981. The Big Barrens of Kentucky not part of Transeau's Prairie Peninsula. In *The Prairie Peninsula—in the "Shadow" of Transeau*. Proceedings of the Sixth North American Conference. R. Stuckey and K Reese, eds. Columbus: Ohio State University.
- Evans, M. 1991. *Kentucky Ecological Communities*. Draft. Frankfort: Kentucky State Nature Preserves Commission.
- Hruska, M., and J. Ebinger. 1995. Monitoring a savanna restoration in East-Central Illinois. Transactions of the Illinois State Academy of Science 88, 109.
- Michaux, F.A. 1805. Travels to the West of the Allegheny Mountains in the States of Ohio, Kentucky, and Tennessee. Reprint edition: R.G. Thwaites, ed. 1904. Early Western Travels, 1748–1846. Volume III. Cleveland: Arthur Clark Co.
- Olson, R. 1998. Torch fuels used by prehstoric Indian cavers: their utility and botanical significance. In *Proceedings of Mammoth Cave National Park's Seventh Science Conference*. Mammoth Cave National Park, Ky.: NPS, 5–8.
  - -----. 2003. The ecological significance of shingle oak (Quercus imbricaria) in karst valleys within Mammoth Cave National Park. Paper presented at the Fifth Annual Western Kentucky University Biodiversity Conference, Bowling Green, Kentucky, November 6–8.
- Olson, R., and M. Franz. 1998. A vegetation habitat classification for Mammoth Cave National Park. In Proceedings of Mammoth Cave National Park's Seventh Science Conference. Mammoth Cave National Park, Ky.: NPS, 19–25.
- Olson, R., M. Franz, and G. Ghitter. 2000. A vegetation map of Mammoth Cave National Park using satellite remote sensing data. *Proceedings of the Eighth Mammoth Cave Science Conference*. In press.
- Pennell, F. W. 1935. The Scrophulariaceae of Eastern Temperate North America. Lancaster, Pa.: Wickersham Printing Co.
- Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann, and D.L. Bunnell. 2002. Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management. General Technical Report RMRS-GTR-87. Fort Collins, Colo.: U.S. Department of Agriculture–Forest Service, Rocky Mountain Research Station.
- Watson, P.J., ed. 1969. The Prehistory of Salts Cave, Kentucky. Illinois State Museum Reports of Investigations no. 16.
- -----. 1974. Archaeology of the Mammoth Cave Area. New York: Academic Press.
- Rick Olson, Division of Science and Resources Management, Mammoth Cave National Park, P.O. Box 7, Mammoth Cave, Kentucky 42259; rick\_olson@nps.gov
- Caroline Noble, National Park Service Southeast Region, Tall Timbers Research Station, 13093 Henry Beadel Drive, Tallahassee Florida 32312; caroline\_noble@nps.gov

### Historical Perspectives on Biodiversity and Geodiversity

#### Vincent L. Santucci

#### Introduction

THE CONCEPT OF GEODIVERSITY HAS COME TO RECENT ATTENTION largely due to the work and publications of geologist Murray Gray. In his book, *Geodiversity: Valuing and Conserving Abiotic Nature*, Gray presents a comprehensive thesis assessing the role and significance of abiotic resources upon biotic resources (Gray 2004).

A basic premise of the geodiversity concept recognizes that there is an intrinsic relationship between biological diversity and geological diversity. In principle, the geologic bedrock is viewed as the foundation of the ecosystem. Geologic resources and processes sustain much greater relationships with biotic resources and biosystems than is commonly recognized. These relationships are integrated at the ecosystem, community, species, organism, cellular, and genetic levels.

The relationship between biodiversity and geodiversity can be evaluated in modern environments or past environments (paleoenvironments). Gray's book presents a multitude of examples from around the world demonstrating the inherent relationships and patterns between modern biotic and abiotic resources. Similarly, the fossil record preserves excellent examples of relationships between ancient organisms and paleoeenvironments. Research focused on paleoecological changes or trends over time may enable greater understanding of the influences that geologic resources may have exerted over biotic resources in the past.

#### Modern relationships

In recent decades the relationships between biodiversity and geodiversity have become more recognized by modern ecologists and natural resource specialists. An increasing number of research publications and conferences focus on the integration of modern "bio-geo systems." The relationships can be examined at the microscopic through the global levels of resolution. Below are a number of examples of how geologic resources and geodiversity influence biotic resources.

**Climate.** Climate can be influenced locally by geologic features and processes. Mountain ranges can impact wind speeds and directions, as well as form rain shadows. Volcanic eruptions generating large volumes of ash may be transported great distances and influence regional climatic conditions.

**Hydrology**. Hydrology is largely controlled by geology and geomorphology. The distribution of drainages, watersheds, aquifers, seeps, and springs are linked to lithologic and stratigraphic contacts and geomorphic features. Lakes form within calderas, karst topography, periglacial zones, and where landslides or basalt flows dam river valleys. Additionally, water chemistry, salinity, and other variables influencing biodiversity are directly associated with geologic resources.

**Soils.** Soils are the link between the abiotic and biotic worlds. Soil composition and chemistry are directly related to the underlying bedrock. Consequently, the distribution of many plant taxa is dependent upon the mineralogical and chemical composition of the soil. Resource management staff at Capitol Reef National Park have been able to use geologic maps and soils maps to locate rare and endangered species of cacti which grow directly and sometimes exclusively within soils developed in the Jurassic Morrison Formation.

**Habitat.** The diversity of geologic features and processes provides an almost infinite array of habitat types to sustain life. Changes in elevation between intermontane basins and mountain ranges typically transcend multiple life zones; geothermal springs sustain nutrients and temperatures required by certain forms of cyanobacteria (Figure 1); caves fissures, talus slopes, and gypsum sands support species adapted to survive in these geologic environments.

**Biogeographic distribution.** The geographic distribution of fauna and flora is well studied. Range maps for modern species are typically illustrated in natural history field guides. Geographic ranges and migration routes are often influenced by surficial geomorphology. Mountain ranges, canyons, deserts, water bodies, and other geologic features may either represent corridors or barriers to migration. Paleontological records show that historic ranges for taxa may change over time, often related to geologic factors. Continental drift and changes in sea level can result in the connection or separation of land masses, in turn resulting in either the direct competition or geographic isolation of biota.

#### Historical geologic and biological views

Geologists are trained to assess the past through evidence and information preserved within rock units. Discernable characteristics such as mineral composition, sediment textures, morphology, and bedding often yield detailed information regarding ancient depositional environments.

Not all paleontologists spend their careers hunting for dinosaurs. Scores of specialists have dedicated their careers in order to establish scientific credibility in the fields of paleoecology, paleogeography, paleoclimatology, and related disciplines. The opportunity to assess both geologic and paleontologic data over long spans of geologic time is powerful. Historic biological and historic geologic data discernable in the stratigraphic record may be of great benefit to the modern ecologist.

Geologic time scale. The division of geologic time is not arbitrary, but has been based upon significant geologic and paleobiologic events. Major boundaries established in the geologic time scale often represent mass extinction and speciation events. Research from around the world, which has been incorporated into the geologic time scale, consistently support the concept of changes in past biodiversity are often tied to changes in geodiversity.

**Extinction.** Extinction has been comprehensively examined by both modern biologists and paleobiologists (Raup and Sepkoski 1982, 1986). Despite the hopes and efforts to establish a simple explanation for extinction, such as a meteor impact, our

understanding of extinction remains limited. Certainly mass extinctions, which transcend taxonomic boundaries, are somehow linked to large-scale change in abiotic resources.

**Speciation.** Just as biodiversity is dependent upon geodiversity, biodiversity is a function of genetic diversity. Questions pertaining to systematics and evolution are typically better addressed by way of paleontological resources than by modern species. The fossil record contains an abundance of evidence to derive

phylogenetic relationships and evolutionary trends (Raup 1981).

**Origin of life.** The adaptability of life is well demonstrated in the geothermal pools of Yellowstone National Park. Cyanobacteria thrive within the high-temperature, mineral-rich hot springs, demonstrating an interesting example of a close relationship between biotic and abiotic resources. The existence of high-temperature cyanobacteria in Yellowstone hot springs is considered important in research associated with the origin of life on earth and the existence of life on other planets (Reysenbach, in press).

**Early biodiversity** / **Ediacara fauna.** One of the most interesting and important paleontological discoveries occurred in a series of very old rocks in the Ediacara Hills of Australia (McMenamin 1998). Finegrained Precambrian sedimentary rocks, deposited in a low-energy environment, preserve beautiful and delicate remains of soft-bodied organisms (Figure 2). These rare and unusual life forms provide an exceptional view of early biodiversity on earth.



Figure 1. Cyanobacteria in a thermal pool at Yellowstone National Park. *Photo courtesy of the author* 

The rich Ediacaran fauna overturned the long-held misconception that biological diversity during the Precambrian was low. In fact, since the discovery at Ediacara, fieldwork in Precambrian rocks has yielded numerous other localities around the world preserving these mysterious soft-bodied organisms—experiments in the early evolution of life.

**Cambrian explosion.** The beginning of the Paleozoic, referred to as the Cambrian, is defined by the almost sudden, worldwide explosion of life forms, in terms of both diversity and abundance. This perceived biotic explosion is more directly tied to the chemical evolution of the atmosphere



Figure 2. An Ediacaran fossil. Photo courtesy of the author

with sufficient concentrations of oxygen available for organisms to precipitate calcium carbonate exoskeletons. Over the past 4 billion years, life has continued to evolve, diversify, and become integrated into communities and ecosystems.

Plate tectonics / continental drift. Modern geologic theory is based upon an understanding that the Earth's crust consists of plates. These plates are dynamic and mobile. Geologists believe that the continental landmasses of today were once part of a single landmass referred to as *Pangaea*. The distribution of identical fossil genera from Permian rock units, exposed across four widely separated continents, provides strong evidence for the original proximity of these organisms and landmasses.

**Mountain building** / orogeny. The geographic range and migration routes of species can be defined by geologic and geomorphic features. The uplift of mountain chains, development of canyons, and expansion of lakes are examples of geologic processes which may influence the distribution and movement of biotic resources.

Visitors to Grand Canyon National Park may learn about the story of the tasseleared squirrels. The Abert's squirrel and Kaibab squirrel are believed to be descenquences, representing eustatic sea-level changes, punctuate the Paleozoic era. During the Cretaceous period, a shallow inland sea extended from the Gulf of Mexico to the Arctic Ocean. This Cretaceous sea existed for millions of years, geographically isolating populations of terrestrial plants and animals.

**Continental glaciation.** Four cycles of glacial advance and retreat are documented during the Pleistocene. Continental ice sheets expanded and withdrew in northern latitudes. During periods of glacial advance, a worldwide drop in sea level was experienced. The drop in sea level, combined with the expanded ice sheet, resulted in a direct connection between Alaska and Russia, referred to as the *Bering Land Bridge*.

**Megafaunal migration.** Changes in sea level, expansion of continental ice sheets, and the development of land bridges enabled terrestrial species to migrate into adjacent land masses. During the Pleistocene, large mammals and humans were able to migrate across the Bering Land Bridge. In turn, these mammals came into direct competition with existing species.

Pleistocene cave deposits. Pleistocene / Holocene climate changes can be docu-

dents of a common ancestor. With the development of the Grand Canyon, two populations of the squirrel were geographically isolated. Eventually the isolated populations evolved into distinct taxa (Figure 3).

**Sea-level changes.** The geologic record preserves abundant evidence of changes in worldwide sea level. Transgressive and regressive se-



Figure 3. An example of geomorphically induced reproductive isolation: the distinctive Abert's (A) and Kaibab (b) squirrel. *Photo courtesy of the author* 

mented through analysis of packrat middens and fossiliferous cave deposits (Santucci et al. 2001). In classic studies undertaken by the paleontologist John Guilday, fossil-rich sequences of Pleistocene strata were excavated from sinkholes and caves of the Appalachian states (Guilday and Hamilton 1978). The stratified cave sediments yielded fossil mammal remains alternating between southern warm-weather species and northern cold-weather species. Through independent lines of evidence, it was determined that this biostratigraphic pattern was due to the displacement south of the northern boreal species during glacial advance, and the return of the southern temperate species during glacial retreat.

Great Smoky Mountains refugia. Great Smoky Mountains National Park is renowned for its rich biodiversity. This fact has been confirmed through comprehensive biological resource inventories in recent years. Part of the historic biological story at the park is tied to the expansion of the continental ice sheets during the Pleistocene. During glacial advance, the more northern boreal and temperate species were pushed south and were eventually established themselves within Pleistocene refugia in the southern Appalachians.

