

*The George Wright*

# FORUM

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Volume 10

1993

Number 3



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*The George Wright Society*

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

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ISSN 0732-4715

Editorial guidelines may be found on the inside back cover.  
The text paper of the FORUM is made of 50% recycled fibers.  
Printing is by Weber & Sons, Park Falls, Wisconsin.

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Cover Illustration by *Michael Keranen* of Hubbell, Michigan

# Letter from Gustavus

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## *The Alaska National Interest Lands Conservation Act: An Open Letter*

*June 19, 1993*

Mr. George Frampton  
Assistant Secretary for Fish and Wildlife and Parks  
Department of the Interior  
Interior Building  
Washington, D.C. 20240

Dear Mr. Secretary:

I am a recently retired National Park Service ranger-historian living in Alaska, having worked in the Alaska parks since 1975. I was on the NPS task force during the “d-2” period as task force historian and keyman for Yukon-Charley, then had various assignments as regional historian and park historian through 1989.

I wish to urge you to urge appropriate congressional committees to launch a long-term oversight investigation into the implementation of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). I have no doubt that you have followed the sorry history of that implementation—its dominance by an anti-theoretical congressional delegation and the Watt–Hodel ideologues. In sum, the National Interest of ANILCA has been travestied in favor of special economic and user interests without regard to congressional intent and the plain statutory language. These abuses have been big and little, and pervasive. They have created precedents with major debilitating effect on protected lands across Alaska. Backed by a species of administrative terror (head-loppings and exile), micro-management for special interests has spawned soft, even craven administrative patterns amongst the various conservation agencies, in the process degrading the

people and missions of those agencies—and thus eroding the land base itself. Many who have drawn the line have been shipped out or rendered impotent, leaving the public trust to the more compliant. Thank God, at operational levels there are many exceptions to this devolutionary process.

My point is that so much has gone wrong, and by inertial momentum is still going wrong, at such deep levels, that a major review of the implementation process is necessary to rectify ANILCA's 12-year-long false start under the Reagan-Bush regime. A new setting of strategic goals based in law, accompanied by roll-back of bad precedents and revitalization (including selective replacement) of personnel, is the bare minimum program for realization of ANILCA's promise. A close coordination between the Department and Congress via oversight hearings, General Accounting Office investigations, and rigorous agency action is the bare minimum level for such a venture. Moreover, the public deserves to know how badly its trust has been traduced. And this Administration could use a forum on matters of real substance in a zone of cohering national concern. In addition, doing something about perverted public lands policy in high-profile Alaska would open the way for roll-back and reform of such policy in the rest of the country. For starters, I offer four general and two specific zones of inquiry, starting with the general:

**1. The wilderness studies called for by ANILCA.** I know that you know that the lines were drawn by former Assistant Secretary Bill Horn, *et al.*, without regard to the criteria of the Wilderness Act, *before* the study teams began their work.

**2. The maladministration of ANILCA's subsistence title.** By way of joint state-federal administration of this title, a flood of non-qualifying people (non-rural and lacking traditional and customary ties to the land) have overwhelmed wildlife and fisheries resources in Alaska, with devastating effect on rural, land-based people and the cultural values ANILCA sought to preserve. This, combined with assault-rifle sport-hunting hordes, has placed true subsisters in dire competition for livelihood. A permit system, going back to the intents of the statute, is essential.

**3. RS2477, Historic Roads and Trails.** With benign support from the delegation and the DOI, the map of Alaska has been splattered with spaghetti across conservation units and other federal lands. The prevailing loose standards for granting such state-administered access threatens to dismember parks, refuges, and other public lands. This effect is of course intended.

**4. Navigable waters.** Ditto. A floating twig qualifies a stream for navigability in the state-DOI conspiracy.

There is more, much more. But this gives a window on the kinds of general precedents that are making Swiss cheese out of the ANILCA legacy.

Now for a couple of specifics relating to Glacier Bay National Park, at whose entrance I dwell. These same *kinds* of issues are legion in every one of the new parks and refuges created by ANILCA:

**1. Proposed Vessel Management Plan.** The park's sensible proposed Vessel Management Plan was revamped, as dictated by the cruise-ship industry with support from the delegation and DOI. Proposed 30% or more increases in num-

bers of cruise ships per season have no basis in scientific understanding of the bay's ecosystem. Limits were originally imposed because the increasing numbers of ships may well have contributed to the absence from the bay of humpback whales for several years in the early 1980s. The proposed plan violates the core conservation-preservation dictum: Be conservative if we don't know what the results will be, so err in favor of the resource. Well, we don't have the foggiest.

Incidentally, this proposed plan, catering to the big ships, infuriates local boaters, who also enter the bay under permit and are getting no commensurate slack. But of course they don't contribute big bucks to politicians.

The proposed Vessel Management Plan is in your office somewhere. It should be killed, or at least tabled until you can judge its iniquity and inequity. *Even at today's level of ship and flight-seeing traffic, the wilderness solitude of Glacier Bay is a thing of the past.* Dave Bohn's great book on Glacier Bay, subtitled *The Land and the Silence*, no longer applies.

**2. Commercial fishing in the park.** Today there is absolutely no legal basis for any commercial fishing in the park. Glacier Bay National *Preserve* (the Dry Bay area at the northwest corner of the park) does have special legislative provision for commercial fishing. Lacking such specific exceptions in law, commercial fishing is prohibited in National Parks. The Park Service has been lax in past years on this issue, resulting in a major commercial fishery operating in Glacier Bay proper. It is perfectly legitimate to proceed to legal administration, i.e., a ban on commercial fishing, by way of a set phase-out time frame, given the historical ambivalence of USNPS administration. But the premise of the current fisheries study oversteps administrative discretion: the study is to determine whether commercial fishing adversely impacts the park's marine resources, with the option of allowing regulated fishing to continue if the impacts are sustainable. Interpretation of Park Service legislation (Organic Act of 1916, NPS Administration Act of 1970, and Redwood National Park Act amendments of 1978) in the 1986 District Court decisions *National Rifle Association v. Potter* allows no such discretion, nor do our own regulations of June 30, 1983, which stemmed from the 1978 amendments. The sum and substance of our legal and regulatory mandate is that we, the Park Service, cannot allow consumptive uses in the National Parks lacking specific legislative provisions for such uses. So how can we justify a study whose upshot is a decision whether or not to allow commercial fishing in Glacier Bay?

I am not advocating dismantling the fine research unit doing this work; there is great need for long-term, in-depth research at Glacier Bay. But let's set those people to work on productive research—changing the current project design and purpose to a full-scale marine ecosystem study whose end would be a designated Glacier Bay Marine Sanctuary, by far the largest and most dynamic in the Nation.

As a resident of Gustavus, where local beneficiaries of the current Glacier Bay fishery live, I can see some accommodation to local, small-scale fishermen who, in the years since World War II (after which the park was finally staffed), have grown accustomed to this source of income and depend on it. Special legislation to that effect—tenured; strictly regulated as to take, species, and zones; and limited to local, small-scale fishermen with a provable history of use—might well be in order,

given the history of this issue at Glacier Bay, where the park has been party to the on-going fishery. But I see no authority whatever for commercial fishing in the bay—small-scale or otherwise—without special legislation. Thus a study hinged on an administrative discretion that does not exist under law or regulation contradicts our mandate; agrees with the National Rifle Association interpretation of our charge, which was rejected by the District court by way of judicial affirmation of the *preservation* nature of that charge; and poses vast precedential danger to the National Park System as a whole. In this instance, the Park Service need only obey its laws and regulations, with such accommodations as deemed appropriate, to avoid shooting itself in the foot.

This whole tangled mess, general and specific, is, I repeat, only illustrative of the multiplex kinds of problems that have grown into the fiber of the pre-ANILCA and the ANILCA lands. As for the national parklands in Alaska, they compose nearly two-thirds of the entire acreage of the National Park System. They and the other beleaguered ANILCA conservation units (not to mention the tragedy of the Tongass National Forest) are surely worthy of some emergency-room care by this Administration after the wrecking-ball experience of the last twelve years. And, as noted above, a cleansing issue, positive and unquestioned by the vast majority of the American people, could be a great boost for this Administration, putting it on track for positive accomplishment in a Nation begging for leadership. I dearly want this Administration to succeed, for otherwise we face another Dark Age in all realms of our society and heritage.

Sincerely yours,

William E. Brown

# Wading into the NBS Pool

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## *Some Thoughts from the GWS Executive Office*

The National Biological Survey will materialize about the same time that these pages are read. Most everyone can see giant benefits to be gained. And yet, almost all the same everyones also fear that separating scientists from their land-managing agencies could leave the agencies without needed daily scientific counsel. We have received copies of several lengthy and heartfelt letters from members who wrote to Secretary of the Interior Babbitt to express these fears. Our own fears extend more to the long-term survival of what is currently envisioned. As long as Bruce Babbitt is at Interior, the NBS is one thing; if another James Watt emerges, it could become quite another. History rarely if ever repeats itself exactly, but what happens if NBS tires of (or is *told* to tire of) research related to parks and reserves, and the scientists disappear from the parks scene as they did in 1940?

Some of you may also have wondered, as we certainly have, what the creation of NBS means for the future of the Society. After all, Park Service scientists have been one of the core groups of our membership, and now they will be transferring wholesale to NBS. (In fact, the GWS president, Gary Davis, and our treasurer, Steve Veirs, are among those who will be making the move.) Is the Society so closely identified with “Park Service science” that the creation of the NBS will, in effect, pull the rug out from under us?

The answer, we think—we hope—is “no.” The Society was never intended to be a group mainly for Park Service scientists, although that perception continues to be held by some. In fact, the Society’s motto, which speaks of “the protection,



preservation and management of cultural and natural parks and reserves through research and education”—with no particular emphasis on *national* parks, and certainly no exclusive focus on science—really is a succinct and accurate statement of what we are about. Now obviously we are vitally interested in promoting better scientific research in national parks, but whether that research is carried on by the Park Service, the NBS, other agencies, or academics is a secondary consideration—as long as the research is effectively coordinated with the management of the area.

That, of course, could be the big sticking-point with the NBS set-up. So we look forward to fostering a close working relationship between the Park Service and the NBS. But more than that, the Society must reach out to new NBS employees who did *not* transfer from the Park Service. The largest contingent of scientists going into NBS will be from the Fish and Wildlife Service, some of whom have not grappled with protected area issues—issues different from those of many of the other land management and species management areas. We need to make the Society known to these folks and welcome their contribution to our forums and conferences.

This is part and parcel of our efforts to make sure that we are inclusive when it comes to defining “parks and reserves.” (The alternative term used above, “protected area,” is admittedly awkward and imprecise, but it does have international currency.) Thus we have labored hard, especially over the past few years, to reach out to, and try to begin serving the needs of, people who work with the Forest Service’s research natural areas and wilderness areas, the National Oceanic and Atmospheric Administration’s marine sanctuaries and national estuarine research reserves, the Environmental Protection Agency’s habitat cluster, the Bureau of Land Management, the various state park agencies, nongovernmental organizations, university departments, and so on—not to mention the Canadian Parks Service and a whole host of other organizations outside the USA. And all of this is in addition to our efforts to achieve a balance between natural resource and cultural resources interests in our publications and activities.

Much, of course, remains to be done on these fronts. Still, the Society has accomplished a lot that is worthwhile. Take, as an example, our (roughly) biennial conferences. When the GWS was established thirteen years ago, the thinking was that there was a need for a healthy, close relationship between and among park and reserve managers and those who perform the research necessary for resource management and interpretation. Prior to our founding, the Park Service co-sponsored, with the American Institute of Biological Sciences, two conferences, in 1976 and 1979, to bring researchers and managers together for week-long dialogues. Before that, several symposia at national conferences were held, including a symposium, “Research in the Parks,” held at the 1971 Annual Meeting of the American Association for the Advancement of Science, which celebrated the centennial of Yellowstone National Park.

The reason for these symposia and conferences, and the reason for GWS conferences and activities since then, has been to give researchers, managers, and in-

tepreters a forum to discuss common problems and potential solutions, and to bring all of them into closer contact—and hopefully understanding of one another’s positions and problems. To a large extent we think these activities have been successful. There is always the danger that the efforts so far could become undone, however, making continued efforts imperative—a word we don’t consider lightly.

The 7th conference, sponsored by GWS, and held last November in Jacksonville, Florida, was our best attempt yet to expand the meeting to include additional national and state/provincial agencies and organizations who oversee protected natural and cultural areas. Now, more than ever, a continued expansion must proceed, bringing NBS, NPS, and all the other organizations mentioned above into close contact and cooperation. We expect to do just that at the 8th conference in Portland, Oregon, the details of which will be announced soon.

If GWS can manage to do just one thing—develop continuity over the long-haul in the dialogue among the various agencies and organizations, among researchers, managers and interpreters, and ameliorate the inevitable vicissitudes in political agendas—we’ll have performed a service worth the considerable effort it’ll take.

Our Society honors the vision of George Wright, who made tremendous personal sacrifices 60 years ago to establish the first scientific programs in the Park Service. But we think that his primary interest was in promoting good research and sound management in the service of all parks and reserves, no matter what the administering agency. In terms of the biological sciences, the NBS has the potential to accomplish Wright’s vision. We in the GWS will do whatever we can to help make the new agency a success.

Bob & Dave

## Recent Life Memberships in the Society

Occasionally in this column we like to acknowledge those members who have made a lifetime commitment to the Society and its work. It is indeed a pleasure for us to thank the following who have recently become Life Members:

- Russell E. Dickenson, Bellevue, Washington
- William O. Fink, Calumet, Michigan
- Raymond G. Gunn II, Salt Lake City, Utah
- John W. Henneberger, Corvallis, Oregon
- Mary Karraker, Capulin, New Mexico
- Ruthann Knudson, Alexandria, Virginia

- Mary Meagher, Yellowstone National Park, Wyoming
- Susan Consolo Murphy, Yellowstone National Park, Wyoming
- John R. Shuman, San Francisco, California
- Arthur L. Sullivan, Van Buren, Missouri
- Jean R. Swearingen, Anchorage, Alaska
- Peter Thompson, Kaunakakai, Hawaii
- Lynn R. Wightman, Morristown, New Jersey

They join twenty-one others on the Life Membership roll.