#### The Darwinian approach

In consideration of this geodiverse perspective, perhaps it is worth reflecting on Charles Darwin's contributions to natural science. Darwin proposed new ideas put forth in *On the Origin of Species* and other publications based upon observations and data accumulated on a global scale. Over the past half-century, natural science has shifted its focus in education, research, and funding away from the Darwin-style bigpicture approach, to an emphasis on the cellular, genetic, and molecular levels of biology.

Unquestionably, we have benefited from the scientific understandings gained through this microscopic and submicroscopic trend in natural science. However, the cost has been a diminished ability for many scholars and students to take on the multidisciplinary, big-picture questions. In turn, we have migrated toward anthropocentric and biocentric strategies for natural science.

Odds are that one would more likely recognize the influence of geodiversity on biodiversity if one lives in the shadow of a volcano, along an active fault line, or in the path of an advancing glacier.

As we continue to integrate biotic and abiotic components of the natural world into our conscience and routinely recognize that geology is the foundation of the ecosystem, then we may come to fully understand that "Earth and its inhabitants have evolved together."

#### References

- Gray, M. 2004. *Geodiversity: Valuing and Conserving Abiotic Nature*. Chichester, U.K.: John Wiley & Sons.
- Guilday, J., and H. Hamilton, 1978. Ecological significance of displaced boreal mammals in West Virginia Caves. *Journal of Mammalogy* 59:176–181.
- McMenamin, M. 1998. The Garden of Ediacara: Discovering the First Complex Life. New

#### **Geodiversity & Geoconservation**

York: Columbia University Press.

Raup, D. 1981. Evolution and the fossil record. Science 213, 289.

- Raup, D., and J. Sepkoski. 1982. Mass extinctions in the marine fossil record. Science 215, 1501–1502.
- -----. 1986. Periodic extinction of families and genera. *Science* 231, 833–835.
- Reysenbach, A.-L. In press. Biodiversity, Ecology, and Evolution of Thermophiles in Yellowstone National Park: Overview and Issues. New York: Plenum Press.
- Santucci, V.L., J. Kenworthy, and R. Kerbo. 2001. An inventory of paleontological resources associated with National Park Service caves. National Park Service NPS / NRGRD / GRDTR-01/02. Denver: National Park Service Geological Resources Division. On-line at www2.nature.nps.gov/geology/paleontology/pub/cavepaleo.pdf.
- Vincent L. Santucci, National Park Service, George Washington Memorial Parkway, Turkey Run Park, McLean, VA 22101; vincent\_santucci@nps.gov
# New Wildernesses Can Be Created: A Personal History of the Gaylord Nelson Wilderness at Apostle Islands National Lakeshore

# Bob Krumenaker

ON DECEMBER 8, 2004, PRESIDENT BUSH'S SIGNATURE on the Consolidated Appropriations Act of 2005 established the national park system's 55th unit of the national wilderness preservation system.<sup>1</sup> The Gaylord A. Nelson National Wilderness includes approximately 33,500 acres, roughly 80% of the land area of Apostle Islands National Lakeshore. This is the first designated wilderness area in any of the four national lakeshores in the national park system, and also the largest of Wisconsin's seven federal wildernesses.

Honoring former Wisconsin governor and senator Gaylord Nelson is a fitting tribute to the person many view as the father of the Apostle Islands National Lakeshore. Nelson, best known for being the founder of Earth Day in 1970, fought tirelessly for the protection of the Apostle Islands, culminating in legislation which established the park that same year. The park consists of approximately 69,000 acres of islands, mainland shoreline, and waters of Lake Superior along Wisconsin's north coast.

What makes this designation highly unusual is the speed with which it occurred, and the overwhelming, perhaps unprecedented, public support that the wilderness proposal received. That support, however, was not a given, and developed in the course of three years of intensive civic engagement. This was also the first time in a generation that the National Park Service's (NPS's) own wilderness study and designation *process* was followed, more or less in sequence, from start to finish. In addition, the park's embrace of its human history as a complement, rather than a competitor, to wilderness may be unique and hopefully heralds a new era in celebrating the integration of natural and cultural resource preservation in the national park system. For these reasons, wilderness designation at the Apostle Islands is both notable and worthy of scrutiny, in hopes that this success story may be useful to other parks where wilderness values are worthy of protection.

# Early interest in wilderness preservation at the Apostles<sup>2</sup>

Initial interest in establishing a protected area in Wisconsin's Apostle Islands archipelago followed after President Calvin Coolidge visited the area in 1928 and local boosters recognized that tourism might rejuvenate an economy devastated by the demise of the lumber industry (and later, by the Great Depression). Heavily cut over, however, the area was dismissed by a 1930 NPS study of the area as not meeting standards for a national park: "What must have been once a far more striking ... landscape of dark coniferous original forest growth has been obliterated by the axe followed by fire. The ecological conditions have been so violently disturbed that probably never could they be more than remotely reproduced."<sup>3</sup>

The NPS study did see potential, however, and recommended that the area be protected from development, perhaps by the state. Although there would be numerous attempts during the 1930s and 1940s by various individuals and groups to facilitate the state of Wisconsin's acquisition of some of the islands, significant progress was not made until 1955, when the state conservation commission issued a policy in support of "Acquisition of an Apostle Islands Wilderness Area."4 Indeed, four of the twenty-one islands that eventually became part of the national lakeshore were acquired by the state of Wisconsin, beginning in 1958.

In the meantime, the forests regrew, belying the dire prediction from the 1930 NPS assessment. While logging continued on some islands, and fishing camps and summer cabins dotted the shores, the archipelago increasingly became known for its undeveloped landscape and its recreational potential.

Gaylord Nelson, first as Wisconsin governor (1958–1962) and later as U.S. Senator (1963–1980), championed the federal protection of the islands as part of the national park system. After the passage of the federal Wilderness Act in 1964, some park advocates promoted immediate designation as wilderness. But Nelson was not among them: Although Nelson had empathy for those who had urged immediate designation of the islands as a part of the national wilderness system (he personally favored keeping the islands wilderness), such an amendment would have created substantial political problems with local people.... Those favoring a more cautious approach at the time knew that the Wilderness Act mandated that the NPS would have to consider wilderness designation in their master planning process after authorization.<sup>5</sup>

The national lakeshore was established by act of Congress in 1970<sup>6</sup> without any wilderness designation. The legislative history made clear that development on most of the islands was intended to be limited to primitive trails and campsites, as well as docks for boats to access the islands. The final bill that was passed deleted at the eleventh hour more ambitious plans for two large mainland units of the park whose purpose would have included the construction of parkways, marinas, and large campgrounds which would have been clearly incompatible with wilderness. Estimates of potential (and perhaps unrealistic) park visitation and economic impact figures for the larger park, whose core would have been the undeveloped islands but whose margins would have been highly developed, are remembered by many in the local community.

# Early park planning and wilderness

Though NPS policy requires that all parks with potential for wilderness undergo a formal wilderness study, that process has been wrought with peril due to the controversial nature of wilderness in recent years. Despite the obvious intent that Apostle Islands eventually be considered for wilderness designation, even here managers were in no hurry to tackle the issue head on. The national lakeshore designation meant to most people that the park was a recreation area first and foremost, and this attitude was prevalent even among park staff. Over time we perhaps forgot our own history, and new staff transferring in may never have known about the intent of the state or the political leaders who led the fight for the park.

The park's first general management plan (GMP) was completed in 1989. While it was an ambitious plan for development, like many GMPs of its era it also identified that about 97% of the land area of the park was as yet undeveloped and therefore potentially suitable for wilderness designation.7 Though NPS policy requires that we protect wilderness values until such time as a formal study is completed, the park managed these undeveloped lands as wilderness, at least in the early days of the GMP, more as a result of lack of development funding than as a deliberate strategy. There was little movement towards conducting the required formal study.

There things would have remained if not for the leadership of Senator Russ Feingold (D-WI), who, after several years of discussion, succeeded at inserting language in the fiscal year 2001 Department of the Interior appropriations bill requiring (and provided funding for) the NPS to conduct the formal wilderness study and environmental impact statement (EIS) for the Apostle Islands. This would be the first wilderness study not associated with a GMP or other planning process conducted by the NPS in a generation.

# The wilderness suitability study, part one: building understanding while developing alternatives

Initial scoping for the wilderness study during the summer of 2001 sought public comment on the possibility of wilderness designation at the Apostle Islands, but in retrospect we started too late on the critical educational step. Wilderness meant different things to different people, and the comments we received clearly reflected a lack of understanding by many respondents of what wilderness designation would meanor not mean-for the park. Several petitions were circulated opposing wilderness at the Apostle Islands. As soon as the study began, we attempted to clearly define the terms and educate the public as to what wilderness really meant, but, in hindsight, we should have begun the public conversation when we realized Senator Feingold was intent on pursuing the study for the park.

In the midst of the initial confusion, though, we heard two very clear messages over and over again. First, people liked the park the way it was, and did not want to see it change. Interestingly, this came from both supporters and opponents of wilderness. Second, we were told that we'd best not even think about restricting boats on Lake Superior or removing existing public docks on the islands-or else we'd see overwhelming opposition. This combination of sentiments, so often expressed, helped us to see through the myriad of positions that were articulated to the interests behind those positions. In fact, it helped us see the National Park Service's own interests, too.

It's necessary to learn a bit about the park's geography to understand those interests. Each of the park's 22 land units (21 islands and a mainland coastline strip) is bounded by Lake Superior. NPS jurisdic-

tion extends out one quarter-mile into the lake but the state maintains ownership over the lake bottom. The only way to get from one unit to another, whether one is a visitor or an NPS employee, is by boat. But distances in the lake are such that non-NPS waters lie in the interstices between islands, and in fact, the NPS has authority over a scant 15% of the waters of the entire archipelago (Figure 1). Thirteen of the islands have public docks on them, and six have historic lighthouses on the National Register of Historic Places. The park's islands are generally convex in shape, lacking narrow bays or other areas that could plausibly be set aside as non-motorized zones (Figure 2). We quickly realized that restricting motorized boat use in the quarter-mile zone that rings each island, the result if Lake Superior were included in the wilderness (while it would continue outside our jurisdiction in the waters between the islands), would be impractical, if not impossible to enforce. It would also subject future managers and park visitors to endless frustrations and conflict. Considering the nonfederal ownership of the bottomlands, we were fairly certain it would be a legal morass, too.

Park and NPS Denver Service Center (DSC) staff<sup>s</sup> sat down in March of 2002 to develop alternatives; while we were intent on having a concept which each alternative would represent (e.g., maximum wilder-



Figure 1. The wilderness status of the various park islands. (Madeline Island is not part of the park.) Map courtesy of Apostle Islands National Lakeshore.



Figure 2. Sand spit on Outer Island: a typical shoreline in the park. *Photo courtesy of Apostle Islands National Lakeshore.* 

ness, all cultural resources excluded, wilderness restricted to the outermost islands. etc.), it was mostly an exercise in drawing boundaries. This exercise took place during my first week on the job as the park's new superintendent. With ten years of experience with wilderness management in Isle Royale and Shenandoah National Parks, I established three conditions that each alternative had to fulfill: boundaries had to be defensible both on a map and findable on the ground; no docks or other developments that we intended to actively manage with modern technologies would be included in any wilderness alternative; and we had to be able to live with any of the alternatives we put forward. In other words, they all had to be viable and we'd see what emerged.

There were no legal requirement to seek comment on the draft alternatives but we elected to do so anyway during the summer of 2002. Talking to people about wilderness, and listening to their concerns, became the vehicle for me to get to know both the park and the community. We held five public meetings, this time ranging as far as Madison and Minneapolis–St. Paul, where many Apostle Islands visitors come from. We held meetings with four Indian tribes, and a task force representing nine tribes. Once again we made it known that we'd meet with any group that wanted to talk with us or had concerns. Long conversations, usually one-on-one, slowly but inexorably built trust and comfort with the wilderness options—and with us. Knowing the affection that so many of our visitors and neighbors had for the park's existing mix of wildness and access, and having been careful with the way we drew the boundaries of the alternatives, we were able to portray wilderness designation as the best way to assure that the park remained the same.

One meeting stands out. On Friday of Independence Day weekend, we held an open house in the NPS contact station on Stockton Island, the site of the park's largest dock complex, largest campground, and best natural harbor. It was a gorgeous summer evening and there were upwards of 50 power and sail boats either at the dock or at anchor in the bay. The 19-site campground was full. The park's wilderness study coordinator, Jim Nepstad, and I "worked the dock" in the afternoon, talking about wilderness and any other park issue that people wanted to discuss, and inviting them to come to the open house that evening. Upwards of 100 people showed up, far more than we saw at any other meeting in any other location. Seared in our minds are

the images of boat owners who came into the meeting with arms folded and skeptical expressions, certain that here was another example for how the government would take away something they valued to achieve some ideological objective. But the people who came to talk about the park they loved were also willing to engage in dialogue about it, and almost every one of the skeptics seemed to leave satisfied that wilderness would not cause the changes they feared. In fact, a number of great new wilderness advocates emerged, converted to the idea that wilderness would preserve the things about the park that they cared about. An invitation to be the featured speaker at the Duluth Power Squadron's annual meeting also resulted from contacts made that day; that session, in the fall, with a community of park users who were not expected to be supporters of wilderness, ended with a standing ovation and the recognition of common interest that has value to the park well beyond the wilderness issue.

In requesting comment on the draft alternatives, we asked people to tell us if we were on the mark with what we were considering, and whether these were the right alternatives. It may be a cliché, but we read each one of the over 1,700 comments that came in. Either I or other members of the planning team called or emailed many of the respondents when they wrote something we thought was important, or we thought might have been misunderstood. We not only learned from these discussions, we also build friends for the park and we increased trust. This round, there were no petitions against wilderness, and there seemed to be a growing comfort level that we were headed in the right direction.9 Wilderness was getting a lot of support, including an editorial in the state's largest newspaper.<sup>10</sup> More importantly, we were able to improve our alternatives in preparation for in-depth analysis and identification of a preferred alternative.

# The wilderness suitability study part two: the NPS chooses a preferred alternative

Since the NPS had not done a standalone wilderness study in decades, we had no cookbook to follow and therefore stumbled into the realization that there were no established criteria (factors) by which we should assess the alternatives and choose between them. We would use the choosingby-advantages decision-making method widely used in the NPS. The initial suggestion that we use the standard GMP factors just didn't seem right-mimicking the NPS's strategic planning goals, these would have given equal weight to resource protection and visitor experience. They didn't seem to have much to do with wilderness, however

It was important to me that we had clear decision factors, based in law and policy, specific to wilderness and in the context of other NPS mandates. I sought input from contacts all around the agency, both to develop the factors and then to vet the ones we came up with:

- Long-term preservation of park natural and cultural resources;
- Ability of the NPS to preserve and tell the stories of the people of the Apostle Islands;
- Consistency with the spirit and intent of the Wilderness Act, the Eastern Wilderness Areas Act, the intent of the Wisconsin legislature when donating lands to form the national lakeshore, and NPS wilderness policy; and

• Consistency with public comments received during the comment period.

Obviously, the "preserve and tell the stories" factor is the unusual one, considering the topic is wilderness. But we had received a number of articulate comments that the human history of the islands was something that shouldn't be lost or forgotten even while we contemplate celebrating what environmental historian James Feldman has called their "rewilding." William Cronon, University of Wisconsin historian and nationally recognized wilderness scholar (and part-time resident of Bayfield, the park's gateway community), has eloquently articulated that the uniqueness of place associated with the Apostle Islands is largely the result of the interplay of the rich human history of the area with the challenges presented by the environment.<sup>11</sup> We wanted to consider how each alternative would affect the cultural history and sense of place of the park, as distinct from how it might affect the tangible cultural resources such as buildings, archaeological sites, etc.

In comparing the alternatives against these factors, we recognized that "maximum wilderness" has an unintended consequence for cultural resources, even if the NPS makes a strong commitment to fulfilling all of its historic preservation mandates within designated wilderness (as we are required to do). By limiting future development to non-wilderness areas, many of which were excluded from wilderness due to their cultural significance, we may be inadvertently directing development toward sensitive sites.

Spirited debate among park staff and the planning team using these criteria resulted in the identification of the preferred alternative as the one which would preserve 80% of the land areas of the park as wilderness. Three islands were excluded in their entirety from wilderness, two because of the density of cultural sites and our commitment to actively managing and interpreting them. The other island which was left out was done so in deference to the wishes of the Bad River Band of Lake Superior Chippewa Indians, who expressed concern that any additional federal recognition would make it more difficult for them to assert sovereignty over that island, which they believe is part of their reservation even while it is part of the national lakeshore.<sup>12</sup>

Ironically, several of the most important natural resource areas of the park fell into areas not included within the preferred wilderness alternative. It took considerable discussion for our own staff to reach a comfort level that not being in the wilderness in no way would lessen the protections these wetlands and wildlife habitat were already receiving (Figure 3).

The selection of the preferred alternative sparked a frenzy of analysis and EIS writing over the fall and winter of 2002-2003, and we prepared to release the draft study and EIS the following spring. Prior to doing so, however, it was essential to secure the support of NPS Director Fran Mainella and the Department of the Interior, so new NPS Midwest Regional Director Ernie Quintana and I traveled to Washington in April to make our case for the 80% alternative. While there, I also visited the offices of The Wilderness Society (TWS), knowing that they were highly interested and were likely to mobilize their members to respond to our proposal. There I met, for the first time, Gaylord Nelson, who at age 86 was still coming to work each day as counselor to TWS. Interestingly, he told me that he was not particular about



Figure 3. Bog on Stockton Island. Only part of Stockton is included in the wilderness area. Photo courtesy of Apostle Islands National Lakeshore.

which alternative we chose and would defer to the in-depth knowledge of the professionals. His colleagues at TWS, however, made it clear that they favored the maximum wilderness alternative.

Mainella asked tough questions at the briefing, testing to make sure we had sought the input of, and engaged with, the spectrum of park users and our political constituency. Not only had our civic engagement strategy worked with the public, but it was essential in securing her support. Having satisfied her concerns, she was an advocate for us with Deputy Assistant Secretary of the Interior Paul Hoffman, whose briefing followed. We left Washington thrilled to have the department's support for our wilderness proposal. In retrospect, we would not likely have had TWS' support unless we had advocated for a maximum wilderness alternative, and we would not likely have had Interior support unless we chose something *other than* a maximum wilderness alternative. In the politics of 2003, it seems unlikely we could have emerged under any scenario with support from both groups.

After publication of the required notice of availability in the Federal Register, the draft wilderness study and EIS was released for another 60-day comment period in mid-June 2003. The final comment period, the third one we sponsored, once again coincided with the park's major visitor season. In many ways it was a repeat of the 2002 campaign, with open houses this time in nine locations across Wisconsin and Minnesota, and smaller meetings with tribes, local governments, and other stakeholders. This time, however, we were advocates for wilderness, and a particular configuration at that, while earlier we had steadfastly tried our best to be neutral.

In addition to the meetings, it was the

summer of tours-especially of Sand and Basswood Islands, which we were proposing to omit from the wilderness because of their cultural resources. Wilderness boundaries are easy to pontificate on from afar, where on-the-ground reality doesn't intrude. It was therefore important to bring the people who were most worried on site, where they would be able to see and discuss their concerns with us. The notoriously fickle weather and Lake Superior both cooperated, and we were able to get into the park most times we tried. Even the less remote parts of the Apostle Islands are hard to access, I was reminded, and the ticks, mosquitoes, and one magnificent bald eagle sighting reminded my guests that Congress doesn't have to declare a place wilderness for it to be one you'll remember for a long time afterwards.

The biggest uncertainty we faced that summer was what would The Wilderness Society and other environmental groups do? Would they mobilize their members with web and email alerts, as they had done the previous summer, but this time oppose the preferred alternative? And if so, would they risk public and political support for any wilderness at all by holding out for the maximum?

After several field trips with influential people in the regional and national environmental groups, it became clear that they were willing to buy our argument to exclude Sand Island but they were holding firm that Basswood should be wilderness. Several key local and regional opinion leaders with ties to national environmental groups met in July and formulated what they called the "Shared Vision," in effect a citizens' proposal for wilderness that was a hybrid between our preferred and the maximum wilderness alternatives. Relationships were good enough that they sought my input into their proposal in an effort to win NPS support (which I couldn't provide) and consistency with NPS logic on boundaries (which I could and did). The national environmental groups subsequently sent out alerts to their members to urge the NPS to support this configuration of wilderness rather than the NPS preferred alternative.

The citizens' coalition neglected to do the grassroots local work, however, to educate the people living near or visiting the Apostle Islands about their counter-proposal, and so, while it generated huge numbers of comments, few came from those who knew the park well. In all those comments I didn't read a single one with an eloquent or cogent argument as to why the shared vision was notably better for the park's future than the preferred alternative that we had proposed. It boiled down to "more is better," which, while a legitimate viewpoint, wasn't compelling.

One reason there was so little knowledge of the "alternative to the alternatives" is that most people got their information about the process and the options from the NPS. Our website had detailed maps, links to newspaper and magazine articles and editorials, and explanations and excerpts from law and policy articulating what wilderness would really mean for the park. For obvious reasons, we were in no position to advocate, or even explain, the "shared vision." The coalition would have to do its own marketing.

Meanwhile, in addition to the open houses, I once again spoke with every group or agency body I could, patiently answering questions but hopefully showing through my own accessibility that the park seriously cared about what people thought. Three of these meetings are especially notable.

The first, with the local Republican Party. The Democrats were already on record in support but I received a warm response to my request to talk with the GOP. We were fortunate that the chairman of the local party was, in addition to being a prominent developer, married to the leader of the park's Friends group. Over the course of the previous year, we'd talked often about park's role and impact in the economics of our gateway communities. Strong advocates of the park, but skeptics of big government, they came to believe that wilderness would assure that any future development needed to accommodate park tourists would be done outside the park and by the private sector, rather than by the NPS or concessionaires. With this innovative argument, they were able to secure the official blessing of the local party leadership, a critical block in the foundation of the prowilderness coalition.13

The second notable meeting was with the Bayfield Town Board. While the board voted on record to support wilderness, a new issue was raised about how we were defining the boundary of the proposed wilderness boundary at the water's edge. Our intent was to use the high-water mark above the beach as the boundary, to allow for variation with fluctuating lake levels and to permit beaching of boats just outside the wilderness. Allowing beaching was important to boaters and we didn't see it as markedly different from allowing motor boats a few feet off shore. There has to be a boundary somewhere, and in other wildernesses it is often at a parking lot or the edge of a road. Though late in the process, thoughtful inquiry at this meeting made us go back and work with the lands, legislative affairs, and solicitors office staff in the NPS and Interior to make sure we could find language that would achieve our intent.

Lastly, lest this narrative be construed as one of success at every turn, I went before a rather unsympathetic Bayfield County Board and failed to either change minds or do much to build trust. The top-of-the page negative headline in the local paper was a setback, but it curiously generated an outpouring of positive community action and media activity in a classic Newtonian "equal and opposite" reaction. The county board's stated reasons for opposing any wilderness were ideological but such a misinterpretation of law and fact that they, ironically, diminished their own influence in the debate.

The Wilderness Act, passed in 1964, was one of the first laws that required federal agencies to seek public input prior to making major policy decisions. It mandates a public hearing. Innovative for its day, the hearing requirement today seems like a throwback to an earlier era of very formal, but stifled and one-way public interaction. After all the open houses, meetings, and almost 10,000 written comments, it also seemed anticlimactic. But it was required by the law – so we had to learn how to conduct a public hearing, something no one on the park staff had ever done.

The hearing was held on August 27, 2003, in the middle of the last comment period. Eighteen people testified. Of these, twelve were in favor of wilderness, four were opposed, and the opinions of the two others were unclear. Two-thirds of the wilderness advocates supported our preferred alternative. There was little new that came out in the hearing, but it was gratifying to have several of the park's friends, including the mayor of Ashland, Wisconsin, the largest community near the park, go on record in strong support. Counting the formal hearing record, almost 99% of the written remarks in the final comment period were in support of wilderness in one configuration or another, a remarkable and gratifying outpouring.

It certainly helped that we continued to get highly favorable editorial opinion in local and regional newspapers.<sup>14</sup> Influential park advocates also facilitated a media event on September 12 where Wisconsin Governor Jim Doyle joined Gaylord Nelson on the state capitol steps to call on the NPS and Congress to establish federal wilderness at the Apostle Islands. Doyle was the first to publicly advocate for naming the area after Nelson.