## International Conference & Exposition on Marinas, Parks & Recreation Developments

Sponsored by the American Society of Civil Engineers, the conference is scheduled for June 26–30, 1994, at the Milwaukee Exposition and Convention Center and Arena (MECCA).

Many new urban, rural and destination resort developments are being designed with recreational amenities, including marinas, parks, multi-purpose sporting facilities, golf courses, stadiums, and athletic centers. Accordingly, engineering and development firms engaged in planning, urban design, landscaping, environmental services, architecture, utility supply, infrastructure, and general civil engineering activities can provide the services required to develop such facilities. Papers are now being sought in these areas.

The exposition will be an integral part of the conference. Potential exhibitors include: designers, manufacturers and suppliers of marina equipment, boat storage equipment/systems, park equipment, playground amenities, golf courses, vacation resort developers, theme parks, computer-mapping software (e.g., geographic information systems [GIS], marina and park management software, etc.

The deadline for submitting abstracts is November 12, 1993. Request information from:

Marinas, Parks & Recreation Conference Conferences & Conventions Dept. ASCE 345 East 47th Street New York NY 10017 USA or call 800-548-ASCE or 212-705-7283
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## Victor H. Cahalane

Victor H. Cahalane, 91, died Thursday, May 6, 1993, at his home in Dormansville, New York. Vic attended Yale University, the University of Massachusetts, and the University of Michigan; in Michigan he became the first director of the Cranbrook Institute. He was a field biologist for the National Park Service, and following the death of George Wright became the Service's chief biologist in which position he served until 1955. He then was assistant director of the New York State Museum until his retirement in 1966.

Vic was past president of the Wildlife Society, the National Parks Association, and Defenders of Wildlife. He was a life member of the George Wright Society. He was also a long-time member of the

Cosmos Club in Washington, the Wilderness Society, the American Ornithologists Union, the Sierra Club, and the Employees and Alumni Association of the National Park Service. Locally, he was active in The Nature Conservancy and the Adirondack Mountain Club. He served on the New York State Forestry Practices Board until recently.

He was also an avid beekeeper, a mystery reader, and a woodworker, and had traveled in Central America and Africa while in his 80s.

Vic was preceded in death by his wife, Isabel Porter Cahalane. He is survived by a daughter, Margaret Hayes, of Dormansville, and a brother, John Cahalane, of Hollis Center, Maine.

## Conrad L. Wirth

Conrad L. Wirth, 93, died Sunday, July 25, 1993. Connie, as he was known to everyone, graduated from the University of Massachusetts in 1923, majoring in landscape architecture. After five years as a landscape and town planner he joined the National Capital Park and Planning Commission in 1928, and in 1931 he transferred to the National Park Service as assistant director. There, he ran the Civilian Conservation Corps for the Department of the Interior. In 1951 he became the 6th director of the National Park Service where he initiated the Mission 66 program: a 10-year effort to bring park buildings and facilities up to a standard of which the American people could be proud, to be completed by 1966, the 50th anniversary of the NPS. This, after over a decade of neglect during the World War II years.

Connie was a trustee of the National Geographic Society, and a trustee emeri-

tus from 1975 until his death; he was appointed by New York Governor Nelson Rockefeller as the first chairman of the New York State Historic Trust in 1966; he was executive director of the Hudson Valley Commission in the 1960s; and he founded the National Recreation and Park Association in 1965, a non-profit research and educational organization. The Wirth Environmental Award was established by the National Park Foundation, honoring Connie and his father, Theodore, and Connie was its first recipient. His autobiography, *Parks, Politics and the People*, was published in 1980 by the University of Oklahoma Press.

Connie was preceded in death by his wife, Helen. He is survived by two sons: Peter, of New Lebanon, New York, and Theodore of Billings, Montana; four grandchildren; and eight great-grandchildren.

# **Fisheries Resource Management Issues and Policies, Interpretation —and the USNPS Mission**

**Daniel R. Tardona and Jayne Tardona**

TIMUCUAN ECOLOGICAL AND HISTORIC PRESERVE  
*Jacksonville, Florida*

**A**N IMPORTANT PART OF THE U.S. NATIONAL PARK SERVICE MISSION is to attempt to promote and protect healthy and productive habitat in order to maintain native plant and animal species. The difficulty is in trying to maintain the delicate balance between preservation and use of resources mandated for the agency by the Organic Act of 1916 (16 USC 1 et seq.). One strategy for accomplishing use of natural resources without compromising their preservation is by instilling in the visitor, through interpretation, an understanding and appreciation of the fundamental paradox of the Park Service mission.

Through awareness and appreciation of the Park Service mission the visitor can be the most effective preserver of natural resources. In many instances interpretive programs can help accomplish this goal. Nonetheless, too often attention is focused upon those natural resources that are most salient to the visitor and park personnel, while little or no attention is focused upon less-observable resources. Fisheries and aquatic ecosystems are major resources that have not received adequate attention within the scope of the Park Service mission. Aquatic ecosystems worldwide are being severely altered or destroyed at a rate greater than at any time in human history and far faster than they are being restored (National Research Council 1992).

Recently, the National Academy of Sciences—National Research Council (1992) reported that, in general, USNPS resource management needs more and better science to support all resource management decisions. Fisheries resources management has suffered even more than other resource areas in part because of the history and evolution of fisheries management in the National Park System. Fisheries management policies have evolved from the early conception that use of this particular resource would not adversely effect the aquatic ecosystem. George Wright and Ben Thompson (1934) perceived fish as a food source for wildlife and a source of recreation for visitors but did not present a case for preserving fish as a part of the aquatic ecosystem. In the early years of the USNPS, basic attitudes and perceptions had not yet evolved that were tied to better understanding of the importance of maintaining biodiversity.

Today, knowledge about aquatic ecosystems has grown considerably, yet still the Park Service has lagged behind. Schullery (1970) articulated the problems of managing fisheries resources from a recreation perspective without addressing the preservation issue. He points out that, by definition, fish are not perceived as wildlife. He goes on to say that fish are not described in the same terms typically used for warm-blooded animals and other creatures or plants. This results in fish being placed in a different category than nonaquatic fauna. Fish do not have big brown eyes and are not soft and furry; no one has ever made a movie about a cute fish. Therefore, fish do not get the empathy that mammals do from the public.

When fisheries management and science issues are addressed, there is a tendency to focus on the recreational aspects of the resource and not on the value of the resource in and of itself and as an important component of the ecosystem. Even when data are collected and sound ecological strategies are designed with regard to fisheries, often re-

source management and science divisions fail to communicate with each other and neither communicates with interpretation. As a result, the visitor is uninformed about the difficult dilemmas encountered in managing fisheries in the National Park System.

Fisheries management goals are inherently difficult to interpret because the issues are so paradoxical. In general, all native plants and animals in national parks are afforded full protection by law, with one exception: fishes. In the national parks legislation (16 USC 1 et seq.), fish are treated differently from other animals, with, it would appear, no ecological justification. Visitors are often confused by this and have difficulty understanding why they cannot pick flowers, collect insects or rocks, yet they can fish and keep a portion of their catch if they wish. NPS-77, the agency's Natural Resource Management Guideline (U.S. National Park Service 1991), states: "Recreational fishing will be allowed in parks where it is authorized by federal law or where it is not specifically prohibited and does not interfere with the functions of natural aquatic ecosystems or riparian zones. Where fishing is allowed, it will be conducted in accordance with applicable federal laws and treaty rights and state laws and regulations. However, the National Park Service may restrict fishing activities whenever necessary to achieve management objectives outlined in a park's resource management plan." This policy, in conjunction with several others, was drafted to guide park managers regarding many fisheries issues, such as exotic versus native species, traditional use, fisheries restoration versus enhancement, stocking, and maintenance of genetic integrity. However, some national park areas share jurisdiction of their waters with state and local agencies; some have jurisdiction over plants and animals but none over waters. These national park areas are therefore limited in their abilities to protect their aquatic resources. It is important that these issues be understood by the general public.

There is a general failure of communication between scientists and the populace regarding conservation issues (Orr 1991). The Park Service, however, is in a position of close contact with the public on a daily basis. As a national leader in the preservation of natural resources and prime communicator of natural resource conservation, it is essential that the USNPS promote clear communication among its scientists, resource managers and interpreters. When this communication breaks down, the credibility of these Park Service divisions comes into question by the public. The committee on improving the science and technology programs of the agency (National Research Council 1992) concluded that the public expects timely answers to their questions about park resources. Science and interpretation should be closely allied to educate the public and answer these critical questions. Since interpretation should reflect resource management goals, fisheries management interpretation has specific problems even when clear and concise communication exists.

USNPS interpreters must understand the issues before communicating to the public. For example, restoration is often erroneously perceived as the isolated manipulation of individual species. The return of an ecosystem to a close approximation of its condition prior to disturbance is *restoration* as defined by the Committee on Restoration of Aquatic Ecosystems (1992). Long-term maintenance of biodiversity depends upon appropriate assemblages of plants, animals, and other elements of natural systems interacting in a complex dynamic. What better arena to attempt to explain this to the general public than in fisheries management? Issues in fisheries management provide the opportunity to communicate the fact that, because ecosystems have been changed so much, it is impossible to return to the original balanced system; that there are often too many unknown factors to maximize biodiversity; that returning to pristine conditions in national parks is not a realistic goal, and that at best we can choose

only one of the many possible human-modified conditions (Diamond 1992); and that passive management practice of allowing a natural ecosystem to heal itself simply does not work. Diamond (1992) points out that the incompatibility of noninterference with nature and preservation of pristine natural habitats should be interpreted to the general public, and fisheries management issues may provide the best avenues to interpret these ideas.

There are problems inherent in fisheries resource management, such as the need for scientific investigation of fisheries resources in national parks; the need for communication of collected data to fisheries resource managers and interpreters; entrenched public perception that fish may be enjoyed and appreciated predominantly by angling; and, finally, the paucity of management policies that are based on sound ecological principles sensitive to political issues, but nonetheless promote preservation of biodiversity while providing enjoyment to visitors. Interpretive programs often focus on the controlled harvest point of view (for example, "fish with a ranger" programs). Appreciation does not have to equate with direct contact and recreational use. "Stream stroll" programs or sea and river snorkeling programs can be viable alternatives or additions to interpretation directed only at recreational use.

Creating opportunities for viewing native fish in their natural habitat should be emphasized when feasible (the fishing bridge in Yellowstone National Park is an excellent example). This is not to say that the Park Service should begin building aquariums. However, the importance of managing native non-game species can be communicated to the public, enhancing appreciation and understanding of fishery issues. In areas where native non-game species have declined as a result of range reduction, pollution, or introductions of non-native game fish, this important information must be communicated through interpretation so visitors may be aware of

their own participation in the preservation of the aquatic ecosystem.

Perhaps the main thrust of fisheries management interpretation should be programs that communicate not only resource management goals but research results. Fisheries should be integrated into the total resource management program as it ties in with toxic waste, recycling, food chains, cultural history, and a plethora of other use and preservation issues. Interpretation is the forum to address the consumptive nature of recreational angling and its relationship to the USNPS preservation mission. This is not an anti-angling position or a "fish-first" advocacy. Park Service policy permits recreational angling, and it is one way that the mission of providing enjoyment to the visitor is accomplished. However, the Park Service needs to address the preservation issue and others, such as: Why can flowers not be picked, yet fish harvested? What is the difference between fish, plants, and wildlife? Why are some exotic organisms removed from parks while some exotic fish are not, simply because they can be effectively managed? Why are some non-native fish species managed for recreational angling when research has shown they have a negative impact on native species and can be effectively controlled in some areas (Larson and Moore 1985; Moore et al. 1983)? Why attempt to restore native fish species to portions of their native range? These are difficult questions, perhaps all too often avoided in resource management programs and certainly in interpretive programs. If such issues are not clarified to the visitor, is not a double message being sent?

The interpretation of fisheries resource management issues and policies provides a golden opportunity to educate and enlist the park visitor as self-regulator and preserver of the fishery resource. The interpretation of fisheries management issues and policies will impart to the public an appreciation of the importance of a relatively unobservable resource, specifically fish communities, to the health of the observable whole,

the biosphere. As biodiversity is preserved, so is our own survival.

Fisheries resources should be recognized as an integral part of the interpretive program in those parks where they exist. This means including fisheries as an interpretive theme in the Annual Statement of Interpretation. To ensure the appreciation and ultimately the preservation of the native stream, lake, or marine environment, we must focus not only on the game and non-game fish, exotics versus native fish, etc., but also on other important components of the aquatic ecosystem. Aquatic snails, crustaceans, benthic worms, and the like should also be included under the fisheries program theme. Fisheries management resource issues and policies then could be incorporated into park interpretive programs and outreach programs presented in schools. They should be designed specifically to interpret fisheries issues, including fishing ethics, as well as how fish and related aquatic resources are intimately connected with the more observable biosphere. Interpretive brochures should focus on reintroduction programs, studies of fish populations, and angling. Brochures encouraging non-consumptive use of native sport fish and non-sport fish are essential. Wayside exhibits should explain why such use is encouraged, and why fishing for exotics is not. This could be an excellent opportunity to relate to the visitor the conflict of preservation and recreation.

Finally, it is imperative that resource management staff and interpretive staff work together to best educate the park visitor. Interpretation's involvement with research can help educate interpreters. Lovaas aptly stated in the summer 1989 issue of *Interpretation*, "As the National Park Service's primary interface with visitors and nature, and thus keepers of the flame of inspiration, Interpretation bears a heavy responsibility. To meet that responsibility, Interpretation must understand and utilize the fruits of Research. Interpretation must understand Research, its role and how to interact with



it." The sharing of data and questions regarding management of all park natural resources is important to best communicate to visitors the Park Service mission and the difficulty inherent in accomplishing the mission.