# Wrapping up the wilderness suitability study: now what?

After the last comment period ended, we retreated to a quiet, but critical stage of the study over the long Wisconsin winter of 2003-2004. The planning team had the laborious task of analyzing and categorizing every comment and correcting errors in the document. I was comfortable with the preferred alterative and received support from the regional director to finalize the study without significant change from the draft which had gone before the public. Mainella did not feel the need for an additional briefing, so we submitted the package for final regional and national review in January 2004. The necessary Federal Register notices were published in April.

An EIS is not considered legally *approved*, however, until a record of decision (ROD) is signed, and regulations require one final 30-day period to elapse after the *Federal Register* notice of availability before the decision-maker can sign the document. While it's not officially another comment period, and we were never certain

what we'd do if we did receive substantive comment during this period, we had to wait patiently for that last month.

Though the wilderness planning had moved to a quiet and behind-the-scenes stage, it was anything put a quiet winter politically for the park. With Yellowstone's on-again, off-again snowmobile regulation in the news, Apostle Islands had our own snowmobile crisis to deal with. While it was totally unrelated to, and in different parts of the park than, the proposed wilderness, we feared that the two issues would become conjoined. In closing down unauthorized snowmobile use in the park, we incurred the wrath of many people in the gateway communities, most especially ice fishermen. Fortunately, the openness we practiced over the preceding two years with the wilderness study served us well and by once again vigorously engaging with those most affected by our actions, we were able to gain sufficient forbearance that the feared backlash did not occur. I promised the community that the park would develop a new draft regulation for snowmobiles to address what we all agreed was an untenable situation and we would hold a few open meetings in the spring to seek input on the proposal.

It was a long winter and the ice finally left Bayfield Harbor in late April, ending a tense ice fishing season. Quintana signed the wilderness study ROD on May 6th and we held the first snowmobile open house that night.

Signing the ROD marked the completion of the wilderness suitability study and the formal beginning of the much murkier political process. The park and region were on record with a formal proposal for wilderness designation for 80% of the land areas of the Apostle Islands National Lakeshore. But only Congress can designate wilderness and park, region, DSC, and NPS Washington staff now had the task of unearthing, or reinventing, the process of officially advancing the proposal to Congress for action. It hadn't been done in so long that the institutional memory was gone. There also had to be one final *Federal Register* notice to announce the availability of the ROD. We prepared the ROD package and sent it up.

Informally, we knew the next step was to secure the director's approval, not just for the ROD but for the actual proposal, and then the Department of the Interior's. A memorandum went from the regional director transmitting the study documents with the appropriate recommendation. Gradually a consensus developed that the best way to record the agency and department's support was not a series of memos but through the development and approval at each step of a formal legislative package that would go from NPS to Interior to the Office of Management and Budget (OMB), representing the White House, and then to Congress with a request for legislative action. If we had OMB's concurrence, we would have the recommendation of the president, which is what the Wilderness Act says is supposed to happen before Congress acts on a wilderness proposal. We began discussions with the NPS legislative affairs office about the substance of the legislation we'd be drafting.

At every stage of the study, however, we always explained to people that Congress can act at any time, and need not await a recommendation from the president. With 2004 being an election year, it was obvious that anything that happened here on out would have to be seen through the lens of state and national politics, and Wisconsin was a swing state in the presidential election. We would do our best as civil servants, but we knew well that we were no longer in control of the process.

In late June the park received its first inquiry from the secretary of the interior's office. They were interested in highlighting the secretary's support for the Apostle Islands proposal and asked for our help in drafting a press release and finding an appropriate venue to make the announcement. We worked on multiple drafts but the summer was progressing rapidly.

September 3, 2004, also happened to be the 40th anniversary of the passage of the Wilderness Act, and as that date got closer, I suggested that perhaps the secretary would be interested in making the announcement in the context of the anniversary. Indeed, Assistant Secretary for Fish and Wildlife and Parks Craig Manson came to Bayfield and the Apostle Islands and made the announcement in a public ceremony on September 2, the eve of the anniversary. To our delight and surprise, however, he went beyond the prepared remarks and challenged the Congress to rapidly enact legislation making the Apostle Islands wilderness a reality.

The presidential election loomed ahead and most observers, as well as participants in the process, were skeptical that Congress would take this on, with so many higher-profile issues dominating the national agenda. But with Manson's challenge, we wanted to seize the moment—just in case and drafting a good Apostle Islands wilderness bill became our top priority, and a priority of the secretary's office.

My offer to write the first draft of a bill was accepted and the specifics of the park proposal were incorporated into an emerging series of drafts that went back and forth with the NPS and departmental legislative affairs staff. The process continued into October, though, and prospects for congressional action seemed unlikely. Congressman David Obey (D-WI), the park's representative and the ranking minority member on the House Appropriations Committee, requested legislative drafting services of the NPS, however, merging the agency effort to develop a wilderness bill with the congressional effort.

The presidential election came and went without a wilderness bill, and, though we were disappointed that a bill hadn't made it to Congress, we had always regarded that as a long shot. Our primary interest at this point was completing the legislative package and getting a transmittal memo through the department and OMB, so that at least the Apostle Islands wilderness would become *recommended* wilderness, a step slightly further along than *proposed* wilderness. It's a distinction with no practical effect on the ground but potentially huge import should there be a long delay in congressional action.

I saw Obey on November 10, 2004, and he said there was one more chance to get a bill in the dwindling days of the 108th Congress, but it wasn't something he could be sure of. Congress had to reconvene in a lame duck session to pass the federal budget. Perhaps he could attach the park's legislation to the appropriations bill.

And that's the way it happened. No committee hearings, no floor debates, very little mark-up. In the final moments of the legislative session, the House passed the Consolidated Appropriations Act of 2005, with small, hardly noticed section which created the Gaylord A. Nelson National Wilderness in the Apostle Islands National Lakeshore.

In the last-minute give and take, Obey agreed to several "savings provisions" in the

bill that guaranteed that nothing in it would alter the existing management of Lake Superior waters, the use of motors or snowmobiles on the lake, or the maintenance and expansion of existing docks. At least one environmental group described this as a "slippery slope," interpreting the provisions as exceptions to wilderness management. In fact, they will have no effect at all on the park, or on wilderness management in the park, because the lake and all of the docks are outside the boundaries of the wilderness.

# Lessons learned

The recent experience at the Apostle Islands proves that wilderness designation remains a viable land management strategy, and that neither the purists nor the naysayers necessarily have the last word. The political environment here no doubt was more amenable than in many other areas, but the strength of our approach was in the good will and trust built up slowly, one person and one group at a time. Communication, especially with those who were most worried, was essential, and allowed us to build a strong and wide coalition.

Defining the terms of the discussion about the certainty of the park's future what we believed wilderness would assure—resonated with people who told us they didn't want the park to change. It helped us answer the question "why wilderness?" in a way that increased people's comfort level, even among skeptics. And trying to gently refocus the concerns of those skeptics on the legal definition of wilderness, rather than the emotional or spiritual aspects of the proposal, also helped turn the discussion with those who didn't believe the park qualified because of previous land use history or motor boats and docks on its edges.

Listening to what worried people said, and factoring those concerns into our planning, but equally importantly, into our communications, helped us make inroads with the business community and user groups. Whenever possible, we let them speak for wilderness while we stood in the background. This allowed public figures of both political parties to come out in support without fear of backlash. Validating, even embracing, the park's human history as a complement of wilderness, rather than a competitor to it, also strongly resonated with people who knew the area.

Now, as we contemplate the beginning

of the first visitor season of the Gaylord Nelson Wilderness, we see opportunity. Our first obligation is to be true to the promises: we said there'd be no significant changes to the visitor experience, and we now need to prove that. We also plan to celebrate the value of wilderness through our interpretive efforts. We will begin to tell the story of Gaylord Nelson to keep his legacy alive for future generations.15 But most importantly, we will be true to the law and spirit of the wilderness act by managing the area using the "minimum requirement," while securing "for the American people of present and future generations the benefits of an enduring resource of wilderness."16

# Endnotes

1. Public Law 108-447, Division E, Section 140.

2. This section is borrowed liberally and with permission from an unpublished manuscript by Jim Nepstad, the park's chief of planning and resource management and wilderness study coordinator, entitled "Wilderness in the Apostles: 1955–1970."

3. Harlan P. Kelsey, "Report on Apostle Islands National Park Project: Memorandum for Mr. Horace M. Albright," January 20, 1931.

4. Wisconsin Conservation Commission, "Policy on Acquisition of an Apostle Islands Wilderness Area," August 12, 1955.

5. Harold C. Jordahl, Jr., A Unique Collection of Islands: The Influence of History, Politics, Policy, and Planning on the Establishment of the Apostle Islands National Lakeshore (Bayfield, Wisc.: Apostle Islands National Lakeshore, 1994).

6. Public Law 91-424.

7. This document later was determined to serve as the park's wilderness suitability assessment, the first step in the formal wilderness study process. It was not thought of that way at the time it was written, however.

8. Michael Rees was the DSC team leader and principal author of the study and EIS.

9. Only 17 of these comments were opposed to any wilderness.

10. Milwaukee Journal-Sentinel, July 30, 2002.

11. Cronon's lengthy and articulate submission during the second comment period is testimony that individual comments can and do influence decision making in an open public process. They helped us navigate the cultural-natural conundrum in wilderness in a way that we believe strengthened our commitment to both. His comments were the basis for his seminal article "The Riddle of the Apostle Islands" in the May-June 2003 issue of *Orion* 

which was published, not coincidently, just prior to the opening of the final comment period. The *Orion* reprint became, with permission, an important handout for us at public meetings and a link on our wilderness study web page. See www.nps.gov/apis/wstudy.htm and link to Cronon article from this site.

12. This land dispute has never been formalized or adjudicated, but the lands clearly are in NPS ownership even if they fall within the Bad River reservation. Long Island is very narrow, experiences high levels of day use in the summer, and has two historic light stations and the ruins of a third on it. While it has some of the best bird and wetland habitat in the park, there were enough "issues" that keeping it out of the wilderness proposal seemed appropriate, and generated very little opposition while earning the (qualified) support of the tribal council. Both the Bad River and the Red Cliff tribes made their support of wilderness contingent upon the NPS' acknowledgement of the tribes' off-reservation rights to hunt, fish, trap, and gather that they assert were guaranteed by their 1842 treaty with the United States. The issue of treaty rights is too complex to be discussed here but we tried hard to meet their concerns, which the park staff view as legitimate, while not encumbering the NPS with a legal position prior to that process playing out, which will take years.

13. Hank and Sue Martinsen also actively encouraged state and national Republican leaders to support wilderness at the Apostle Islands, including a conversation with President Bush at a Washington party. We'll never know the impact of these conversations, but it's hard to imagine they were anything but helpful.

14. See, for example, www.ashlandwi.com/placed/index.php?story\_id=151079; www.superiorwi.com/placed/index.php?story\_id=151820; www.madison.com/archives/read.php?ref=tct:2003:10:11:283971:EDITORIAL; and www.washburnwi.com/placed/index.php?sect\_rank=5&story\_id=154274.

15. The author is writing as of spring 2005. Nelson died on July 3, 2005.

16. The Wilderness Act, Section 2(a).

Bob Krumenaker, Apostle Islands National Lakeshore, Route 1, Box 4, Bayfield, Wisconsin 54814; bob\_krumenaker@nps.gov

# Contemplating One-Sided Clams: The Northern Abalone Quincunx

# N. A. Sloan

# Introduction

IN THIS PAPER I DISCUSS A PROPOSED NATIONAL MARINE CONSERVATION AREA in British Columbia, Canada, using northern abalone *(Haliotis kamtschatkana)* as a lens through which regional communities can view issues of culture, commerce and conservation. Indigenous Haida people, whose traditional territory includes Haida Gwaii (Queen Charlotte Islands), sometimes refer to northern abalone as "one-sided clams." British Columbia marine waters have one species of abalone, a herbivorous snail reaching 140 mm in shell length that uses its massive (and edible) foot to creep over lower intertidal and shallow subtidal rocky substrates under a canopy of kelp forest while grazing on algae.

With over 2,500 species recorded so far, invertebrates represent more than 90% of the marine animal species diversity around Haida Gwaii (Sloan and Bartier 2004). Yet marine invertebrates are usually overlooked as focal species, in favor of highprofile vertebrate "charismatic megafauna," when envisioning conservation (Lunney and Ponder 1999).