But first, to be an effective resource management tool, interpretation must reflect resource management and science issues and policies. Therefore, policy changes must occur first, especially

regarding management of the fishery resource. Then management plans based on sound scientific data must be communicated clearly and accurately to the interpretive branch, which then passes them on to the public. Interpretation of fisheries management issues and policies may then be one of the most potent ways the Park Service mission can be illuminated to the ultimate resource preserver—the park visitor.

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# U.S. National Park Service Inventory and Monitoring: A California Park Perspective

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GOLDEN GATE NATIONAL RECREATION AREA  
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In the last decade biological diversity has become one of the most intense focal points for thought and research in the ecological sciences since Darwin presented his thesis on organic evolution. One hundred and forty three years after Darwin and Wallace proposed the mechanism for evolutionary change, society is urgently seeking ways to maintain the variety of living species observed on the planet (Wilson 1988, Daily and Ehrlich 1992). In the face of exponential growth in the human population and consequent consumption of natural resources (Daily and Ehrlich 1992), biological diversity is being lost at an alarming rate (Wilson 1988). Concern among scientists for the loss of biological diversity (Harris 1984) sparked the formation of a new scientific society, the Society for Conservation Biology, which is dedicated to understanding processes, developing technologies, and integrating this knowledge for social change (Soulé 1987). It is ironic that as our ability to analyze complex ecological relationships has increased, the biological diversity crisis deepens.

Since MacArthur (1965) first discussed patterns of species diversity, tremendous effort has been focused on the topic. The U.S. National Park Service, with a mandate to maintain biological diversity, will use inventory and monitoring to document biological diversity in managed ecosystems (U.S. National Park Service 1992, Rugh and Peterson 1992). Any monitoring effort must be done with a clear understanding of the intricate assortment of processes that influence an assemblage of species (Cody 1975), such as habitat selection

(Rosenzweig 1985, Thomas et al. 1992). At the population level we must understand (1) that abundance may be misleading as an indicator of habitat quality, and (2) the roles of "sources" and "sinks" (Lidicker 1975, van Horne 1983, Pulliam 1988). We must understand the influence wildlife species have on their habitats (Naiman 1988), such as meadow voles on grassland (Batzli and Pitelka 1970, Lidicker 1975, Batzli 1992). The role of disturbance (which at intermediate levels can promote diversity) and natural patch dynamics are integral to

understanding diversity at a landscape scale (Pickett and White 1985, Verner et al. 1986, Urban et al. 1987). The influence of scale on study design cannot be overlooked (Wiens 1981). All of these critical concepts are nested within the hierarchical concept of landscape ecology (Urban et al. 1987).

Golden Gate National Recreation Area (GGNRA) was formed by an act of Congress in 1972 as a unit of the National Park System. The park encompasses 300 km<sup>2</sup> of central coastal California bracketing the Golden Gate and is part of the Central California Coast Biosphere Reserve dedicated in August 1989 (UNESCO 1989). In 1992 it was the most-visited unit in the National Park System, with nearly 20 million visitors. Two centers of endemism are separated by the Golden Gate giving rise to exceptional diversity (Murphy 1988), but because of urban development 11 species are federally classified as threatened or endangered. Park management policies and practices to protect biological diversity remain controversial (Westman 1990).

In the past two decades our society has catapulted into the automated information age of small computers. As computers became smaller, they became more affordable and programming became more sophisticated to the point that an individual can have data storage, retrieval, and analytical capabilities on his/her desk that would have made a scientist on the "Manhattan Project" shudder at the magnitude of their power to process information. Although we are seeing a proliferation of these hardware and software tools, our ability to gather basic wildlife distribution and abundance data to use with these tools lags far behind. Biological diversity will be affected by numerous proximate and global human influences over the coming decades (Wilson 1988). Without empirical information about these relationships, natural resource managers remain blind to the consequences of their decisions, which ultimately affect the biological resources in their care. A case in point is the Park Service's need to have

basic biological inventories of each of the 350 park units in the system (Rugh and Peterson 1992).

In 1989 the superintendent of Golden Gate National Recreation Area set two new objectives for natural resource management at the park. First, the park ecologist would begin inventorying wildlife resources. This objective recognized the need to manage dynamic processes and ecosystems for the conservation of biological diversity (Western 1989). Second, the park would establish natural resource monitoring programs similar to more established programs at Channel Islands National Park (Davis and Halvorson 1988, Fellers et al. 1988). The GGNRA monitoring programs were designed to detect changes in important natural resources and potential resource losses as a result of management actions (Howell 1982, Howell 1985, Howell 1987, Thomas 1992), succession (McBride and Heady 1968), animal influences (Naiman 1988), fire (Thomas 1985) or global climate change (Smith and Tarpik 1989, U.S. Department of the Interior 1989, Burke and Kiester 1990). Historically, data collected were project-specific, had little portability to new situations, and were occasionally misplaced.

The California Wildlife Habitat Relationship (WHR) System (Airola 1988) provided a starting point to direct inventory and monitoring efforts. Which species to expect in a given habitat is not always evident. Terrestrial vertebrates exclusive of birds and bats were selected for study because they exhibit characteristics that leave them vulnerable to environmental change. Ehrlich (1986) described three attributes necessary for invading species to be successful: the ability to cross barriers, establish successfully, and expand their range. Terrestrial vertebrates, especially many amphibians, reptiles, and mammals, tend to lack one or more of these characteristics leaving their populations susceptible to environmental change.

My research is designed to bring together the power of new computers, geographic information systems software,

and wildlife habitat relationship models to evaluate their ability to assist in conducting a basic resource inventory (Howell 1993). In it, I discuss several themes underlying the process of developing, conducting, and evaluating a basic inventory of terrestrial vertebrates and their habitats and the application of geographic information systems.

For decades federal scientists have struggled with inventorying and monitoring wildlife species, establishing procedures to permit the detection of wildlife distributions and population changes, and predicting the response of wildlife populations to environmental change. Pioneering efforts in the U.S. Forest Service (Thomas 1979, Verner and Boss 1980, Patton 1992) and the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1981, Hays et al. 1981, Schamberger et al. 1982) responded to the need for better and more accessible wildlife information in the decision-making process. Ralph and Scott (1981) examined the difficulties in our ability to estimate bird numbers. Davis (1982) compiled a handbook of census methods for numerous species. The U.S. Bureau of Land Management joined in the effort with a guide to wildlife inventory and monitoring (Cooperrider et al. 1986). Additional guidance is available from a wide array of sources (Seber 1982, Welsh 1987, Corn and Bury 1990, McCullough and Barrett 1992).

The Park Service has, by U.S. Code, the strongest mandate for wildlife preservation of any federal agency (Coggins and Wilkinson 1987). In 1991, the director of the USNPS Western Region signed a memorandum of understanding with the other federal land management agencies and California state agencies to protect and preserve California's biological diversity (California Resources Agency 1991). In 1992 the Park Service issued guidelines for inventory and monitoring in the National Park System (USNPS 1992). In 1983, USNPS commissioned the American Association for the Advancement of Science to prepare guidelines for re-

source inventory and baseline study methods (Conant et al. 1983). Ironically, the volume was prepared for developing countries, not the U.S. national parks. In a review by van Riper III et al. (1990) about inventory and monitoring, Conant et al. (1983) was not cited by a single author. It did receive brief mention in the description of Channel Islands National Park's inventory and monitoring program (Davis 1989). A park superintendent thinking of embarking on an inventory and monitoring program would be well advised to review Conant et al. (1983) in some detail. A discussion with resource management and research staff will improve understanding of the nature of commitment necessary to develop and maintain an effective inventory and monitoring program. Miller et al. (1983) stated, "Its [Conant et al. 1983] purpose is to explain, in a single volume, current methodologies for renewable natural resource inventories and environmental baseline surveys that are appropriate for strategic planning and project assessment."

Scientists within the Park Service have begun to address the state of knowledge of inventory databases for national parks. For example, Cook et al. (1990) reported serious inconsistencies in mammal inventory data among parks in California and recommended steps to ensure consistency and quality of data. Similar inconsistencies were reported for vascular plants and amphibians and steps were recommended to close the gaps in knowledge (Stohlgren et al. 1991). Quinn and van Riper III (1990) called for workshops and forums to design and standardize inventory and monitoring studies.

All the above authors called for standardization and uniformity, but in our quest for standard reporting, we can not permit the format to mask the quality of the underlying data. Needs and methodologies will vary across regions and parks. Studies should not be designed by constraints but must "mesh comfortably with space and time scales of organisms, patterns of environmental

variation, and content of study objectives" (Wiens 1981). Rigid standardization can lead to studies being limited to the "lowest common denominator," and thereby achieving uniform mediocrity. Wiens' (1981) recommendation was entirely consistent with recommendations for National Park Service's move toward ecosystem management (Agee and Johnson 1989). Adaptive management, first described by Holling (1978), is a process that uses management actions as hypotheses to be evaluated through the scientific process (Walters 1986). Science requires the hypothetico-deductive method of testing hypotheses and documentation of results (Romesburg 1981).

Verner (1986) presented a comprehensive overview of the state of wildlife inventory and monitoring. He recommended alternative strategies for different situations suggesting a focus on high-risk species. High-risk species were defined as having low intrinsic rates of increase, limited geographic distributions, low abundances, and limited successful reproduction in single habitats. He thought that habitat suitability models were appropriate for high-risk species, and wildlife-habitat relationship systems were appropriate for low-risk species. A similar approach of selecting species representative of the entire community was recommended for Channel Islands National Park (Davis and Halvorson 1988, Davis 1989). It has been argued, however, that a strategy for high-risk species will not necessarily protect or maintain desired levels of diversity. The validity of using indicator species has been seriously questioned on the grounds that habitat requirements of one species does not sufficiently overlap requirements of another species (Landers et al. 1988). The use of stratified random sampling of taxonomic groups has been suggested, and favorably received, rather than assuming that a particular species reflects environmental conditions suitable for all species in a community (Fry et al. 1986). A balance should be struck between focused censuses for community indicator species

(Morrison et al. 1992) and diversity-based monitoring such as illustrated by my research because of the necessity to know which species actually are present.

Sampling to adequately address Type II error, the failure to reject an incorrect hypothesis (e.g., that some species population has not changed when in fact it had), will be an essential consideration when designing a good inventory and monitoring program. Hamilton (1979) warned that levels of precision were often set by: 1) routinely used textbooks, 2) what was satisfactory in the past, 3) what everyone else used, 4) what was attainable with available funds, and 5) what seemed about right. He stated that optimal sample size should be selected to minimize the cost-plus-loss function, that is, losses to resources due to errors in inventory estimates. Guidance is available for selecting appropriate sampling and statistical procedures (Cochran 1977, 1983, Box et al. 1978, Day and Quinn 1989, Chatterjee and Price 1991). Fertile ground for research includes the limits of sample size and power in inventories, the underlying costs, and efficiency of inventories (Verner 1983).

The relationship of survey cost to sample survey methods (Hansen et al. 1962), and to "optimal" precision of resource inventories (Hamilton 1979) has been examined. A central point made by Verner (1986) was the need to show the cost of the inventory effort. A lizard survey at five locations cost \$41,000, and a desert tortoise survey with 1,500 line transects cost \$100,000 (Marcot et al. 1983). Raphael and Marcot (1986) reported that their multi-year inventory of vertebrates in a mixed-conifer forest cost \$600,000. My research cost \$35,000 per year to implement, \$17,000 of which was received from donations. Earthwatch volunteer labor had an estimated value of \$57,600. In this case the implementing agency invested \$36,000 over the first two years of inventory and received \$91,600 in outside support and labor. Although resource value in national parks will be difficult to assess, inven-

tory and monitoring will remain capital- and labor-intensive. Once a commitment is made to an inventory and monitoring program, it must be carried out in a dedicated and persistent manner—otherwise the program will result in little or no value to all.

Resource inventory is the basis for long-term monitoring of processes that affect biological diversity. The fundamental question of what actually lives in GGNRA has yet to be answered adequately. Through my research I explore some of the processes and problems of gaining information from a “basic” inventory of the diversity of higher plants, amphibians, reptiles, and mammals. This study provided the beginnings of a larger network of integrated inventory and monitoring among biosphere reserves around the world (diCatri et al. 1992). I hope lessons learned will improve efforts to document and monitor the complete range of flora and fauna across all habitats in GGNRA.

### Management Recommendations

Conant et al. (1983) recommended that inventory and monitoring should not be project-oriented; that is, focused on or by a specific management problem. They went on to suggest that the methods of study should correspond to the conceptual framework of ecology and ecosystem function. The following recommendations evolved from my research in developing the inventory and monitoring program for Golden Gate National Recreation Area, and should be viewed in that light (Howell 1993):

- ◆ The California WHR System is being used by three California national parks—Golden Gate, Redwood, and Yosemite. The System should be made available to all park units in California with appropriate instruction for proper use.
- ◆ Wildlife habitat relationship models should be used to guide hypothesis development about distribution and community structure when available.

- ◆ Sampling methods, remote sensing, GIS applications, and multivariate modeling should continue to be evaluated by scientists for effectiveness and reliability.
- ◆ The USNPS Western Region should continue to participate in the California Interagency Wildlife Task Group, which is attempting to promote development and adoption of new standardized wildlife assessment and monitoring methods by all state and federal agencies in California.
- ◆ Conant et al. (1983) is a valuable reference for superintendents, natural resource specialists, and research scientists in the national parks. Also the authors might be contacted to elicit updating and revising, and possible republication of this out-of-print book.
- ◆ Adaptive management of natural resources (Holling 1978, Walters 1986) should become the rule in the national parks.
- ◆ Workshops on inventory and monitoring design should be conducted for USNPS resource managers and scientists annually to examine limitation, progress, and opportunities in developing reliable programs (Rugh and Peterson 1992).
- ◆ Data management should become institutionalized under a computer-automated database administrator (Gorentz 1992).
- ◆ Annual inventory and monitoring reports should be produced by each unit with an active program.
- ◆ Cost and efficiency should be an integral factor in the analysis of an inventory and monitoring program (Hamilton 1979).
- ◆ Experimentation in habitat manipulation should be promoted, when feasible, to enhance biodiversity—especially in areas such as GGNRA, where human disturbance has been great.
- ◆ A balanced effort should be conducted between a community-based approach and a species-of-management-concern approach.