Gwaii Haanas National Park Reserve and Haida Heritage Site is a national park managed by Parks Canada Agency with the Haida in a First Nation–Canada cooperative management agreement in place since 1993. Given the success of this arrangement with the lands, there are expectations that adding on the proposed Gwaii Haanas National Marine Conservation Area (NMCA) Reserve could involve another cooperative management agreement with the Haida. This implies full consideration of traditional Haida knowledge about marine resource uses along with coastal community experiential and Western science knowledge.

I explain how the northern abalone of Haida Gwaii function as a focal species whose cultural history, protection, and recovery could help focus public attention on regional marine area conservation. To do this, I use a quincunx—a rather exotic word for an arrangement of five items in which four are at the corners of a square or rectangle and one is at the center. This arrangement, shown in Figure 1, is useful when contemplating a central role for northern abalone surrounded by four types of issues relevant to engaging Canadians in Gwaii Haanas' marine conservation future.

# **Fisheries**

Northern abalone was commercially fished in British Columbia from the early 20th century until the fishery's closure in 1990. This was the first total closure—covering all sectors (Aboriginal, commercial,



Figure 1. The Haida Gwaii northern abalone quincunx. Abalone image courtesy of L. Lee, World Wildlife Fund-Canada.

recreational) and the entire geographic range-in Canadian history (Sloan 2004). It was the advent of SCUBA diving in the 1950s that initiated the decline. Landings peaked, and a quota was introduced, in the late 1970s, but stocks showed no recovery through many subsequent surveys, and the total closure remains in force. Further, high black-market value and the difficult enforcement logistics, particularly along the rugged and sparsely populated north coast, render abalone vulnerable to poaching (Campbell 2000). Aggressive fishing causing serial stock depletion has characterized abalone fisheries for various species throughout Pacific North America (Hobday et al. 2001; Sloan 2004).

In the last eight years of the fishery, the coast north of Vancouver Island to Alaska

averaged 76% of annual coast-wide northern abalone landings. Within the north coast, Haida Gwaii accounted for 63% of mean annual landings over the same period and the proposed Gwaii Haanas NMCA area accounted for 61% of total annual Haida Gwaii landings (Sloan et al. 2001). That the Gwaii Haanas area has so much prime abalone habitat is not surprising, as rocky coast with kelp forests characterize much of the shoreline.

Knowledge of abalone distribution and density around Haida Gwaii comes from fishery-independent diving surveys by Fisheries and Oceans Canada (DFO) from 1976 to 2002 during which index sites were established. One area within Gwaii Haanas' proposed marine area, for example, was surveyed seven times by 2002. Gwaii Haanas represents, therefore, a well-documented (by both fisheries-dependent and -independent sources) northern abalone area, and recent surveys show this area continues to support populations. As well, since 1998 further diving surveys, using a protocol similar to that of DFO, have been executed each year by the Haida Fisheries Program (HFP) which has directly involved the Haida in abalone stock assessment.

To put abalone fisheries in an Alaskato-Mexico context, commercial diving fisheries for six abalone species have all been accompanied by serial stock collapses and cries for management reform that include the use of refugia. The most dramatic case is of the deep-water white abalone *(Haliotis sorenseni)* off southern California, which is now approaching extinction (Hobday et al. 2001). This is after a brief nine-year period (1969 to 1977) that accounted for 95% of the historical landings.

A second complexity to rock reef/kelp forest-associated fisheries is the on-going commercial diving fishery for red sea urchin *(Strongylocentrotus franciscanus).* Red sea urchins coexist with northern abalone as fellow algae-grazers associated with kelp forests and are fished commercially and for Haida subsistence (Sloan et al. 2001).

# Haida subsistence and culture

The collapse of abalone stocks and subsequent closure to all, including the Haida for subsistence gathering, represents an appreciable cultural loss (Sloan 2004). Further, no Haida were among the 26 licensed to participate in the commercial fishery that led to the stock collapse. The Haida remain legally excluded (based on overriding stock conservation concerns) from access to an otherwise constitutionally established subsistence fishing right.

Competition for abalone between the Haida and sea otters (Enhydra lutris) was distinctly possible. The sea otter population of Haida Gwaii was likely intact, although hunted and perhaps locally depleted nearby larger village sites, prior to the vigorous sea otter fur trade between Haida and English and Americans from the 1790s to 1830s. By the early 20th century, sea otters were effectively extirpated from the Haida Gwaii region (Heise et al. 2003). Sea otters are keystone, kelp-forest-associated, specialist predators of invertebrates that reduce abalone to sparse crevice-dwelling populations in areas where they co-occur (Watson 2000). It is possible, therefore, that abalone were relatively more available to the Haida near village sites when sea otters were hunted in the pre-contact era. Further, after the 1840s, abalone may have become more available throughout Haida Gwaii because of reduced sea otter populations due to the fur trade, as abalone populations rebound in the absence of sea otters (Watson 2000).

There is, as well, an appreciable role for abalone shell in Haida trade and material culture (Sloan 2003). Many North American indigenous peoples prized the nacreous (mother-of-pearl) insides of abalone shells (Dubin 1999). Abalone shell from at least four species in the California area was a trade commodity throughout northwestern North America. Abalone was part of an overall marine shell trade, also including tusk shell (*Dentalium* spp.) and olive snail (*Olivella* spp.), going back 7,000 years.

The first recorded European contact with the Haida occurred in July 1774 when the Spanish (Juan Pérez aboard the *Santiago*) encountered Haidas off northwestern Haida Gwaii. Translations of ship's logs

revealed that trading occurred during which the Spanish exchanged goods including "Monterey" (abalone) shell, brought north from the Spanish-occupied area of what is now California, for sea otter and other pelts (Sloan 2003). The earliest Haida article inlaid with abalone shell (a labret, or lip-plug) was collected by George Dixon aboard the Queen Charlotte in 1787 off the northwest coast of Haida Gwaii (King 1981). Amazingly, in the same year, other British on a trading mission along the southeast coast of the archipelago also noted high-status women's' labrets, "some inlaid with pearl" (Galois 2004:128). However, many authors, starting with Swanton (1908:303) have reported that the shell of northern abalone was less preferred for decorative work compared with California-area abalone shell. In summary, the occurrence of California-area abalone trade shell in Haida art, language, and family crest usage demonstrates the influence of the abalone shell trade, particularly in the postcontact era (Sloan 2003).

#### Species at risk

An intriguing species-at-risk precedent in Canadian marine conservation is the potentially mutually exclusive recovery of two "listed" species: northern abalone and their predator, the sea otter (Sloan 2004). Northern abalone was Canada's first marine invertebrate to be federally listed by the Committee on the Status of Endangered Wildlife in Canada as "threatened" in 1999. Sea otters have been internationally protected since 1911 and federally listed as "endangered" in Canada since 1978 (down-listed to "threatened" in 1996). In the U.S., white abalone was the first marine invertebrate to be proposed for the endangered species list (Hobday et al. 2001) becoming federally listed in June 2001.

Canada's Species at Risk (SAR) Act (passed 2002, fully in force 2004) compels protection and recovery of all federally listed species, including protection of their critical habitats in federally controlled areas such as NMCAs. Further, listed status requires the production of a national recovery strategy that goes through public consultation towards a formal action plan, also subject to public consultation, that guides recovery efforts. The SAR Act prohibitions protect individuals, their "residences" (e.g., nesting trees) and critical habitats. The strategy and planning processes are now completed for both northern abalone and sea otter.

Sea otters do occur around Haida Gwaii and there have been eight confirmed sightings, all likely free-ranging males, between 1972 and 2002. They could have originated from any of the expanding populations surrounding the Haida Gwaii region, such as southeast Alaska, or from the mainland coast, or from northern Vancouver Island (Heise et al. 2003).

Northern abalone has become a regional marine conservation focal point. The federally funded, community-driven Haida Gwaii Abalone Stewardship Program, now entering its fourth year, is an important first for Haida Gwaii (Jones et al. 2004). Abalone is the first marine species to unite local and national marine environmental nongovernmental organizations, the HFP, and federal agencies. One of the two stewardship areas is within Gwaii Haanas' proposed NMCA; it was selected according to fishery-independent survey data and local experiential knowledge.

#### Marine area conservation

Northern abalone is exemplary in its spatially persistent clumping associated with kelp forest ecosystems, whose sea-surface canopies render them easy to map. Therefore, abalone is a useful surrogate for exploring area-based conservation ideas such as zoning, including sizing and placement of no-take zones (Sloan 2004). The prospect of zoning for no-take through to (sustainable) commercial extraction is articulated in the Canada National Marine Conservation Areas Act (passed in 2002).

Abalone populations generally rely upon having sufficiently dense clumps for successful fertilization of broadcaster gametes linked by relatively restricted dispersal of their short-lived, non-feeding larvae. Therefore, understanding the dynamics of clump size, between-clump proximity, and connectivity via larval transport is key to sustaining their populations. Further, abalone species respond well to area protection and readily increase in density, average body size, and reproductive output within refugia (Sloan 2004).

# Conclusion

Issues of culture, conservation, and commerce unite when contemplating northern abalone. Concerning culture, the loss of northern abalone as a traditional food for the Haida is ethically and politically important. As well, abalone has a long humanassociated history linking material culture, trade, and ceremonial use, including postcontact Haida–European relations. Another cultural aspect is the role of northern abalone as a focal species in increasing public awareness of marine conservation and changing attitudes towards acceptance of new ideas about protecting species and habitats (ecosystems) through protecting marine areas. Finally, given that understanding coastal community values is central to success in marine conservation, northern abalone provides a vehicle by which regional communities can address complex marine conservation challenges, such as zoning within protected areas and speciesat-risk recovery.

Concerning conservation, there is federal agency will to cooperate in regional programs to restore abalone populations. Provided that there is consensus and clarity on the population objectives for northern abalone, this species' characteristics, such as its tendency to clump, render it well suited as a case study for discussing marine area protection. The goals of the local abalone stewardship program to restore populations to the point of enabling a Haida (and then an overall recreational) fishery (Jones et al. 2004), and that of the national recovery strategy to ultimately have the species delisted, are not intractable, but represent differing geographic scales of recovery.

Concerning commercial fishing, it is most unlikely that a sustainable commercial fishery will re-emerge. However, fishing for red sea urchin, in kelp forest habitats, will continue in Haida Gwaii, including in the proposed Gwaii Haanas marine area. This supports the widely stated recommendation in the literature for a multi-species, ecosystem-based management perspective. The interacting effects of the red sea urchin fishery on future northern abalone and sea otter recovery within kelp forest ecosystems warrants careful consideration.

Abalone conservation poses some interesting questions (Sloan 2004). First, why recover northern abalone if recovered sea otter populations would likely crop abalone populations to low levels, threatening even subsistence fishing? Confronting such hard choices will help develop the public's understanding of the innate complexity of marine area conservation. Second, what benchmark state of local kelp forest ecosystems, including optimal populations of northern abalone, red sea urchin, and sea otter, should be the (integrated) recovery goal within Gwaii Haanas? Perhaps the goal should be the restoration of pre-European contact (pre-1790) conditions, which likely would mean low abalone populations with sea otters present. Whatever state is desired, we have little local kelp forest ecosystem baseline data from which to compare current with past states. Third, would protecting abalone in some areas lead to enhanced larval settlement in adjacent areas that could eventually support some level of non-commercial fishing (Aboriginal and recreational)? The possibility of net export of recruits ("spillover") from protected areas to adjacent areas is an important consideration when discussing protecting marine areas with the fishery sector (Roberts et al. 2005). Finally, there is the important issue of propagule dispersal (Shanks et al. 2003). That is, what is the spatial scale of larval origin and destination dynamics of northern abalone populations? For Gwaii Haanas' future, this relates to zoning issues such as no-take zone *sizes* (to protect sufficient densities to maintain adequate recruitment), *shapes* (to preserve an adequate amount of kelp forest habitat), *locations* (for appropriate distance between sub-populations) and *connectedness* (to link sub-populations via larval transport in currents and according to different planktonic larval durations).

With public consultations on establishing Gwaii Haanas NMCA imminent, there is an opportunity for abalone to focus ideas and values. Thinking about northern abalone links people to the sea culturally and fosters learning about the inherent complexity of contemporary marine conservation. If we are serious about the Panel on Ecological Integrity's core ideas of Canadian national parks (and, by extension, forthcoming NMCAs) as "centres for ecological understanding" and "sentinels for the ecological condition of their region" (PCA 2000a, 2000b), then we should seize opportunities that species such as northern abalone present to us.