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# Can Wildlife Pay for Itself?

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**I**T IS SENSIBLE, INDEED NECESSARY, to link investment in natural resources with sustainable development. Investors do not like to waste money and those who invest in unsustainable development will either lose money or get out quickly, leaving their losses behind. There are many examples of wasted money, including governmental aid money, due to its being spent on financing bad development. Very often this is because systems that would actually be more sustainable, productive, and economically valuable left in a semi-natural state, like a forest, have been converted to a different and ultimately less productive mode, like a ranch.

This paper examines the question “Can wildlife pay for itself?”—or, more precisely, “Is wildlife a good investment?” The term “wildlife” is taken to encompass both natural habitats and the wild species they support. “Pay” denotes the direct provision of a cash return, the indirect provision of financial benefit, and the provision of social benefits more economically than engineered substitutes can do.

On some land, wildlife can provide all these returns as well as contribute to that intangible group of elements that we call “quality of life”—one reason why cash profit is not the only reason why people invest in this area. On much land, wildlife is the most economical form of land use—if the economic sums are done right. Undeniably, in many countries wild nature provides essentials outside the cash economy and if such products were properly valued the immense economic benefit of wildlife would become evident.

There are many countries where forests, savannahs, rivers, and coastlands are important sources of food, in the shape of meat, honey, fish, mushrooms, fruit, and nuts. They are also important for fiber, fuel, medicines, and building materials. Valued correctly, they are an obvious major element in the life-support system. To give three examples:

- 90% of the total primary energy used in Nepal, Tanzania, and Malawi comes from firewood and dung, and these natural sources provide 80% of total primary energy use in many developing countries.
- In Botswana, a range of wild animal species together yield 40% of the animal protein intake. One species, the spring hare, yields three million kilograms of meat per year.
- In Nigeria, wild animals provide 20% of rural animal protein.

At the other end of the spectrum, direct cash benefits come from many kinds of exploitation of wildlife within formal economies. Fisheries are simply systems for cropping the wildlife of the ocean, inshore seas, and fresh waters. Even mariculture, for salmon, shrimps, or mollusks, involves the cultivation of wild species, and generally of individuals taken from wild stocks, contained in modified areas of natural habitat.

As another example, 40% of the pharmaceuticals traded across the counter in North America are said to be of wild origin. The value of the substance derived from the rosy periwinkle in treating leukemia, or of aconitum, in more traditional heart remedies, or of penicillin and all the other fungal-derived antibiotics, which were taken from the wild progressively once penicillin had shown its properties as a contaminant of one of Fleming's culture plates, is very obvious. The economic value of timber, latex, and other materials taken from wild habitats is equally inescapable. Some years ago an estimate showed that 4.5% of North America's GNP [gross national product] was based on the economic harvest of wild species, and that wild harvested resources contributed US\$87 billion a year between 1976 and 1980.

There are also many indirect cash values. Tourism is the biggest industry—or certainly the biggest foreign exchange earner—in many developing countries. It has been estimated that each lion in

the Amboseli National Park in Kenya is worth US\$27,000 a year and that a herd of elephants is worth US\$160,000. The park yields US\$40 per hectare per year under tourism, which is about 50 times what might be expected to come to the national treasurer if it were converted to local agriculture.

Wildlife is also immediately valuable as a source of genetic material. Crop breeders go back to the wild time and again to derive new genes that will make their strains more resistant to climate change and pests, or to meet new market demands. Nature continues to diversify, and will provide such contributions without charge to humanity, so long as we maintain the ecological systems within which that diversification proceeds.

Nature also does many things for us vastly more cheaply than engineers can do. Forests on upland catchments not only stabilize the soil but regulate the run-off of water, and yield pure supplies. The catchment around Tegucigalpa, the capital of Honduras, supplies 40% of its water needs, regulated by percolation through the forest, at approximately one-fortieth of the cost of alternative supplies through engineered impoundments in the denuded hills. Natural sea defenses save most coastal nations vast sums. It has been calculated that the retention of wetland in the region around Boston Harbor has saved US\$17 million a year in flood protection works. A hectare of inter-tidal wetland in the eastern United States has been estimated to have a cash value of US\$72,000 a year as a coastal defense and fish nursery ground. In low-lying island countries like the Maldives, offshore coral reefs that break the fury of the storms may make all the difference between habitability and disaster. Elsewhere in the tropics one sees the other side of the coin, where the destruction of mangroves and erosion of coral reefs has made coasts like those of Bangladesh very much more vulnerable to tropical storms.

All these benefits can be tied more or less directly to particular species or sys-

tems. Beyond—or rather on top of—them, natural ecosystems provide a free service without which we could not live. Green plants renew the oxygen we breathe, and ecosystems cycle the essential elements of carbon, nitrogen, phosphorus, and sulfur. The earth would not be habitable without such processes. The fact is that the non-human, uncosted, economic system of our planet is still bigger than that on which we pride ourselves. The economy of the developed world nestles within a niche in the natural world. All societies depend on it, and without these services there would be no civilization.

If I were privileged to be Director General of Wildlife Services Incorporated, and charged out what the monopoly under my control provided, I would have the biggest and most lucrative business in the world. I would be charging a royalty to the farmers who use my species, modified by selective breedings and continually refreshed by recourse to the wild species in my keeping. I would be submitting bills for your oxygen consumption, your sea defenses, and the management of your rivers.

The answer to the question “Can wildlife pay for itself?” is thus obviously affirmative. The real question is, however, quite different. It is: “Can wildlife pay for itself within the context of our economies?” This is a much more difficult question because those economic systems are distorted in many ways. In particular, we use methods of valuation which favor the conversion of wildlife towards systems that may be less economic and less rewarding.

One reason for this incorrect valuation is the hostility to nature which is still residual in many people and communities, perhaps deriving from the struggles that our early ancestors had against their surroundings. For example, land tenure for settlers in Australia depended on the clearance of the wild vegetation that was pejoratively labeled “bush” (off which the Aboriginal inhabitants had lived sustainably for millennia). Quite recently, in Brazil, the state

was subsidizing the construction of roads into the forests, and granting tax concessions for forest clearance and conversion of woodland to ranchlands of far lower productivity. Even in the United Kingdom, the denuded uplands, deforested by Bronze Age or Neolithic people, are now more valued as sheep pasture than as restored forest. There is a touch of arrogance that puts a value on human-made investment, rather than the natural systems it replaces. Only recently have economists demonstrated the economic fallacy of such an approach, and urged that we must value “natural capital” and cost its depreciation and depletion by human impact. When this is done, we begin to see that wildlife does pay for itself in terms of the opportunity cost of sea defenses on most of the soft coasts of the world held in place by salt marshes, mangroves, and coral reefs, or in the free dispersion of pollution, which we only value properly when we overtax the system and have to make immense investments in pollution abatement and environmental restoration. Similarly, when we do the valuations aright we can see quite easily that wildlife pays for itself in national parks, in maintaining gene banks, and supplying genes for crops, and in supplying pharmaceuticals, or the substances that we have learned to copy in the drugs industry.

A second, more complicated and subtle issue arises from the difficult question of “Who owns wildlife?” The human assumption that wildlife resources were endlessly replenished, and hence could be treated as “open access resources” from which anyone could take what they could catch and gather might be held to imply some sort of divine ownership. Or does the sovereign state own wildlife? Or do the local communities who often live in balance with nature, so long as their populations do not grow too large, but are equally often dispossessed by urban groups with greater money and power?

The fact is that sustainable wildlife use is often best carried out by local

communities. However, many of their activities lie outside the cash economy, and do not feature in GNP, and hence they tend to be disregarded by the central administrations of sovereign states. Forest dwellers, for example, may harvest logs sustainably one by one and take a mixed crop of other products including meat, fruit, fiber, and latex. According to calculations by Norman Myers, the value of such a harvest in any one year is likely to be comparable with the once-off return that will come with the logging of the forest, which takes all the timber in one operation, and destroys it as a source of other products. But because the logging brings revenue to a central national treasury, governments are easily tempted to displace forest people in favor of timber concessions. The social costs of the disruption commonly fall on the local communities. Very few countries pay such communities to conserve resources, however vital these may be. The villagers in the Andes certainly do not get paid for looking after the world's stock of wild potatoes.

This problem even arises in relation to tourism which, par excellence, depends on maintaining wildlife on the ground. The Masai Mara reserve in Kenya, for example, is owned by the Narok district council. Yet only eight percent of the revenues from that industry go to the council, and only around one percent finds its way to the local Masai. In Ngorongoro, one of the world's greatest wildlife spectacles, a recent investigation found that although it was the largest business and the largest employer in the district, only four of 250 employees of the Conservation Area Authority were locally recruited, and a negligible proportion of the revenues from tourism reached the Masai villages.

This is serious, because if wildlife has no value to local people, they have no incentive to conserve it. If local people can neither graze their livestock in, nor take meat from, the national parks in or near which they live, and the parks bring them no economic benefit, can you

blame those people for turning to poaching? For this reason, many enlightened modern wildlife habitat management schemes, like the CAMPFIRE project in Zimbabwe, are based on giving local people a stake in the sustainable management of the resource, with economic returns, and this is the best way of stopping poaching and illegal encroachment.

A third problem is emotion. There is an increasing conflict between those who support the sustainable use of wildlife and those who feel that the commercial exploitation of nature is wrong. Many people hold this latter emotion strongly and very sincerely. However, banning the commercial use of wildlife eliminates its economic value. On the other hand, the marketing of wildlife products, and even trophy-hunting, can bring revenue into conservation and to local communities. Commercial crocodile ranching has been a factor in the increase of crocodiles in the wild—because their value has become apparent. And if it is necessary to cull elephants or other large mammals because they are increasing in numbers and putting intolerable pressure on local communities, why should not licensed hunters who are prepared to pay for taking trophies be permitted to do so, bringing in yet further revenue from an exercise that would otherwise have to be done anyway by government employees? Some people believe strongly that is morally wrong for others to get pleasure from killing, but it can, in turn, be argued that that is between an individual and his or her conscience.

IUCN's position on the Sustainable Use of Wild Species was clearly defined in a recommendation passed at its General Assembly in Perth, Australia. The "ethical, wise and sustainable use of some wildlife" is accepted as "an alternative or supplementary means of productive land use, and can be consistent with and encourage conservation, where such use is in accordance with adequate safeguards." Those safeguards include scientific monitoring to ensure that the ex-

plotted populations or ecosystems are not adversely affected, compliance with national and international law, protection from avoidable cruelty and suffering, and conformity with guidelines IUCN is developing. IUCN also urges the equitable allocation of resources, and distribution of benefits among those involved.

Conflicts of values can sometimes manifest themselves in most peculiar forms. Because of the preference for domesticated over wild species, there are many investment programs to raise domesticated stock like cattle in areas where meat production could be larger, more ecologically sustainable, and more diverse if a range of wild species were utilized. In Botswana, for example, the European Community is funding a cattle-raising scheme which brings important revenue to the country. However, because of EC veterinary regulations, the cattle have to be segregated from the wildlife, there is aerial spraying of pesticides to control tsetse fly, and mixed cropping with cattle and game is rendered impossible. Given the fact that Europe does not exactly suffer from a shortage of beef, this scheme may not be the best investment of taxpayers' money from European Community countries. It might be wise to encourage game production, and cultivate a taste for impala or springbok biltong, and other forms of choice meat.

Substantial revenues are derived from the cropping of wildlife in European countries. Grouse moors, partridge and pheasant shoots, and deer forests are substantial money earners. There are real opportunities for investment in making wildlife spectacles for tourists and catering for needs in access, information, and accommodation. Traditional zoos may be in decline but new spectacles, including indoor tropical forests and wildlife viewing areas in urban zones, are on the increase. Wild lands set aside with their native species for sport and recreation have become an economic asset in many countries, generating a revenue used for the upkeep of

the area or park. Another dimension, of course, is the wildlife film industry, which has been extremely successful, and has done much to bring conservation and its needs to the attention of the public.

It is clear that wildlife *can* pay for itself in simple cash terms in many areas. It is often the best and most economic form of land use. But whether that is recognized depends on the structure of the economy. It depends on the way in which wildlife is valued, on the balance that is struck between local interests that lie outside the formal economy and central interests that are out to maximize national revenues in the short term, and on issues of ownership. Unless we get those things right, the economic sums often yield the wrong answers.

GNP statistics certainly get these sums wrong. For example, they put a premium on building sea defenses at high cost rather than conserving natural systems which do not feature in the GNP statistics at all. Both pollution control and polluting industries are positively recorded in GNP, and there must be some element of distortion and double-counting about that. In most cases, the cost of clean-up greatly exceeds the cost of environmental protection, but cure contributes to GNP while prevention does not.

National resource accounting needs a thorough review. By doing a careful analysis we are likely to find that investing in wildlife is good business, and investing in keeping some natural systems rather than building engineered substitutes is superlatively good business.

This whole issue needs to be seen in context—the context of environmentally sound and sustainable development and the equitable apportionment of its benefits. As the recent IUCN, United Nations Environment Program, and World Wide Fund for Wildlife publication *Caring for the Earth: A Strategy for Sustainable Living* emphasizes, each community needs to judge for itself how it can best conserve its environment and use it optimally. The issues addressed in this

note must be considered within that process, which will demand dialogue. There must be dialogue between all sectors of community, especially environmentalists, who understand the value of the services nature provides, and the limits of nature's tolerance; economists, who face the challenge of incorporating these values into their models and equa-

tions; governments, as custodians of the economy and regulators of policy and action; and local people, who are the custodians and users of the land and its living resources. IUCN will endeavor to promote that dialogue, and guide it to solutions, that cater for the interests of both people and wildlife.