#### References

- Campbell, A. 2000. Review of northern abalone, Haliotis kamtschatkana, stock status in British Columbia. Canadian Special Publication of Fisheries and Aquatic Sciences 130, 41–50.
- Dubin, L.S. 1999. North American Indian Jewellery and Adornment from Prehistory to the Present. New York, N.Y.: Harry N. Abrams.
- Galois, R., editor. 2004. A Voyage to the North West Side of America: The Journals of James Colnett, 1786–89. Vancouver, B.C.: University of British Columbia Press.
- Heise, K.A., N.A. Sloan, P.F. Olesiuk, P.M. Bartier, and J.K.B. Ford. 2003. Living marine legacy of Gwaii Haanas. IV: marine mammal baseline to 2003 and mammal-related management issues throughout the Haida Gwaii region. *Parks Canada Technical Report in Ecosystem Science* 38.

Hobday, A.J., M.J. Tegner, and P.L. Haacker. 2001. Over-exploitation of a broadcast spawn-

#### Volume 22 • Number 3 (2005)

ing marine invertebrate: decline of the white abalone. *Reviews in Fish Biology and Fisheries* 10, 493–514.

- Jones, R., N.A. Sloan, and B. DeFreitas. 2004. Prospects for northern abalone (Haliotis kamtschatkana) recovery in Haida Gwaii through community stewardship. In Making Ecosystem-Based Management Work. N.W.P. Munro, J.H.M. Willison, T.B. Herman, K. Beazley, and P. Dearden, eds. Proceedings of the 5th International Conference on Science and Management of Protected Areas. Unpaginated CD-ROM. Wolfville, N.S.: Science and Management of Protected Areas Association.
- King, J.C.H. 1981. Artificial Curiosities from the Northwest Coast of America—Native American Artefacts in the British Museum Collected on the Third Voyage of Captain James Cook and Acquired through Sir Joseph Banks. London: British Museum Press.
- Lunney, D., and W. Ponder. 1999. Emergent themes from the other 99%. In *The Other 99%: The Conservation and Biodiversity of Invertebrates*. W. Ponder and D. Lunney, eds. Mosman, N.S.W.: Transactions of the Royal Zoological Society of New South Wales, 446–454.
- PCA [Parks Canada Agency]. 2000a. Unimpaired for Future Generations? Protecting Ecological Integrity with Canada's National Parks. Volume I: A Call to Action. Report of the Panel on the Ecological Integrity of Canada's National Parks. Ottawa, Ont.: Parks Canada Agency. On-line at www.pc.gc.ca/docs/pc/rpts/ie-ei/report-rapport\_1\_e.asp.
- Roberts, C.M., J.P. Hawkins, and F.R. Gell. 2005. The role of marine reserves in achieving sustainable fisheries. *Philosophical Transactions of the Royal Society B* 360, 123–132.
- Shanks, A.L., B.A. Grantham, and M.H. Carr. 2003. Propagule dispersal distance and the size and spacing of marine reserves. *Ecological Applications* 13 (Supplement), S159–S169.
- Sloan, N.A. 2003. Evidence of California-area abalone shell in Haida trade and culture. *Canadian Journal of Archaeology* 27, 273–286.
- ———. 2004. Northern abalone: using an invertebrate to focus marine conservation ideas and values. *Coastal Management* 32, 129–143.
- Sloan, N.A., and P.M. Bartier. 2004. Structuring natural science baselines including species inventories for marine area conservation. In *Making Ecosystem-based Management Work*. N.W.P. Munro, J.H.M. Willison, T.B. Herman, K. Beazley, and P. Dearden, eds. Proceedings of the 5th International Conference on Science and Management of Protected Areas. Unpaginated CD-ROM. Wolfville, N.S.: Science and Management of Protected Areas Association.
- Sloan, N.A., P.M. Bartier, and W.C. Austin. 2001. Living marine legacy of Gwaii Haanas. II: Marine invertebrate baseline to 2000 and invertebrate-related management issues. *Parks Canada Technical Report in Ecosystem Science* 35.
- Swanton, J.R. 1908. Haida Texts-Masset Dialect. Memoir of the American Museum of

Natural History, Volume X, Part II. The Jessup North Pacific Expedition. New York: G. E. Stechert.

- Watson, J.C. 2000. The effects of sea otters (Enhydra lutris) on abalone (Haliotis spp.) populations. Canadian Special Publication of Fisheries and Aquatic Sciences 130, 123–132.
- N. A. Sloan, Gwaii Haanas National Park Reserve and Haida Heritage Site, Parks Canada Agency, Box 37, Queen Charlotte, British Columbia V0T 1S0 Canada; norm.sloan@pc.gc.ca

# The Moral Power of the World Conservation Movement to Engage Economic Globalization

#### Ron Engel

#### Foreword: Pushing the "Yes" button for Bob Linn

LATE ON THE EVENING OF NOVEMBER 24, 2004, THE RESOLUTION ON THE EARTH CHARTER finally reached the floor of the World Conservation Congress at Bangkok. The resolution called for the World Conservation Union to not only endorse the Earth Charter but "recognize it as an ethical guide for IUCN policy." Years of work to bring ethics into the mainstream of the international environmental movement were nearing fruition. As a delegate of the George Wright Society, a organizational member of IUCN, I had the privilege to vote. In the moments that passed waiting for the vote to be taken a good part of my life was replayed. Right there at the center of it, like some guardian angel, was Bob Linn.

I first met Bob in June 1960 when stationed with my family on Mott Island en route to a seasonal ranger assignment on Amygdaloid Island, Isle Royale National Park. I remember the delight of my two-year-old son when he heard Bob play his marimba. As far as I could see, as park naturalist, Bob had the best job in the world—and he did not demur. A few years later, we were both to lament our exile in Washington, D.C. After my wife, Joan, and I built a cabin at the tip of Michigan's Keweenaw Peninsula, as close as we could get to Isle Royale, and Bob had retired from the Park Service and was building the George Wright Society in Hancock, we shared leisurely walks and dinners and talked about everything under the Heavens—family to wolves to politics to evolution to God.

In the course of one of these conversations in 1983, Bob suggested I read an essay in *The George Wright Forum* on biosphere reserves. It took one afternoon for me to decide to devote an upcoming sabbatical to them. Bob gave me personal introductions—Bill Gregg, Ted Sudia, Tommy Gilbert, Jane Robertson, among others—and so sent Joan and me off on a journey that led, step by step, person by person, place by place, into the *terra incognito* of the international conservation movement. Eventually I landed on the doorstep of IUCN in Gland, Switzerland, and the office of Jeff McNeely, who invited me to form an "ethics working group." IUCN, an acronym for International Union for the Conservation of Nature and Natural Resources (now known as IUCN–The World Conservation Union), is a supraorganization of some 1,000 governmental and nongovernmental organizations (NGOs). Founded in 1948 to promote international cooperation on behalf of science-based conservation, it is the only organization with "observer" status in the United Nations General Assembly, providing expertise on the conservation of nature.

Over the following decade the IUCN Ethics Working Group grew into a network of per-

sons from sixty nations and helped pave the way for the writing of the Earth Charter in the late 1990s—the most comprehensive declaration of values and principles for a just, sustainable, and peaceful world the international community has yet composed (see www.earth-charter.org).

Bob was there the whole time. He published our first papers in the *Forum*. He worked in Ted Sudia's Institute for Domestic Tranquility to give these ideals roots in the American polity. And he was always there to listen and advise on those long summer evenings on the Keweenaw.

Now it is the evening of November 24, 2004, in the Queen Sirikit National Convention Hall in Bangkok. A representative of the American government asks to be recognized and states her judgment that the Earth Charter resolution ought to be defeated. A delegate from the Netherlands voices strong support. We are asked to vote. I push the green "yes" button in front of me—*this is for Bob Linn*. We wait for the tally of the hundreds of delegates to be displayed on the great screen in front of us. The motion passes, overwhelmingly, with a significant majority of both government and nongovernmental members. Applause sweeps across the hall. Another world *is* possible!

The following essay, which I delivered as a keynote address at the closing plenary on "Strengthening Corporate Social Responsibility, Law and Policy" at the Congress Forum, is dedicated to the life and ideals of Robert Linn.

I want to thank Jeff McNeely, IUCN chief scientist, Josh Bishop, IUCN senior advisor for economics and the environment, and David Harmon, editor of *The George Wright Forum*, for their comments and suggestions on this manuscript.

Ron Engel, Copper Harbor, Michigan, June 2005

#### The ethical basis of conservation

Forty years ago when I arrived on the doorsteps of the University of Chicago to take up studies in religion and philosophy, I was worried whether anyone on the faculty would understand my enthusiasm for nature and the kind of work I wanted to do in what has since become known as the field of "environmental ethics."

My first night in Chicago I attended a rally for SANE—the leading anti-nuclear organization in the states at the time—and one of the speakers was introduced as a professor at the University of Chicago Divinity School. Joseph Sittler began his speech by reading a poem by Richard Wilbur entitled "Advice to a Prophet," which includes these haunting lines:

> What should we be without The dolphin's arc, the dove's return,

These things in which we have seen ourselves and spoken? Ask us, prophet, how we shall call Our natures forth when that live tongue is all Dispelled, that glass obscured or broken . . .

... come demanding Whether there shall be lofty or long standing When the bronze annals of the oak-tree close. Not only were my worries alleviated that evening, but I had my first lesson in environmental ethics.

The roots of environmental ethics lie not in philosophy books but in our gratitude for the gift of life—"gracias a la vida" the gift of our bodies as well as our souls. In and through our experience of nature we create the world of interlaced meanings and metaphors that constitute our distinctive existence as human beings. The very notions of "lofty" and "long standing" emerge through the alchemy of the human imagination interacting with other unique actualizations of creative evolution. "How shall we call our natures forth when that live tongue is all dispelled, that glass obscured or broken?"

As Joseph Sittler later wrote, "Not in abstract propositions or dramatic warnings but in powerful, earthy images the poet makes his point. The point is single, simple, and absolute: human selfhood hangs upon the persistence of the earth, her dear known and remembered factualness is the matrix of the self."

This is the ultimate motivation, I suspect, for our work in the international conservation movement. We love life—"everything which is natural which is infinite which is yes" as the poet e.e. cummings expressed it, we know we owe everything to it, we are profoundly grateful, and we want to repay our debt by responsible care and respect, building a civilization that sustains life as long as Earth shall last. I believe this is true whether we work professionally as leaders of environmental NGOs, as scientists, artists, or teachers, or as dedicated conservationists in the worlds of commerce, industry or government.

# The moral authority of the World Conservation Union

What this means for the topic at hand is that the single most fundamental asset we have as members of IUCN is our moral authority. By "moral authority" I mean our capacity to articulate, justify, defend, and practice principles of human action that enhance the flourishing of the evolutionary adventure, including all its human members. This authority has been built up over many years by thousands of persons who have found in this organization a way to act responsibly and effectively on behalf of their affirmation of the sacredness of life.

We can identify a number of ways in which we draw upon this moral authority in our conservation activities. A good example is our work in environmental law, which finds its justification in its appeal to justice, among other moral values. Articles 2–9 of the IUCN Law Commission's Draft International Covenant on Environment and Development spells out the most basic moral affirmations that ground the treaty's legal obligations, e.g., Article 2: "Nature as a whole warrants respect; every form of life is unique and is to be safeguarded independent of its value to humanity."

The scientific credibility of the Union is also ultimately based on its moral authority—the belief that truth is a morally important value and that scientists are trustworthy truth-tellers regarding the biological health of the planet. Our worldwide networks of scientific experts labor diligently to be sure this trust is well-placed. Similarly, the political persuasiveness of the resolutions we pass at this Congress rests on the moral authority of the Congress as a democratic decision-making body—the fact that we truly represent the international community, and practice fair, open, and informed debate. As Valli Moosa, the newly elected president of IUCN has stated, "It is from diversity that we gain our strength and political niche, and our unique moral authority." In addition, we depend upon our moral authority for support for our community conservation projects. It is assumed that we serve the common good and that our actions will be in keeping with our stated purposes. Any perception that our principles are being compromised is damaging to our moral reputation, and hence the practical effectiveness, of our projects.

In recent years a major source of the moral authority of the Union has come from our willingness to tackle the societal roots of environmental problems. It was not only a realistic policy decision, but a courageous exercise of moral responsibility, that led the Union to decide that nature protection alone was not enough, and that human poverty, lack of political participation and education, and regional and global inequities, must also be addressed. Our decision to tackle these issues not only added to our moral authority but required our moral authority. We had no standing in the international community that warranted this kind of activity until we took on board the fundamental moral premise of sustainable development, that concern for people and concern for the environment are mutually interdependent. Prior to Stockholm [the 1972 U.N. global conference on the environment], this was not the case. Martin Holdgate recounts in his history of IUCN, The Green Web, that it took years of experience in the field, internal debate, and institutional self-examination to bring the Union to adopt the vision of a "just world that values and conserves nature."

Since unsustainable and unjust eco-

biodiversity loss, restructuring our domestic and global economic systems is an urgent priority. Ashok Khosla of Development Alternatives in India pointed out at this Congress, "The fact that after 50 years of international development, \$1 trillion in development assistance, and a 20-fold growth in the world economy, there are more poor people and vastly reduced forests should be a cause for worry among those who design our economic systems." But redesigning our global economic system is likely the most difficult and complex task we can undertake, involving powerful government and business interests, some of which are corrupt or weak or otherwise incompetent, immense geopolitical forces, entrenched professional and academic interests, passionate public opinion, the welfare of countless individuals and communities, and high stakes for the future of the biosphere.

nomic growth is one-if not the-cause of

I therefore heartily commend the IUCN leadership for having the moral courage and foresight to initiate an engagement with economics and the business community. The kind of serious dialogue between conservationists and business leaders that is conceptualized in A Strategy for Enhancing IUCN's Interaction with the Private Sector (approved by the IUCN Council in March, 2004), and is now being modeled at this Congress, is long overdue. Furthermore, I believe the IUCN initiative has placed the goal where it needs to be: biodiversity conservation and human wellbeing must become a central aim of business, not merely a regulatory obligation or charitable expense.

To meet this challenge, we will need to marshal all the resources at our disposal. As the *Strategy* suggests, in addition to our capacities in environmental economic policy analysis, environmental science, law, strategic planning, and community development, we also need to bring to the table our moral values and authority. The moral standing of the Union gives us access to centers of decision-making, both private and public, which few other organizations in the environmental field can reach.

But we face a double challenge. To be successful, our approach to this work must not only draw upon our hard-won moral authority, it must proceed with utter moral credibility. It would be a blow to the moral authority of the Union if this initiative should be perceived as a capitulation to the reigning economic powers. The *Strategy* explicitly recognizes this risk, and acknowledges a "widespread skepticism in the conservation community about the merits of collaborating with business."

We are seeking to overcome a division that has existed for over two centuries between movements for environmental preservation and proponents of modern forms of economic development. We will need to cut to the ethical roots of this conflict if we are to succeed in building meaningful partnerships between conservationists, community advocates, economists, and business leaders.

As a first step in that direction, let us acknowledge that it is proper that we use other forms of life. This is a condition of our existence as participants in the evolutionary process, and as co-creators and beneficiaries of the productive powers of human society. But from an ethical perspective, use value is always secondary to intrinsic and systemic value—to the flourishing of the community of life on planet Earth. This is the concern many of us have as we begin to walk down the road of engagement with

business and markets. The moral conscience of the Union strongly protests not only economic inequality between persons, but any attempt to reduce life to its mere "resource" value. Animals, for example, are not inherently "production units." As worthy of admiration as human artifacts may be, achieving at their finest a second-order cultural form of intrinsic value, the baseline value that must be preserved at all costs, because it is the ultimate generative source of all other forms of value, is the wild value original to the universe as given. The magnificent flourishing of organisms, life forms and systems that we inherit can be imitated, but never replaced. It is they alone that inspire us to "reverence for life."

#### The need for ethical terms of reference

What we need are ethical terms of reference for this engagement. We cannot afford marriages of convenience. To achieve significant policy improvements we will need principled agreements that are binding between all parties-citizens, corporations, governments-new moral compacts, not mere contracts. As Paul Hawken writes in The Ecology of Commerce, business will become meaningfully involved in the transition to sustainable development when it understands itself as "part of a larger covenant." We can say the same of the conservation movement. Clear, strong, experientially informed, rationally defensible, ethical frames of reference are essential preconditions to a true partnership in any aspect of human affairs.

It is at this point that one more source of our moral authority (often taken for granted) comes into play. This is the work we do in ethical reflection.

In the final analysis, everything depends upon our capacity for critical and

constructive ethical thought. To step backto examine as objectively as possible the issues at play in any decision or choice; to appreciate the multiple, often conflicting, values at stake; to listen and learn from what others report of their experience; to question not only the opinions in play but the presuppositions of the conversation itself; to turn the direction of discussion as much as possible toward joint inquiry; to bring every bit of knowledge available to the table, scientific, cultural, personal; to consult the moral wisdom of our traditions regarding what principles, virtues, and purposes are most crucial and helpful to the subject at hand; to allow one's imagination to freely entertain novel alternatives; to offer reasoned moral arguments, and to carefully and genuinely consider the moral arguments offered by others; to propose without demanding; and then finally to reach explicit consensus (but always revisable if new considerations make it necessary)-this is the best description I can give of what is involved in ethical reflection, sometimes called "practical moral reasoning." Most typically this kind of critical and constructive moral thought happens as a step or moment within the natural flow of shared conversation, but there are times when it must be quite deliberate, public and systematic. In my judgment, this is one of those occasions. If the engagement of IUCN with business and markets is to follow "clear priorities and guidelines," as the Strategy recommends, we need explicit attention to what ethical terms of reference are required.

There are several reasons why.

First, it assures our ethical integrity. Even if the ethical terms of reference that we propose are not initially acceptable to our business partners, they make our intentions clear, and give us a road map to follow when issues become intractable. This kind of "truth in advertising" cannot help but receive respect from the business community, and will reassure our constituencies that we are keeping our mission intact. Ethical integrity does not require ethical rigidity or dogmatism. But we will put everyone on notice that convincing public reasons will need to be given for any changes we make.

Second, ad hoc ethical norms are insufficient to give us the comprehensive moral direction we need. Our focus in this Congress Forum is upon industries and businesses directly involved in natural resource development or capitalizing upon ecosystem services. This is an appropriate beginning point. To be practically effective, ethical terms of reference need to address the special issues and conditions involved in each particular form of economic activity. The IUCN Council has taken steps to define such terms by insisting that "prior informed consent" and "restoration of legacy sites" are among the key issues for discussion (and for evaluating IUCN's dialogue) with the mining industries. But sooner or later specific ethical guidelines such as those developed for the mining industries must take their place within a larger and more complex ethical framework-an ethical philosophy, if you willwhich has the capacity to provide general terms of reference for all of our engagements. The suggestions I will be making below leap-frog to this point in the process. In our future work we can anticipate a creative interplay between the norms that emerge in the course of our work in specific contexts and the task of constructing general ethical terms of reference.

Finally, social compacts between business and conservation based on clear reasoned ethical terms of reference, far from being a naïve and idealistic diversion, are one of the most hard-headed and realistic things we can do in the cause of sustainable development.

While visiting Australia recently I had the opportunity to talk with Geraldine McGuire, who worked for several years as a community facilitator for Rio Tinto, the multinational mining company, to help achieve "responsible closure" of a large open-pit gold mine in a remote area in Indonesia. Her responsibility was to help build a "tri-sector partnership" between the company, government, and civil society (including environmental advocacy groups) in order to address the issues involved in the mine closing, most especially the protection of worker rights and sustainable livelihoods, dam safety, land compensation, and environmental restoration.

McGuire underscored what a published case study prepared by the Natural Resources Cluster of Business Partners for Development (BPD) also emphasized-that three ethically significant components in the process were of primary practical importance in achieving positive outcomes. One was moral trust, the sine qua non of everything else. The second was clear agreed-upon social and environmental criteria and goals. The third was the writing of a "charter" for the Mine Steering Committee, the decision-making forum that brought together stakeholder participants in structured dialogue. The charter defined the purpose of the partnership, the roles and responsibilities of its members, decision-making principles (decisions were to be arrived at by consensus in the spirit of musyawarah untuk mufakat-the local Indonesian moral tradition), and the requirement that participants use an agreed-upon list of social and environmental criteria when making their decisions. The point McGuire wanted to drive home was that without the charter the partnership would likely have dissolved in rancor and misunderstanding. It was essential that these constitutive terms of reference be established at the outset, because it would have been impossible to establish them in the course of the negotiations.

One of the most important conversations we can be having right now is about what ought to be the ethical terms of reference for such charters.

Let me suggest three different sets of terms for your consideration today. I believe that all three sets are essential if meaningful partnerships are to be formed. These are preliminary thoughts, however, my first cut at this subject. I welcome your thoughts, criticisms, and suggestions.

The first set has to do with *our common moral situation*—the reality we share, the ground upon which everything must be built; the second with the process of engagement, the *procedural norms* that should govern it; and the third with the *agenda for discussion*—the ethical issues that we agree beforehand must be on the table for discussion.

# Our common moral situation

I would like to propose that the following description of our common moral situation serve as the fundamental ethical context and framework for our engagement with business and markets:

• We are members of a planetary community of communities, an evolving interdependent community of life. We love life, we know we owe everything to it, we are profoundly grateful, and we want now to return the gift by building a civilization that sustains life as long as Earth shall last.

- We acknowledge that each member of the community of life, human and otherthan-human, has independent dignity and value regardless of its economic worth or use, and that we are so closely related to one another that the welfare of each is bound up with the welfare of all.
- As a species engaged in a great evolutionary experiment testing whether or not it is possible to create a form of social life governed by free, morally reflective, cooperative individuals, we affirm that we are members of a universal moral community, personally and collectively responsible for the care and respect of the community of life, and for the equitable sharing of the goods of life across present and future generations.
- We have so far largely failed in that responsibility, separating ourselves from the community of nature and humankind, hoarding the goods of life and the fruits of our shared labors, and as a result are alienated from the ground of our being and from one another. Some bear much greater culpability than others, due to profound inequalities of power and resources.
- Yet the experiment is not over and we have hope because we are all born with the potential for developing moral sensitivity, reason, and choice, and because our communities and institutions have at critical times in history demonstrated the ability to transform themselves and pursue authentic ethical purposes.
- The aim we all share is to place our immense capacities for technological innovation and economic production in the service of a flourishing planet in

which the capacities and rights of each person are realized.

This is a thumbnail sketch of the ethical world view that has emerged in recent decades across international civil society, portions of which are expressed in IUCN documents such as the World Charter for Nature, Caring for the Earth, and the Draft International Covenant for Environment and Development. The most comprehensive and widely endorsed of these declarations is the Earth Charter, which affirms that "the spirit of human solidarity and kinship with all life is strengthened when we live with reverence for the mystery of being, gratitude for the gift of life, and humility regarding the human place in nature."

You will also recognize that the moral landscape I have described is far distant from the moral ontology assumed by neoclassical economics, the world view that dominates most public policy today and which provides the implicit ethical underpinning for economic globalization.

As Stephen Marglin, professor of economics at Harvard University, who initiated research aimed at opening debate within IUCN on the ethical foundations of public policy, has argued, the view of our common moral situation assumed by the discipline of economics is based on assumptions of hyper-individualism, radical subjectivism, maximization of self-interest, and unlimited wants, prioritizing the values of efficiency, competitive advantage, and growth. This is an inaccurate picture of reality, and ethically inadequate for formulating sound environmental and social policy. Marglin's analysis builds on the work of progressive economists such as Herman Daly, who, in works such as For the Common Good: Redirecting the Economy Toward Community,

the Environment, and a Sustainable Future, has sought to resituate our understanding of economic activity in a relational, evolutionary, purposive world view, one which gives support to values such as respect, responsibility, cooperation, and love.

# Ethical guidelines for dialogue

The second set of ethical terms of reference that are essential to a productive partnership between business leaders and conservationists involves the ethical criteria for the dialogue that must necessarily lie at the heart of such a relationship.

The Strategy for Enhancing IUCN's Interaction with the Private Sector sets forth a set of "ethical and practical principles" for guidance. The IUCN program for the period 2005–2008 also does a laudable job of identifying some of the most important of these criteria (although it does not name them as "ethical") in its discussion of rules of governance. Although there is substantial overlap, I find the latter to be the most comprehensive and relevant to our discussion here. To quote: "IUCN believes that governance should be based on the principles of:

- Transparency—openness in decisionmaking
- Access to information and justice accurate, effective and open communication
- Public participation—genuine involvement in decision-making
- Coherence—a consistent approach
- Subsidiarity-decisions taken at the lowest level appropriate
- Respect for human rights—interwoven with 'good' environmental governance
- Accountability—for economic, social and environmental performance
- Rule of law-fair, transparent and con-

sistent enforcement of legal provisions at all levels."