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*This paper originated as a talk given before a symposium at the Royal Society of Arts in London in September 1992. It is here republished, with permission, from IUCN's "Focus Series." Copies from the series may be ordered from IUCN—The World Conservation Union, Rue Mauverney 28, CH-1196 Gland, Switzerland.*

# What We've Learned About GIS

## One Park's Experience in the World of Geographic Information Systems

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### Preface

**O**VER THE PAST THREE YEARS Colonial National Historical Park has been developing a park-based PC-DOS Geographic Information System (GIS) under a cooperative agreement with the GIS Research Program of North Carolina State University (NCSU). During this development period we have received several dozen phone calls from other national parks, USNPS regions, other federal agencies, and state, local, and private organizations regarding our GIS experience. This article attempts to summarize both our positive and negative experiences in developing our GIS. We hope this will be of use to those planning to implement GIS.

### Brief Description of GIS and Its Uses and Value

A Geographic Information System is basically a set of computer programs that allows the construction, display, and analysis of maps and their associated attributes (data)—e.g., type of well, length of stream, size of lake, type of forest vegetation, frequency a field is

mowed, etc. All information in a GIS is georeferenced to a fixed point; that is, each point (e.g., well site), line (e.g., road or stream), or region (e.g., field, forest, lake) has a known geographic reference, often referred to longitude and latitude, or state plane, or universal



transverse mercator (UTM). The use of maps and other drawings is a common activity shared by all the resource management, planning, and administrative functions of an organization. The use of GIS increases the comprehensiveness and efficiency of map use and the associated attributes.

GIS operates first by developing a computerized description of all the information contained on a map or drawing. Each point, line, and region on a map is translated into a series of code numbers (digits) and entered into the GIS computer software. This process is referred to as digitizing. Digitizing can be accomplished through:

- typing on a computer key-board;
- using electronic tracing tablets, called digitizers; or
- directly entering digital satellite remote sensing data.

The digitized media can be traditional maps or drawings, aerial photographs, satellite images, or digital descriptions of phenomena from surveyor's notes to electronic scanners.

The second step in GIS use is the manipulation of the digitized map information in the computer. This is the power of the system. A GIS can automatically change a map's scale, the number of features displayed, legends, and titles without having to redraw or photographically alter it. This is a major advance in both efficiency and completeness.

GIS allows for new information to be generated from the map base with remarkable savings of time and effort. Calculations of area (acreage of wetlands, open fields), linear distances (miles of fencing, roads, earthworks), adjoining property owners, slope and aspect, and many more analyses can automatically be determined with the GIS.

A major strength of GIS is the ability to combine maps and drawings of dif-

ferent scales and themes to develop maps that did not exist previously. For example, GIS can automatically combine a historic vegetation map with a map of present conditions to produce a new map highlighting areas of similarity and dramatic change. The final step in GIS application is the production of map documents (paper, mylar, video) for use in communication and management.

It is of particular importance in the use of GIS for parks that these output maps be of high quality both in accuracy and presentation. There is no loss in accuracy with most GIS programs. Presentation quality is usually better than manual methods, due to the efficiency of the automated plotting and the ability to quickly redraft drawings that need to be updated or changed. In essence a change in management perception is brought on by the use of GIS. With GIS, maps and drawings are considered transitional documents and are easily reproduced or redone. With traditional hand-produced maps and drawings, these products were the only data source and had to be thought of as archival material with little or no potential for redrafting or enhancement.

Applications of GIS can be quite extensive. The overriding importance of preservation of both cultural and natural resources, with the complexities that this entails, makes the potential for use of GIS in a park quite significant. For example, a GIS could be used to refine management plans for vegetation manipulation that would give full consideration to such diverse issues as historic vegetation conditions, viewsheds, wildlife concerns, wetlands disturbance, interpretive development, wildfire management units, maintenance scheduling, utilities and drainages, and law enforcement.

## Developing GIS at Colonial National Historical Park

Colonial National Historical Park is a 9,324-acre park along the James and York Rivers, composed of Jamestown

Island, Yorktown Battlefield, the Colonial Parkway, Green Springs, and Swann's Point. The development of GIS

at Colonial has been phased in. Instead of a single centralized system the Colonial GIS provides distributive access to the database by historic interpretation and preservation, cultural resource management, natural resource management and visitor protection. The base system includes one 486- and three 386-based PCs, with GIS software and access to the database at three park locations.

The park has developed data themes for the GIS under cooperative agreements with NCSU's GIS Research Program, the College of William and Mary—Virginia Institute of Marine Science (VIMS), and the U.S. Department of Agriculture—Soil Conservation Service (SCS).

Also with NCSU assistance, we developed park GIS standard operating procedures to guide the development of new geographic and database files, database management, data dictionary, and cartographic map output.

### **GIS Planning**

Any park considering the implementation of GIS needs to develop a GIS Management Plan. Colonial's plan was developed in the summer of 1990 and provides direction for program implementation (including a needs assessment), determination of priorities, and staffing, hardware, software, and data acquisition needs and cost.

The planning process began by educating Colonial employees about the likely uses of GIS. Several memos, including one on what GIS is and how it might be used at the park, were distributed. We also conducted a day-long introductory GIS workshop at the park attended by 20 park supervisors and division chiefs. The morning session covered principles of GIS, different types of automated mapping and GIS systems, GIS data structure, possible park GIS applications, system design alternatives, and short- and long-term costs. So that participants could relate to specific is-

suess, some park themes were digitized and maps produced for the workshop. At each break, we observed that participants were looking at the maps with a new perception as they learned to recognize potential GIS applications in their operations. The USNPS Washington Office's 20-minute film on GIS was also shown. A hands-on approach was used during the afternoon session, wherein participants were led through an exercise using GIS software and a plotter. Intensive interviews were held over the next two days with different park work groups in all divisions to discern how the different divisions might use GIS and to set priorities for data themes (see Figure 1).

The GIS implementation decision for the park was based on three criteria: 1) the appropriateness of raster versus vector data structures, and the need to exchange digital data with other GIS users (local and state governments, university systems); 2) the ability to have several park divisions benefit from, and use, the GIS immediately; and 3) realistic staffing, budgeting, and training that could be committed to a GIS. The final plan allows for access to a PC-based GIS by the three major park divisions.

### **Cooperators**

The use of university cooperators has been critical to the success of our GIS program. Graduate students become researchers and digitizers as they prepare their theses about different theme development projects. Also, it provides for better give and take than trying to go through private contractors to develop themes, receive training, and solve problems. Furthermore, there is little chance we could receive the equivalent of trained personnel and sufficient full-time employee positions (FTEs) from the park's base funding to develop a GIS. Thus, a university cooperator helps to greatly enhance park staffing and speeds the development of a GIS. Like any cooperative endeavor it requires lots of communication, give and take, and experimentation.

**Figure 1. Themes Digitized at Colonial**

NCSU GIS Research Program	forest cover, fields, wetlands (tidal and non-tidal), roads, streams, earthworks, archeological base map for Jamestown Island, 18th-century historic sites for Yorktown, historic glasshouse; grid overlays for UTM, longitude/latitude, and park roads system kilometer markers; park boundaries, fee-simple acreage, scenic easements; fire management units; rare, threatened and endangered species. and critical habitats; wildlife sightings; historic vegetation changes
College of William and Mary-VIMS, Coastal Management and Policy Center	wetlands (expansion on NCSU work), additional streams, shorelines (1854 to 1990), near surface geology, flood plains, global positioning system (GPS) geodetic control points, watersheds and sub-watersheds, Chesapeake Bay regulatory zoning, water quality and quantity data
State of Virginia, Council on the Environment, ECOMAP GIS	1972 DLG Roads, trails, political boundaries, shoreline, wetlands (NWI), streams, ponds, rivers
USNPS, Colonial National Historical Park	wildlife sightings, fire history, utility rights-of-way, legal jurisdiction, exotic and noxious vegetation species, vegetation species of special concern, expansion of fields, geomorphology of Jamestown Island, National Register of Historic Places, special events and emergency hazardous spills, soil sampling
SCS, Richmond, Virginia	soil survey, drainages
James City and York counties, GIS	(to be supplied in the coming year): topography, order-one geodetic control points, building outlines, adjacent tax parcels, adjacent land-use patterns

### **Cost and Funding**

Developing a GIS system is costly and time-consuming. However, the benefits are great, allowing for responsive and enhanced park planning, environ-

mental assessment, historical research, inventory and monitoring, and emergency response. Based on our experience, the full development of GIS can take a minimum of two years. The park must be able to dedicate one to one-and-

a-half FTEs to accomplish full development, which is in addition to the time of interns and graduate students working on projects. The park GIS staff must be technically competent and well trained. They need an in-depth understanding of base operating systems, archiving, GIS software, hardware, and data-base management.

Funding for our GIS has come from a number of sources, including the US-NPS Washington office and Mid-Atlantic regional office, park base funding, the state of Virginia, VIMS, and NCSU. Figure 2 summarizes expenditures since the winter of 1990.

### Software

The choice of software will dictate staffing, hardware, and final database management system design. Colonial's GIS software choice is ATLAS\*GIS, a DOS-based system. The choice of ATLAS\*GIS was dictated by the low initial cost, user-friendly menu system, minimal training requirements, the capacity to perform the mapping analyses and production tasks identified in the workshop interviews, and conversion abilities to and from ARC/INFO, AUTOCAD, and DLG3. These data exchange capabilities are essential for the efficient transfer

of data to and from non-USNPS sources. These include the Virginia Council on the Environment ECOMAP GIS, VIMS, and the counties of York and James City. Whatever the choice of software, it must have conversion capabilities so that data can be shared with all cooperators.

A PC-DOS software application allowed us to use the same hardware that was already in the park, and didn't require learning a new operating system such as UNIX. ATLAS\*GIS has a database system that is fully compatible with dBase III plus and dBase IV. The software is supported at many universities, and has a macro-programming language, ATLAS\*SCRIPT, for repetitive tasks, special applications, and customized programming. Also, ATLAS\*GIS has a report-writing module built in that creates data tables (e.g., acreage reports). Finally, ATLAS\*GIS has excellent map presentation output, supporting dot-matrix and laser printers, plotters, and raster printers. Linked with IDRISI, a low-cost raster PC-DOS system that can handle satellite images, we have a complete GIS system at less than one-half the cost of ARC/INFO, and more versatile than GRASS, with less training required.

**Figure 2. GIS Expenditures at Colonial National Historical Park (as of 30 September 1992)**

	<b>COST</b>
HARDWARE, distributive system, 3 PCs, 2 plotters, 2 printers	\$45,000
SOFTWARE, GIS, supporting software: ATLAS*GIS (2), LAN ATLAS*GIS (1), ATLAS*PRO (1), LANTASTIC LAN, QEMM, NORTON	\$8,100
SALARY (personnel time spent for data development, administrative, planning)	\$90,000
DATA INPUT, DEVELOPMENT, FREE THEMES from state of Virginia and VIMS	\$153,000
TRAINING, travel, meetings	\$5,500
SUPPLIES, materials, contracts for hardware maintenance	\$2,900
SPECIAL PROJECTS	\$10,500
<b>TOTAL</b>	<b>\$315,000</b>

## Hardware

The choice of software and system design will determine the final decision about hardware configuration and purchases. Options include stand-alone, multi-purpose, or network operation. Some key factors that are generic to all systems, and very important for effective operation, include virus protection, uninterrupted power supply, power conditioning, a back-up (archiving) system, and environmental control (ventilation, temperature, and humidity).

We recommend that the minimum DOS hardware configuration be 8 MB of RAM (12 MB if using WINDOWS), a 486-MHz processor, a 335-MB hard disk, a high-resolution video board matched to the GIS software drivers, and a 20-inch screen (select a high-quality monitor offering high resolution, a flat screen, adjustable color, and compatibility). Also, think seriously about buying a tower case configuration. This will provide plenty of additional slots for add-on boards to accommodate LAN, video, fax, extra hard-disk drivers, and CD-ROM.

Include a laser-jet printer and large-size plotter. The laser-jet printer should have 4-5 MB of memory to handle large data files. We often use the laser-jet printer to test map output design and for final file records of all maps produced.

We recommend a plotter which handles A-E sizes, and has carousels that hold eight pen colors. A top-of-the-line plotter (\$7,000-8,000) provides the fastest and most accurate plotting. We chose a Hewlett-Packard Draftmaster because of its technical performance, as well as the company's outstanding technical support, and its responsive on-site repairs. The secondary GIS location at our park has a smaller A-B plotter. If funding were available, a raster (A/B size) base color printer would be a good investment, although not critical. With the advent of new colors for plotters, we will be able to create even more effective maps that closely reflect raster output.

When procuring a digitizer for corrections and smaller projects consider buying the higher resolution back-lit digitizer that can handle U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps. The larger the digitizer, the better.

Regarding the health and safety of GIS operators, proper ergonomic furniture and adequate lighting is critical. Does the table have an adjustable-height keyboard with wrist pad and anti-static control strip? Is there proper lighting for the different work areas? Is the lighting adjustable? Does the lighting cause glare on the monitor screen? Finally, proper heating, air conditioning, humidity control, and dust control is critical for hardware operation, plotting, and printing. Also, secure sufficient floor space for map files, work tables, and digitizer.

In preparing a request for bidders, use companies that have the technical expertise to provide service during the first year and beyond. On-site warranty service during the first year is a wise investment. After the first year it's desirable to have, at a minimum, on-site warranty service for the plotter. Make sure the bid specifies that the vendor will guarantee hardware and software compatibility. As for choosing among EISA, ISA, SCSI configurations, make sure the vendor guarantees that all parts and boards are compatible. Early on we had problems with the high-resolution video board and tape back-up system not being fully compatible with EISA or SCSI architecture.