This is an excellent set of ethical standards for serious engagement and dialogue between business, the community, and conservation advocates. I would not remove one from the list. Let me, however, rephrase, unpack, or otherwise expand a few so that their ethical aspect is a bit more prominent.

**Transparency.** There is openness in decision-making so that all interested parties, including the public at large, are aware of the course of discussion; the economic and other interests of the parties are fully disclosed; it is made explicit what each is agreeing to, and therefore pledging to honor; there is no hidden pressure to reach any particular outcome.

**Coherence.** Each participant in the dialogue makes proposals and offers justifications in terms others can understand and might reasonably accept; ethical principles, e.g., equity in the climate change debate, are viewed as ends or standards of action as well as means to facilitate agreement on courses of action.

**Public participation.** Each person enters the conversation on a basis of moral equality; there is no privileged position (no greater virtue, or power, resides with any party); each is assumed to have equal capacities for ethical reflection and judgment; the membership of the dialogue is truly inclusive, not only conservationists and business leaders, but representatives of the communities affected, labor as well as management; protesting and dissenting voices are not only tolerated (assuming civility prevails) but sought out for the important moral perspectives they can offer.

Accountability. Independent (third-

party) ways of measuring performance and outcomes are built into the process from the beginning.

It is one thing to outline abstract criteria of this sort, and quite another to do the spade work required to ensure they are implemented. But without the spade work, we risk trafficking in moral platitudes. Ethical seriousness requires that the necessary conditions be provided for the criteria to be meaningfully employed and recognition of this fact should also be an important ethical term of reference for our engagements.

Let us take participation as an example. Because of distrust, language and cultural barriers, and other factors, the parties most affected by a particular business operation are often not at the table. How would we secure participation of the villagers who gathered to protest the Thai-Malaysian gas pipeline project because of its impact on their beach in Songkhla Chana? Does IUCN have sufficient contact with the most morally energized grassroots movements and alternative development organizations trying to address the problems of economic globalization? One of the principal ingredients in the success of the trisectoral partnership at Kelian Mine (described above) was that the community and labor participants were remunerated for the time they devoted to the steering committee meetings. How can we bring to the table the particular business interests that most need to be there? As Ashok Khosla also noted at this Congress, if we publicly named and engaged the 120 companies responsible for 80% of global carbon dioxide emissions in the world, as identified by the U.N. Framework Convention on Climate Change in 2000, we might begin to find effective solutions!

The subjective conditions for success-

ful dialogue and engagement are as important as the objective ones. These have to do with the personal moral values and character of the parties to the dialogue. Although such matters are typically treated as strictly private affairs, in fact they are not. Our personal values have as much a place as more utilitarian considerations in policy decisions. As reported in the journal Environmental Values, when researchers interviewed senior policy advisers active in global climate change negotiations, the majority articulated deeply held personal environmental values, but kept these values separate from their professional environmental and policy activities. As one official said, "Personally I'm willing to sacrifice quite a lot of my material well being in order to protect the environment ... but as a government official, of course I'd have a much more balanced view .... " An important ethical term of reference will be making sure that participants are encouraged, and have structured opportunities, to share their personal experience and values, and that they sincerely try to understand the experience and values of others.

Successful dialogue also depends upon the moral maturity of each of the participants. Such qualities as compassion for the situation of others; willingness to admit error, deceit, or wrong-doing; ability to keep one's word; or perhaps most difficult of all, what the Buddhists call non-attachment to material things, are determining factors in the quality of discussion. One of the most difficult moral truths to accept is that, while win-win solutions are always to be preferred, on most occasions there will be losses involved, sometimes serious losses that might be most accurately named "sacrifices." One or more of the parties will need to give up important advantages for the sake

of the common good. We will need to find ways to help participants in our engagements prepare for the morally difficult choices they will sometimes need to make.

# The agenda for deliberation

Finally, I believe there is a set of critical economic, social, and environmental issues that all parties must agree to place on the agenda for explicit and deliberate ethical reflection and decision. As the list below will show, I believe our ethical terms of reference should include good-faith deliberations on both the ways in which particular economic policies can be improved and how the system itself should be transformed.

**Reform of business and market practice.** The first set of agenda items are those which we have concentrated upon in this Global Synthesis Workshop, and which advocates of green commerce have sought to promote in a variety of programs and publications.

It is essential that we continue in our engagement with business to show why conservation of biodiversity is both good business and good ethical practice, to strengthen corporate social responsibility (CSR), pursue investments with the "triple" bottom line of financial return and social and environmental results, promote tax and other economic incentives for environmentally positive investing, encourage socially responsible investing, build public moral support for more effective regulatory mechanisms, create honest markets by incorporating indirect (external) costs of providing goods or services into prices, make sure company standards and codes of conduct respect sustainable thresholds of natural systems, and construct new ethically informed indices of economic progress. It

also is essential that we continue to define and press the crucial ethical principles pertinent to each economic sector, such as prior informed consent, and legacy obligations in the mining industries.

Ethical analysis of major environmental economic issues. A second set of agenda items has to do with the leading global environmental issues with significant economic components and the ways in which ethics can contribute to their resolution. I do not need to tell you that this list is long, and many-including biotechnology; the rights of indigenous peoples; sustainable use of wild species; health, human rights and the environment; the definition of "sustainable development" and its key components such as the precautionary principle-are of direct concern to members of our IUCN Ethics Specialist Group (ESG). Let us look more closely at two illustrative examples.

Global climate change is negatively impacting the intrinsic, instrumental, and systemic values of biodiversity throughout the planet, and sabotaging attempts to lift the world's poorest out of poverty. ESG member Don Brown will be convening a meeting at the Intergovernmental Panel on Climate Change in Buenos Aires on the ethical dimensions of the climate change negotiations, pointing out that the figure set for the absolute ceiling on carbon dioxide emissions is ultimately an ethical judgment, and that questions of equity and the respective responsibilities of wealthy and developing nations hold a vital key to lasting agreements.

Security has emerged on the global agenda as an increasingly urgent geopolitical issue and one that the conservation community quite rightly seeks to show has environmental as well as economic, social, and

military aspects. No doubt the most neglected dimension of the issue, however, is ethical. The root causes of violence in the world are to be found in conflicting worldviews and values. Other important contributing factors, such as endemic poverty, the spread of deadly armaments, large-scale population movements, ecosystem breakdown, new and resurgent communicable diseases, and rising competition over land and other natural resources can often be shown to be due to personal, corporate, national, and international moral failings. To try to address these problems without acknowledging moral culpability, or apart from ethically inspired efforts at peacekeeping, equalization of living standards, democratic governance, and ecosystem conservation, is futile. The greed and triumphalism that dominate American society at present are primary causes of its failure to collaborate in the multilateral efforts necessary for true international security and this will only change when the moral conscience of the nation, including its business community, is re-awakened.

**Economism.** If there is to be progress on restructuring the global economy, we must distinguish between ethically justified economic development—sustainable development in the best sense of the term—and what is called by Herman Daly the ideology of "economism"—the belief in unlimited economic growth, unregulated markets, limited government, and the positive benefits of consumer culture.

I sometimes have the impression in these meetings that there is an elephant in the room and no one is talking about it. As a citizen of the United States, I can assure you the elephant is real and quite large. The ideology of economism, and the petroleumbased economy that underwrites it, has such a tight grip on our society that it is in effect our secular religion. But not only that of the United States. As Sulak Sivaraksa, Thailand's leading spokesperson for engaged Buddhism, has said: "Western consumerism is the dominant ethic in the world today."

We must convince our responsible business partners that this phenomenon deserves a high place on our agenda for discussion. All the CSR, market incentives, scientific studies, and dialogues between conservationists and business representatives will be of little avail if the ideology of economism remains intact, and if the aggregate economic demands on the ecosystems of the planet continue to accelerate.

This ideology operates at three interdependent levels, each of which needs special analysis. We briefly treated the first in our discussion of the moral ontology assumed by the discipline of economics, the world view that dominates most public policy today, and rationalizes the present pattern of economic globalization. To show you just how alive and well this ideology is in the United States, one of the members of the University of Chicago "school of economics" recently argued that if we are to obtain the "marvelous material benefits of capitalism" we must submit to competitive markets that are "relentless, ruthless, unruly, and irreligious." This helps explain the widespread fatalism that economic globalization in its current form is inevitable, and that if we are to receive its alleged economic benefits we must be willing to make substantial environmental and social sacrifices.

The second level is that of corporate power and influence. The mainstream corporate sector broadcasts the ideology of economism and benefits from it. As one academic analysis of journalism notes, news today must "fit" within the "info-tainment" strategy and profit-seeking guidelines of the corporations which own most major news media. A principal component in the ideology is that government control of the economy through regulatory law is inefficient and oppressive. When we speak of governments as being too weak to deal with environmental and social problems we are seeing a self-fulfilling prophecy.

The third level is that of popular consumer culture, based on the widespread and largely unconscious assumption that we have unlimited wants, that the good life consists in the acquisition of ever more manufactured products and experiences. Can we expect biodiversity to be valued and preserved when our public spaces are filled with advertising images that pander to the crudest material appetites, and that glorify a lifestyle of excessive material affluence? In the United States today the metaphor of marketing pervades and corrupts virtually every facet of public, business and personal life, including attitudes toward the land, defined as investment "real estate."

We must face this destructive reality in which we are all caught up—citizens, conservationists, politicians, businesses alike and place it squarely on the agenda for discussion. In Vaclav Havel's words, "the system of consumer culture and development" is the "lie" which most of us live, and yet we act as though it were reality; whereas "living in the truth" is to call it a lie and tackle the immense cultural challenges and realignments of economic and political power necessary to change it.

**Global corporate governance.** I do not see how this can be done unless conservationists and enlightened business interests together examine the ethical justification for the reigning form of economic organization, the corporation, especially in regard to the question of internal and external democratic political governance.

In a very short period of time corporations have grown from small organizations legally chartered for clear and precise purposes and operating under clear stipulations, with full shareholder liability, to a global economic hegemony, with the same rights and protections as those of individual persons, plus limited liability, and the legal responsibility to earn a profit for their owners. The corporation is an artificial human creation and there is no reason to believe that it is the most morally justified form of economic organization that it is possible to contrive. It is now a very hierarchically ordered organization, with gross disparities between levels of remuneration and opportunities for meaningful participation-the opposite of the kind of responsible mutuality and equality we try to nurture in a democratic social order. In what specific ways is it therefore legitimate and justified? What other forms of economic organization could be more ethically defensible instruments for ensuring the well-being of nature and human life?

A closely related question, one that is being increasingly asked throughout international civil society, is what new forms of global political governance can make economic organizations—whether corporate or otherwise—more directly accountable to the citizens of the world. The immense impact of transnational corporations makes this question both urgent and inevitable.

# Hope for IUCN

I have argued throughout this paper that reconstructing the global economic system will be the primary test of the capac-
ity of the World Conservation Union for moral leadership in the 21st century. My hope is that IUCN will take this challenge seriously and continue to work to build consensus on the ethical terms of reference for a transformative engagement between conservationists, civil society, government, and business.

Fortunately, we are not alone. We can and should link arms with the many persons throughout international civil society, in the United Nations and other international institutions, and most especially within the progressive business community, who are as desirous as we to find an alternative development path based on ethical commerce, just and sustainable communities, and new ways of measuring human progress.

To do so would mean keeping faith with all those who have gone before us in this organization, and the many millions more, who have hoped against hope that our species would rise to the challenge of governing its economic affairs in such a way as to honor the gift of life.

Ron Engel, Ethics Specialist Group, IUCN Commission on Environmental Law, and Center for Humans and Nature, P.O. Box 717, Beverly Shores, Indiana 46301-0717; jronengel@comcast.net

## FOR A QUARTER-CENTURY, the George Wright Society has been about one thing:

KNOWLEDGE FOR PARKS.

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 & zip / state / prov. postal code work work phone fax email expertise (name up to four areas) \_\_\_\_ regular \$45/yr \_\_\_\_ supporting \$150/yr \_\_\_\_ institution \$100/yr life \$500 patron \$1,000/yr full-time student \$25/yr \_\_\_\_ check enclosed \_\_ please charge my Visa / MasterCard / American Express Card number: \_ Expiration date (MM/YY): \_\_\_\_\_ Signature: MAIL TO: George Wright Society • P.O. Box 65 • Hancock, MI 49930-0065 • USA OR FAX TO: 1-906-487-9405



Dedicated to the Protection, Preservation, and Management of Cultural and Natural Parks and Reserves Through Research and Education