## Theme Development

There are many sources available for development of your GIS themes. These include USGS, EROS, SCS, the U.S. Environmental Protection Agency, state and local governments, universities, and park maps. You may have to modify or derive separate themes from those sources. It may be necessary to know how the themes were developed including scale, accuracy, and protocol for classification. This also applies to anything that is developed from park maps, aerial photography, or satellite imagery.

It is imperative to decide how the theme is to be used and develop guidelines for classifying the data. How will the proposed software handle the data? This will definitely affect the final classification scheme. When we received 1:100000 DLG data from the state of Virginia, we found it was from 1972 and due to transportation errors it did not always properly align with our 1:24000 data. This required us to reformat the road delineation to meet our database needs.

Don't discount the importance of digitizing guidelines. How arcs, nodes, lines, points, and polygons are digitized will make a significant difference in the final quality and usefulness of the theme. Quality assurance protocols and error checking can reduce the number of slivers, unclosed polygons, or missing key nodes. Agencies such as SCS have written guidelines for developing themes, e.g., soil surveys (shoreline may be based on low, mean, or high tide). Will you digitize only the road center line or the shoulders or both. You should be able to use the final digitized product to calculate and conduct GIS operations by park boundary, project area, or political subdivision.

Identify what sort of geodetic control system is available in your area. Do you only have the USGS 7.5-minute maps available, or USGS benchmarks? Check on the availability of GPS order-one benchmarks provided by local or state government. The use of GPS, which was unavailable when we developed our earlier themes, can make a large difference in accuracy. A properly registered base map and themes are critical to GIS use. Another must is to decide on a base map for subsequent data theme development and registration. We used USGS orthophotoquadrangles but would have worked with a finer resolution had it been available.

A good test of the GIS is the development of a few important themes before full implementation. This allows for system testing, experimentation, and refinement. A lesson we learned from our earliest work in developing the vegetation cover data theme, is not to use any

aerial photography that produces a negative or transparency smaller than 9x9 inches. Anything smaller makes interpretation very difficult. The choice of film types depends on the season and the type of data needed to record and interpret. Contact a remote sensing specialist for advice. You may need to photograph your area in different seasons or different types of film or both. Finally, don't forget the important phase of field-checking all your interpreted data. Develop a statistically valid method. In interpreting bottomland hardwoods from aerial photographs on Jamestown Island, we found sixteen polygons that were initially interpreted as upland hardwood because of the flat contour of the land. After "ground-truthing," they were changed to bottomland hardwoods. We also discovered missing streams and roads, and trails classified as roads, from USGS DLG files.

We don't recommend digitizing all of the themes in-park. For the initial theme development use a cooperator or one of the national contractors for manual digitizing or scanning. We have found it extremely useful and cost-effective to bring our cooperator into the park to develop and enter the different themes. Having the cooperators on-site allows them to work directly with the subject specialist during the input process. It might be the park historian, curator, park engineer, fire management officer, law enforcement specialist, or natural resource specialist. Moving the digitizer around to be near the subject specialist allows for questions to be answered quickly. Ambiguities with a source map can be quickly clarified and answered. It also allows for regular quality checks and corrections. Also, by doing the work on-site the initial standard operating procedures for the theme can be quickly updated. We have found this a more effective and accurate method than developing a series of mylar overlays and sending them out to be entered into the GIS off-site.

### **Database Management**

In the operation of the GIS, data-base management is critical. This includes

access to the database; who is permitted to edit data; and tracking (documenting) new additions, changes, and problems. Database management also includes security, back-up responsibilities, restoration after disasters, and archiving. One person must have ultimate responsibility for all database management. Access to the original database must be limited and careful tracking of all changes and additions are mandatory. A data dictionary for all coded information must be maintained. It is important to have a clear understanding of and documentation regarding the accuracy and resolution of each database theme.

Our standard operating procedures cover database development and quality control and assurance, digitizing, hard disk setup, LAN use, archiving, documentation, security, disaster preparedness and recovery, and maintenance of hardware. There are individual sections dealing with the different databases which explain structure, coding, file naming, primary and secondary naming (along with layer naming), and data sharing with cooperators.

Access to copy, edit, archive, and restore files should be restricted. Practice "safe computing"—always check new data for viruses and routinely check GIS hard disks.

### **Future**

So where are we going with GIS at Colonial during the upcoming fiscal year? We hope to add in-park color scanning and digitizing capabilities (we borrow a unit now). We will be exploring digital orthophotoquadrangles and raster software for satellite imaging. We will further develop our adjacent land use, environmental, and cultural

database themes. We hope to add WINDOWS capability to the GIS and explore linking it with digital photography of our resources as part of our inventory and monitoring program. This would include the use of a digital slide converter and camera. We will be converting our total GIS database to ARC/INFO for sharing with local and state government. The park's cultural database will greatly expand as part of the multi-year Jamestown Island archeological survey. We will be adding ATLAS\*SCRIPT software for application development, and possibly CD-ROM backup capabilities to replace our present 700-MB tape backup. We will increase the processing speed of our main PC with the addition of an Intel 486 overdrive chip. We will be greatly expanding the data dictionary and expanding our attribute databases. We also need to expand our hard disk storage. We hope to add GPS equipment for inventory and monitoring work. We will continue to expand our training to upgrade skills. We also expect to add additional GIS users through training. We will continue our public relations efforts explaining GIS accomplishments to park staff, visitors, cooperators, and the community.

GIS is an extremely useful tool to manage the multitude of spatial and non-spatial data required for park management. We can expect a quantum leap in the size of our GIS databases as the park becomes more involved in long-term environmental monitoring. GIS provides a whole new perspective when park resource data is georeferenced, analyzed, and displayed on a monitor or map.



# The Rise and Decline of Ecological Attitudes in National Park Management, 1929–1940

## Part III (Conclusion): Growth and Diversification of the National Park Service

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THE WILDLIFE SURVEY CONDUCTED BY GEORGE WRIGHT and his fellow Park Service biologists published its report, *Fauna of the National Parks of the United States* (Fauna No. 1), in 1933, the first year of Franklin D. Roosevelt's presidency. Thus the efforts of the Park Service's wildlife biologists to move national park leadership toward ecologically oriented resource management occurred largely within the context of the New Deal. Extending from Roosevelt's inaugural to the beginning of World War II, the New Deal fostered great expansion and diversification of Park Service programs and opened the way for dramatic changes in the composition of the national park system. It placed new responsibilities on the Park Service (especially in the fields of recreation and assistance to state parks), brought different kinds of parks into the system (historic sites, reservoirs, national parkways, among others), and accelerated physical development of the parks to provide for public use and enjoyment.

By the end of the 1930s the Park Service differed remarkably from what it had been when its first director, Stephen Mather, resigned early in 1929. Yet in some ways, the New Deal programs reflected a continuity of national park management, as many of the programs were in line with basic directions set under Mather. During the 1930s the Park Service sought (as stated in a 1936 internal report) to "enlarge its field of

usefulness" through increasing the viability and the social utility of the national park system—expanding the system and making it more accessible and popular with the public. These were goals quite similar to what Mather had sought.<sup>161</sup>

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<sup>161</sup> The quote is found in National Park Service, "Growth of the National Park Service Under Director Cammerer," 1936, 1, typescript, Entry 18,



Moreover, the proliferation of New Deal programs drew the Service's attention toward matters other than scientifically based management of the parks' natural systems. While such programs as the Civilian Conservation Corps (CCC) nurtured the biologists' efforts by funding additional positions, the era's principal emphasis was certainly on recreational development and expansion of the system. The emergence of ecological management in the national parks had to confront this emphasis. By the end of the decade the gradual demise of the wildlife biology programs evidenced the triumph of the Park Service's traditional recreational tourism urge, therefore maintaining a strong continuity with the Mather era.

### The Bid for Expansion

During the New Deal the National Park Service aggressively sought growth, diversification, and park development—indeed, the Service seems to have gotten everything its leadership could have hoped for. Even before Congress passed the act establishing the CCC, Park Service Director Horace Albright (who had succeeded Mather in 1929) recognized the potential gains from the act. In early March 1933, approximately two weeks prior to the act's passage, Albright wrote his Assistant Director, Arthur Demaray, that the share of funds allotted to the national parks would depend on the Park Service's preparedness—how much it could demonstrate that it was ready to spend. As recalled by Conrad Wirth, the landscape architect who would ultimately take charge of the Service's many CCC programs, Albright was seeking “to justify a good, sound park program should the funds suddenly become available.” The director quickly prepared estimates of \$10,000,000 for con-

struction, including roads, trails, and other developments. He asked the park superintendents to assess immediately their ability to take advantage of the new funds, and called for an updating of national park master plans to prepare for the infusion of New Deal money. With Roosevelt's emergency relief programs, the Service was (as later recalled by Arno Cammerer, who succeeded Albright as director in August 1933) poised to “absorb...a large segment of such work and to benefit greatly therefrom” by making the parks more accessible for public use and enjoyment.<sup>162</sup>

Albright also contacted state park authorities around the country, advising them that the CCC would become involved with state as well as national parks. Of all CCC activities, assistance to the states in recreational planning and development most expanded the Park Service's operations. Funded by the CCC and given solid encouragement from the very first by the Service's directorate, the state parks assistance program began in 1933 and gained momentum rapidly under the leadership of Conrad Wirth. Wirth, who had joined the Service in 1931, was named Assistant Director for Recreational Land Planning—bureaucratic status which indicated the importance placed on these programs. His principal aide was Herbert Evison, former secretary of the National Conference on State Parks—the organization which Mather and Albright had helped found in the early 1920s in their efforts to encourage a stronger state park system.<sup>163</sup> Wirth quickly built an

<sup>162</sup> Arno B. Cammerer, “History and Growth—the National Park Service” (1939), 4, typescript, HFLA. Albright's motivation and active pursuit of CCC money are discussed in Wirth, *Parks, Politics, and the People*, 73-74. See also Paige, *Civilian Conservation Corps*, 38-39; and Unrau and Willis, *Expansion of the National Park Service*, 77.

<sup>163</sup> Wirth *Parks, Politics, and the People*, 75-76, 88; Olsen, *Organizational Structures of the National Park Service*, 52-53.

RG79. Unrau and Willis, in *Expansion of the National Park Service*, provide a detailed account of Park Service growth and expansion in the 1930s.

impressive, far-reaching program, developing proposals for adding new parks to state systems, and overseeing the planning, design, and construction of the facilities necessary for state parks to accommodate public use.

Soon employing thousands of CCC workers in state park projects, the Park Service constructed roads, trails, cabins, museums, campgrounds, picnic grounds, administrative offices, and other features of state parks—work which replicated the CCC projects Wirth was undertaking in national parks.<sup>164</sup> Through assistance to the states, the Service's expertise in intensive physical development of parks extended far beyond national park boundaries. Also, in state or national park construction, the Service's architects and landscape architects of the 1930s directed CCC craftsmen toward a harmonious blending of new construction with the surrounding park landscapes. Following the traditions of rustic architecture established earlier in the national parks, CCC laborers created many structures which later generations would praise for their beauty and quality of construction. Altogether, the focus of CCC development was clearly in support of public recreational use of parks, thus reinforcing within the Park Service this approach to management and greatly enhancing the bureau's leadership role in national recreation matters.

Added to the Park Service's state programs was a national survey of potential recreational lands which could help meet the American public's recreational needs. The survey came about as a result of Park Service encouragement when it participated on the National Resources Board, established by Roosevelt in 1934 to study the nation's natural re-

sources and land uses, including recreation. As recalled in an internal document, the Park Service submitted an "urgent" recommendation to the Board that there be a study to determine recreational requirements.<sup>165</sup> Late in 1934 the Service completed the survey—which it viewed as only preliminary. It quickly began campaigning to expand the survey and to institutionalize existing cooperation with the states by gaining full Congressional sanction for activities which heretofore had been only administratively authorized. This lobbying paid off; the resulting Park, Parkway, and Recreational Area Study Act of 1936 authorized the Park Service to make a comprehensive national survey of park and recreational programs and to assist states in the planning and design of parks.<sup>166</sup>

The National Park Service had thus secured Congressional approval for extensive participation in recreational programs throughout the nation, thereby making a decisive bureaucratic and political commitment to the recreational aspects of park management and to all levels of parks, from state and local to national. Using mostly CCC funds, Wirth promptly began implementation of the act, building upon the 1934 preliminary survey to detail the nation's park and recreational needs in a report

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<sup>165</sup> National Park Service, "Growth of the National Park Service," 5. For discussion of the survey, see Wirth, *Parks, Politics, and the People*, 172-173; and Ise, *Our National Park Policy*, 364.

<sup>166</sup> In a 1936 report, the Park Service stated that it had "sponsored" the legislation. National Park Service, "Growth of the National Park Service Under Director Cammerer," 5. See also *Annual Report of the Secretary of the Interior For the Fiscal Year Ending June 30, 1935* (Washington: Government Printing Office, 1935), 183. Conrad Wirth mentions in his autobiography that the act was passed "at the request of the National Park Service through the Department of the Interior." The act is reprinted in his autobiography. See Wirth, *Parks, Politics, and the People*, 166-168; and Unrau and Willis, *Expansion of the National Park Service*, 109-120.

<sup>164</sup> The Park Service's CCC programs are discussed in Wirth, *Parks, Politics, and the People*, 94-127; and Ise, *Our National Park Policy*, 363-364.

entitled *A Study of the Park and Recreation Problem of the United States*, published in 1941. A comprehensive document, the study argued for the expansion of recreational facilities throughout the country. Also, in cooperation with the Park Service, 46 states worked on statewide surveys, with 37 of the reports ultimately completed, and 21 published. In addition to these studies, the Service undertook a survey of seashores and major lakeshores in the United States, identifying numerous areas eventually to be included in the national park system or state park systems—and in many cases to be put to intensive, recreational use.<sup>167</sup>

The Service's development of parkways for "recreational motoring" further enhanced its leadership role in national recreational programs. Even before the New Deal began, the George Washington Memorial Parkway, Colonial Parkway (to connect Yorktown and Jamestown, Virginia), and Shenandoah National Park's Skyline Drive were already under construction as part of the national park system. Major additions to the parkway program came later in the decade with authorization of the Blue Ridge and Natchez Trace parkways. All of these new scenic highways received massive doses of New Deal emergency relief funds. They also received staunch support from Park Service leadership, which regarded them as perhaps the most "spectacular new phase of national

park planning and development during recent years."<sup>168</sup>

As part of its nationwide recreational work, the Park Service urged authorization of the "recreational demonstration area" program, another type of park planning and development to accommodate intensive use. The Service recognized the potential for acquiring marginal agricultural lands located near urban centers, the lands to be converted into recreational areas—a concept promoted in 1934 by Wirth while serving as Director Cammerer's representative on a presidential land planning committee. Intended to become state or local parks, the demonstration areas were also to be developed for picnicking, hiking, camping, boating, and other similar uses. Having, as Wirth saw it, "unanimous approval and support" from within the Park Service, the program began in 1934, with the Federal Surplus Relief Administration purchasing the lands and the Park Service supervising their conversion into park and recreation areas. Most of the areas, as Cammerer noted in 1936, were meant to serve "organized camp needs of major metropolitan areas." In time, 46 demonstration areas were established, requiring a substantial Park Service commitment in planning, design, and construction to develop the areas for public use. As intended, almost all of the recreational demonstration areas were eventually turned over to state or local governments, with only Catocin Mountain Park, Prince William Forest Park, and a few other areas becoming part of the national park system.<sup>169</sup>

<sup>167</sup> National Park Service, *A Study of the Park and Recreation Problem of the United States* (Washington: Government Printing Office, 1941), see for example, 122-132; Wirth, *Parks, Politics, and the People*, 150, 192-193. In 1937, Cape Hatteras National Seashore, on the North Carolina coast, became the first of these areas to come into the national park system. Others followed, mainly in the 1960s and 1970s. See Barry Mackintosh, *The National Parks: Shaping the System* (Washington: National Park Service, 1991), 81-84.

<sup>168</sup> Unrau and Willis, *Expansion of the National Park Service*, 144-145. The quote is from in *Annual Report of the Secretary of the Interior* (1937), 55.

<sup>169</sup> Cammerer's quote is in *Annual Report of the Secretary of the Interior* (1936), 104. The Recreational Demonstration Areas are discussed in Unrau and Willis, *Expansion of the National Park Service*, 129-143; Paige, *Civilian Conservation Corps*, 117-118; and Wirth, *Parks, Politics, and the People*, 176-190. Wirth's promotion of the Recreational De-

Most of the development that the Park Service oversaw in recreation demonstration areas and state parks was undertaken with CCC funds. CCC monies financed not only the labor (including the enrollees' housing and meals, provided in camps) but also the National Park Service's own professional staff involved in these programs. In addition, major developmental funds came from the Public Works Administration for such projects as electrical and sanitation systems, and road and building construction. Beyond the New Deal's giving crucial support to state park development, the Park Service recognized the relief programs as "invaluable" to the national parks themselves, making possible the completion of "a wide variety of long-needed construction and improvements."<sup>170</sup>

The Park Service expanded into additional fields during the New Deal era, most notably the management of historic and archeological sites, where heretofore there had been no coordinated federal oversight. During the administration of President Herbert Hoover, the Park Service had sought (without success) to gain control of historic and prehistoric sites managed by the departments of war and agriculture by authority of the Antiquities Act of 1906 and other acts. Among these sites were Gettysburg, Antietam, and Vicksburg battlefields (managed by the War Department), and archeological areas like Tonto and Gila Cliff Dwellings national monuments (managed by the U.S. Forest Service, of the Department of

Agriculture). Immediately upon Franklin Roosevelt's taking office, Horace Albright, who shared with Roosevelt a strong personal interest in American history, proposed to the new secretary of the interior, Harold Ickes, that the President transfer the numerous historic and prehistoric sites from other departments to National Park Service jurisdiction.

Aware that the Organic Act provided authority for involvement in historic preservation, Albright believed the Service could provide the best management of these sites. It already managed Mesa Verde National Park and a number of other prehistoric areas in the Southwest, plus three historic areas in the east—Morristown National Historical Park, and Colonial and George Washington Birthplace national monuments. But Albright also hoped to strengthen the Park Service's defenses against a possible U.S. Forest Service takeover by getting the Park Service into fields alien to its rival bureau. And he wanted to build the Service's political strength in the eastern United States—where most of the sought-after historic areas (mainly Civil War and Revolutionary War sites) were located, and where there were very few existing national park units.<sup>171</sup>

This time the Park Service succeeded. In June 1933 President Roosevelt signed two executive orders effecting transfer on August 10 of numerous sites to the national park system, thereby substantially reorganizing the federal government's historic preservation program. Thus the Service had campaigned for and gained a vast new program, with 44

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monstration Area program is also discussed in Herbert Evison and Newton Bishop Drury, "The National Park Service and Civilian Conservation Corps," interview conducted by Amelia Roberts Fry, Berkeley, California, 24 October 1962, and 19 and 26 April 1964, typescript, 64, HFLA.

<sup>170</sup> National Park Service, "Growth of the National Park Service" (1936), 3.

<sup>171</sup> Albright, *Birth of the National Park Service*, 245, 285-286. Albright recalled (p. 286) his belief that "acquisition of the military parks situated in many eastern states would bring a much larger constituency and much broader base, and the Park Service would be perceived as a truly national entity." For a list of the sites managed by the National Park Service prior to the reorganization by President Roosevelt, see Mackintosh, *Shaping the System*, 16-17, 22-23.

historic and prehistoric sites coming into the system, along with 12 natural areas. Among the new natural areas in the system were Saguaro and Chiricahua national monuments, while the new historic areas included many public parks and monuments in Washington, D.C., such as the Mall and the Washington and Lincoln monuments—the Park Service's first major venture into urban park management.<sup>172</sup> Two years later, with the Service's encouragement, Congress passed the Historic Sites Act of 1935, which authorized cooperation with state and local governments in identifying, preserving, and interpreting historic sites.<sup>173</sup> By this act the Park Service increased both its historic preservation responsibilities and its already substantial involvement in state and local surveys and planning.

But as a part of the reorganizations made early in the Roosevelt era, the National Park Service had to accept two changes that it did not want. In 1933 it was given responsibility for managing federal buildings in Washington, D.C. (except for judicial and legislative buildings); and along with this the Park Service suffered a name change—it became the Office of National Parks, Buildings, and Reservations. Management of buildings in Washington added significantly to the demands on the Park Service. Initially, this meant taking on about 1500 additional employees, a figure that escalated rapidly in the ensuing years. And by the mid-1930s, the Park Service was in charge of approximately 20,500,000 square feet of space in 58 government-owned buildings and 90 rented buildings in and around the District of Columbia

and elsewhere—for example, the United States courthouses in Aiken, South Carolina, and New York City.<sup>174</sup> In 1934 the Park Service managed to get its new name (a “much-hated” designation, as Albright recalled it) abolished, and the original name restored. Later, in 1939, management of federal buildings was transferred to the Public Buildings Administration.<sup>175</sup>

Finally, additional involvement in recreational programs came when Congress in the mid-1930s authorized a National Park Service study of the recreational potential of Lake Mead, the huge new reservoir behind recently-completed Boulder Dam on the Arizona-Nevada border. Even before the study was completed the Service had established CCC camps and begun development along the reservoir's shoreline. Not surprisingly, given the direction the Service was taking in other recreational matters, the study found the recreational potential to be very high, and in October 1936 the Park Service formally agreed with the Bureau of Reclamation to manage public recreational use on and around Lake Mead.<sup>176</sup>

Ironically, only 23 years after a bitter nationwide controversy over the destruction of Yosemite National Park's Hetch Hetchy Valley with a dam and reservoir, the Park Service thus found itself a willing participant in the management of

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<sup>172</sup> Background to the reorganization and a list of sites brought into the national park system in August 1933 are found in Barry Mackintosh, *Shaping the System*, 24-43. See also Ise, *Our National Park Policy*, 352-353.

<sup>173</sup> Wirth, *Parks, Politics, and the People*, 163-166; Mackintosh, *Shaping the System*, 49.

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<sup>174</sup> National Park Service, “Growth of the National Park Service,” 2; Unrau and Willis, *Expansion of the National Park Service*, 60-64; *Annual Report of the Secretary of the Interior* (1936), 135.

<sup>175</sup> Albright, *Birth of the National Park Service*, 314; Mackintosh, *Shaping the System*, 26; Olsen *Organizational Structures of the National Park Service*, 61. The director expressed desire to return to the “National Park Service” designation in his 1933 annual report. See *Annual Report of the Secretary of the Interior for the Fiscal Year Ending June 30, 1933* (Washington, Government Printing Office, 1933), 192.

<sup>176</sup> Unrau and Willis, *Expansion of the National Park Service*, 153-155; *Annual Report of the Secretary of the Interior* (1937), 38.

Boulder Dam (later Lake Mead) National Recreation Area, then the largest reservoir in the world. Philosophical contradictions inherent in the National Park Service's managing a reservoir where the main feature was itself a gigantic impairment to natural conditions were apparent from the very first. In 1932, at the request of Secretary of the Interior Ray Lyman Wilbur, former U.S. Congressman Louis C. Crampton, a long-time supporter of national parks, headed a reconnaissance of the reservoir area, the study team including national park superintendents from Grand Canyon, Yellowstone, Zion, and Bryce Canyon. Their lengthy report noted the contradictions, observing that conservationists had long fought to protect national parks from "becoming incidental to or subordinate to irrigation and water supply uses." The report warned that, heretofore, all national parks have involved the "preservation of wonders of nature." Thus:

To deliberately bring into the national park chain and give national park status to such a dam and reservoir would greatly strengthen the hands of those who seek to establish more or less similar reservoirs in existing national parks.

The team also warned that designating a reservoir a national park might encourage mining, cattle grazing and other utilitarian uses of the existing national parks.<sup>177</sup>

Yet even these contradictions were readily resolved, to the enhancement of Park Service interests. As with many other park-related programs initiated during the New Deal era, recreational needs provided the National Park Service its principal rationale for entry

into the field of reservoir recreation management. Crampton's 1932 report on Lake Mead recommended that the area should not be designated a "national park"; rather, the reservoir's *national* importance as a *recreation area* should be declared, and that aspect of its management turned over to the National Park Service. The reconnaissance team believed that the Park Service's reservoir recreation work would be "entirely consistent with history and with principle." As justification the report cited the 1916 Organic Act's statement that the Service would manage "such other national parks and reservations of like character as may be hereafter created by Congress."<sup>178</sup>

Thus, by devising the new designation of "national recreational area" (and indeed, by relying on its Organic Act) the Park Service effectively side-stepped the philosophical contradictions with its traditionally held purpose of preserving natural areas unimpaired and launched a new and ambitious program centered on reservoirs which were being created by damming the rivers of the West. (This program would ultimately mushroom for the Park Service, bringing huge sums of money and closer ties to the Bureau of Reclamation; it would also bring increasingly bitter criticism from conservationists of the 1950s and 1960s, who were very much aware of the contradictions with what they saw as the Park Service's primary mission.) Although within the Park Service, perhaps including Director Cammerer himself, there seems to have been some hesitation about this new involvement at Lake Mead, it was nevertheless urged on by

<sup>177</sup> Louis C. Crampton, Memorandum for the Secretary, 28 June 1932, Entry 18, RG79. Crampton's study was separate from the study conducted in the mid-1930s.

<sup>178</sup> Crampton, Memorandum for the Secretary 28 June 1932. The reconnaissance team included superintendents Roger W. Toll (Yellowstone), M.R. Tillotson (Grand Canyon), and P.P. Patraw (Bryce Canyon and Zion). The Organic Act's wording is in Tolson, *Laws Relating to the National Park Service*, 10.

Conrad Wirth, spearhead of the Service's growth in recreational development. Wirth, in turn, found support for recreational programs from such individuals as Associate Director Arthur Demaray, and even biologists George Wright and Ben Thompson.<sup>179</sup>

The National Park Service's recreational programs did in fact draw upon the talents of George Wright, who as head of the Wildlife Division represented the strongest potential resistance in the Service to its development-oriented park management. In 1934, recognizing Wright's considerable administrative skills, Director Cammerer appointed him to head the initial study of the nation's recreational needs, the study which the Park Service had urged the National Resources Board to authorize. The study team, which included, among others, Conrad Wirth and the Park Service's Chief Forester, John Coffman, worked feverishly through the summer and into the fall, submitting their final report in early November.

Wright wrote Joseph Grinnell, his mentor at the University of California's Museum of Vertebrate Zoology, that he found the recreational field to be "quite alien"—nevertheless he supported the Service's rapidly expanding recreational programs. Shortly before his death in early 1936, Wright voiced approval of the Park Service's growth and diversification, stating in a paper entitled "Wildlife in National Parks," that it was logical to place "responsibility for recreational re-

sources" under the Service.<sup>180</sup> Moreover, Wright had earlier given his blessing to the Park Service's involvement with reservoirs.

Apparently, as the chief proponent of preserving natural conditions in the parks, he saw the Service's varied recreational efforts as a means of relieving harmful pressure on the traditional national parks. In this regard—and consistent with the major focus of his career—Wright wrote Sequoia superintendent John White in 1935 of his concern that the national parks themselves not "supply mass outdoor recreation"—a prospect that would place a "destructive burden" on the parks. To Wright, adopting the policy of "giving all of the people everything they want within the parks...would involve sacrificing the Service's highest ideals."<sup>181</sup>

Overall, the National Park Service eagerly responded to the variety of New Deal opportunities in national recreational planning and development, as well as expansion of historical programs. Regardless of the taint of bureaucratic aggrandizement, the Park Service pursued very seriously—and very idealistically—its advancement of recreational development in national, state, and local parks. Its assistance to the nation's park systems and its nationwide surveys and planning laid the foundation for expanding recreational opportunities throughout the country, a contribution which

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<sup>179</sup> George L. Collins, in "The Art and Politics of Park Planning and Preservation, 1920-1979," interview by Ann Lage, 1978 and 1979, Regional Oral History Office, University of California, typescript, 51-52, HFLA, recalls that Wright, Thompson, and Arthur Demaray supported Wirth in his quest for control of recreation management at Lake Mead. The Park Service's reservoir recreation program, begun with Lake Mead, was propelled further with the river basin development of the New Deal-World War II era and beyond.

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<sup>180</sup> George M. Wright to Joseph Grinnell, 29 August 1934, George M. Wright files, MVZ-UC; George M. Wright, "Wildlife in National Parks," *American Planning and Civic Annual* (1936), 62. Grinnell, Wright's admiring mentor, wrote Wright that, given the significance of the recreational study, he could think of "no one better fitted than...yourself to guide and direct along this important line." Joseph Grinnell to George M. Wright, 18 August 1934, George M. Wright files, MVZUC.

<sup>181</sup> George M. Wright to Col. John R. White, 23 June 1935, Entry 34, RG79.

later generations would find easy to forget or take for granted.

It is also important to point out that even though Conrad Wirth showed little interest in scientific resource management and allowed the biology programs to decline during the last half of the 1930s while he was in charge of CCC funding and staffing, he was nevertheless the Park Service's chief advocate for the creation and development of recreational open spaces, whether with national, state, or local parks. His extensive surveys and planning for new parks during the New Deal (and later during his "Mission 66" program) would bear fruit with the establishment of dozens of new parks for the public's enjoyment and for the preservation of fragments of the American landscape—a legacy of inestimable value.

### Effects of the New Deal Programs

Still, the variety of programs taken on during the New Deal impacted the Service and the national parks in significant ways. Prior to 1933 the Park Service administered a system consisting mostly of large natural areas in the West, along with a few archeological sites in the Southwest and historic sites in the East. During the New Deal, the Service's expansionist tendencies led it into enormous new responsibilities in recreation and historic site management. Using unprecedented amounts of money available, mainly from the CCC, it extended its activities and influence far beyond national park boundaries, becoming involved in complex planning, intensive development, and preservation work with state and local governments from coast to coast. By the mid-1930s, after all of the Park Service's CCC operations had been consolidated under Conrad Wirth, some observers were claiming that, given the size of the programs under Wirth, there were in fact two National Park Services—the "regular"

Park Service and "Connie Wirth's Park Service."<sup>182</sup>

The Park Service's official organizational chart, revised no fewer than eight times during the 1930s, reflected the bureau's growing diversification and professional specialization. The sequence of charts showed an increase from three Washington branches and four "field" professional offices (landscape architects, engineers *etc.*) in 1928, to a complex organizational maze of ten "branches" (or their equivalent) and four newly created "regional offices" on the 1938 chart. (The regional offices had been established in 1937, largely at Wirth's instigation, to correspond with the regional organization used by the CCC.) On the 1938 chart, specifically identified functions that related to the Service's growth and expansion during the 1930s included management of historic sites, archeological sites, memorials, parkway rights-of-way, and District of Columbia parks and buildings. In addition, under Assistant Director Wirth's Branch of Recreation, Land Planning and State Cooperation were the Land Planning Division, the Development Division, and the U.S. Travel Division (the latter, created in early 1937 to stimulate travel to the national parks, would soon open an office on Broadway in New York City).<sup>183</sup>

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<sup>182</sup> Collins, "The Art and Politics of Park Planning and Preservation," 52.

<sup>183</sup> The organizational charts are found in Olsen, *Organizational Structures of the National Park Service*, 42-61. Conrad Wirth recalled that the superintendents were at first "adamant" in their opposition to establishing regional offices, concerned that they would encroach upon the superintendent's authority and affect their lines of communication with the director. The superintendents also feared that the new offices would be headed by men who had risen through the ranks of the CCC, rather than the Park Service. Wirth, *Parks, Politics, and the People*, 119. See also Cammerer, "History and Growth of the National Park Service," 5. In early 1937, the Park Service established its travel division to fill, as Cammerer put it, "a long-indicated need for a national clearing house of information on recre-



Additional changes for the Park Service were detailed in a 1936 internal report, which noted that in the previous three years Service expenditures had increased "about fourfold and its personnel about eight." From 1930 to 1933, total appropriations had amounted to \$11,104,000 annually. Over the next three year period, appropriations averaged \$51,824,000 annually—a dramatic increase. Similarly, personnel figures rose from a monthly average of 2,022 employees in 1932, to 17,598 in 1936, with about three-fifths of the 1936 employees paid from CCC funds. (In Washington alone, management of the federal buildings and the public parks for which the Service was responsible required about 5,000 employees by 1936.) The overall figures also included money and personnel for managing the 56 new historical and archeological parks brought in by Roosevelt's 1933 reorganization, plus staffing for a number of newly created parks.<sup>184</sup>

The various New Deal emergency relief programs which the Service had so successfully tapped funded most of these staff increases. The 1936 internal report revealed that between July 1, 1933, and June 30, 1936, the Service's emergency relief funds totaled \$116,724,000, as compared to \$38,748,000 in regular Park Service appropriations. And, as stated in the same report, the "biggest single factor" in expansion of the Service's operations was supervision of recreational planning and development. The report

indicated that in state parks, up to 91,000 enrollees living in 457 camps had been directed by as many as 5,499 Park Service employees. The relief programs had not only helped bring the national parks "to new levels of physical development," as the 1936 report put it, but also had supported "new and important fields of activity" for the bureau—the many and varied Park Service programs of the 1930s.<sup>185</sup>

In the national parks themselves through 1936, the Service managed as many as 117 CCC camps with 23,400 enrollees, and employed as many as 2,405 "national park landscape architects, engineers, foresters, and other technicians."<sup>186</sup> This last figure alone exceeded the total of Park Service employees in 1932, prior to the beginning of Roosevelt's emergency relief programs—and was a reflection of the heavy emphasis the New Deal placed on forestry and recreational development in the national parks. Much later, in 1951, then Chief Landscape Architect William G. Carnes estimated that the Service in the 1930s had employed as many as 400 landscape architects at one time. By comparison, the Service employed a maximum of 27 biologists in the mid-1930s—significantly fewer than those employed in recreational development. Of the biologists, 23 were funded by CCC money, the remaining four being paid through the Service's regular appropriations.<sup>187</sup>

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ational and travel opportunities ...and to stimulate interest therein both at home and abroad." *Annual Report of the Secretary of the Interior* (1937), 35-36. See also Swain, "National Park Service and the New Deal," 318.

<sup>184</sup> National Park Service, "Growth of the National Park Service Under Director Cammerer," 1-3. Numerous parks were authorized during the New Deal era, including Everglades and Big Bend national parks, Blue Ridge and Natchez Trace national parkways, and Joshua Tree, Organ Pipe Cactus, and Capitol Reef national monuments. Mackintosh, *Shaping the System*, 58-59.

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<sup>185</sup> National Park Service, "Growth of the National Park Service Under Director Cammerer," 4. Further discussion of appropriations during the New Deal is found in Unrau and Willis, *Expansion of the National Park Service*, 75-76.

<sup>186</sup> National Park Service, "Growth of the National Park Service Under Director Cammerer," 4. Almost certainly, many of these individuals were not fully trained professionals, but nevertheless were employed in some aspect of those fields.

<sup>187</sup> William G. Carnes, "Landscape Architecture in the National Park Service," *Landscape Architecture* (July, 1951), copy attached to Hillory A. Tolson,

The totals of funds and positions accounted for by the Park Service during this period suggested not only the New Deal's interest in recreational development of national and state parks but also its emphasis on large resource surveys and national planning—fundamental elements of the New Deal to which the Service readily responded. Furthermore, with these programs the bureau's foresters, architects, landscape architects, and engineers were gaining increasing voice in management affairs. And by the mid-1930s the Park Service claimed its "preeminence" in the recreational field had reached "new heights," with its mission expanded to aiding the conservation of "parklands everywhere."<sup>188</sup> Thus, while certainly meaningful, the emergence of scientific research and biological management in the national parks seems diminished, even overwhelmed, in the context of the Park Service's extraordinary expansion and development during the 1930s.

In this regard, it is significant that when Cammerer's health forced him to step down in 1940 to become regional director in the Park Service's Richmond, Virginia, office, one of Secretary of the Interior Harold Ickes' top recommendations to succeed Cammerer was none other than Robert Moses, the "czar" of New York's park, parkway, and recreational development. Ickes thought that the New Yorker would provide "vigorous administration"—clearly in contrast to what he thought of Cammerer's abilities. The secretary's interest in Moses, conveyed to President Roosevelt, certainly suggests a perception of the National Park Service as much more of a recreational and

tourism organization than one committed to scientific and ecological land management. Moreover, it was Roosevelt's personal animosity toward Moses—rather than any concerns that Moses' aggressive developmental tendencies might overwhelm the national parks—that seems to have led to the President's rejection of Ickes' proposal.<sup>189</sup>

### Dissent and Protest

The many developmental activities of the National Park Service during the 1930s did in fact draw criticism. Concerned about the bureau's developmental tendencies, Newton B. Drury, head of the Save the Redwoods League and destined to succeed Cammerer as director, observed that the National Park Service was becoming a "Super-Department of Recreation," and a "glorified playground commission." These tendencies also caused organizations such as the

<sup>189</sup> Newton Drury discusses Ickes' interest in Moses becoming director in Newton Bishop Drury, "Parks and Redwoods, 1919-1971," interview by Amelia Roberts Fry and Susan Schrepfer (1959-1972), typescript, 352-353, HFLA. Ickes' quote is found in T.H. Watkins, *Righteous Pilgrim: The Life and Times of Harold L. Ickes, 1874-1952* (New York: Henry Holt and Company, 1990), 578. See also Swain, "National Park Service and the New Deal," 329-330. Cammerer died of a heart attack in April 1941, less than a year after stepping down to the regional director's position in Richmond. As Horace Albright saw it, Cammerer's death was due in part to the stress caused by Secretary Ickes' continually hostile treatment of Cammerer. In a fascinating account, Albright later described the anger he felt toward Ickes while at Cammerer's funeral. He recalled that Cammerer's body was in a "couch casket," opened along an entire side so that the former director appeared to be sleeping on a couch. Seated on the front row close to Ickes and near Cammerer's open casket, Albright felt his anger rising and badly wanted to rebuke Ickes. He recalled that the Secretary "looked right straight ahead, all through the services, but I never in my life came so near to doing something very bad....my feelings ran something like this: Look at Cammerer. Keep looking at him. Just feel, as I hope you do, that you killed him. You didn't knife him, you didn't poison him, you didn't shoot him, but you killed him just the same."

Horace M. Albright, "Reminiscences," interview by William T. Ingerson, New York City, 1962, typescript, 543, BL.

memorandum to Washington Office and all Field Offices, 15 February 1952, HFLA; Summer "Biological Research and Management," 9.

<sup>188</sup> *Annual Report of the Secretary of the Interior* (1936), 99; *Annual Report of the Secretary of the Interior* (1937), 34.

Redwoods League, Wilderness Society, and National Parks Association to believe that the U.S. Forest Service might manage the Kings Canyon area of the Sierras (one of the principal national park proposals during the late 1930s) better than would the Park Service. Concerns of this kind contributed to a delay of Congressional authorization of Kings Canyon National Park until 1940 and inspired strong wording in the enabling legislation to protect the new park's wilderness qualities. Aversion to Park Service emphasis on tourism development also caused the Redwoods League to oppose establishment of a national park in the redwoods area of northern California.<sup>190</sup> This opposition contributed to decades of delay, with serious consequences for preservation of the redwoods.

Particularly vociferous criticism of changes taking place during the New Deal came from the National Parks Association, which, since its founding in 1919 with Park Service Director Stephen Mather's support, had been the public's principal advocate for maintaining high national park standards. The Association feared that the traditional large natural parks were threatened by too much development and that the Park Service was distracted by its many new and varied responsibilities. In a conservative reaction to the sprawl of New Deal programs, the Association argued that the

National Park Service was run by its "State Park group financed by emergency funds," and that with the new types of parks the public was increasingly confused as to what a true national park was. To the Association, the "real impetus" behind the expansion and development of the system was the:

recently conceived idea that the Park Service is the only federal agency fitted to administer recreation on federally owned or controlled lands. Some persons even go so far as to assert that its proper function is to stimulate and direct recreational travel throughout the country.<sup>191</sup>

To correct these problems, the National Parks Association in the spring of 1936 recommended purification. It urged establishment of a "National Primeval Park System" which would contain only the large natural parks and be managed independent of historic or recreation areas, or of state park assistance programs. As stated by the Association, this proposal was intended to save the "old time" big natural parks from "submergence" in the "welter of miscellaneous reservations" which were coming into the system. Furthermore, the Association proposed limiting future additions to the primeval park system to those areas which had not been seriously impacted by lumbering, mining, settlement, or other adverse human activities—only the most pristine areas were to be included.<sup>192</sup>

During the 1930s the National Parks Association's highly restrictive approach seems to have had little impact on the Park Service or on the growth of the sys-

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<sup>190</sup> Schrepfer, *The Fight to Save the Redwoods*, 56-64. On the other hand, some opposed the Kings Canyon legislation because a national park would restrict use and development. Details of the complicated campaign to establish Kings Canyon National Park are found in Dilsaver and Tweed, *Challenge of the Big Trees*, 197-214; and Ise, *Our National Park Policy*, 396-404. See also George M. Wright to John R. White, 23 June 1935, Entry 34, RG79, for Wright's comments on the U.S. Forest Service "treating the Kings Canyon areas as a national park...enforc[ing] practically the same rules for its preservation." Wright saw the Forest Service's efforts as an encroachment on traditional Park Service management practices—and thus one of the "gravest dangers" facing the Park Service.

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<sup>191</sup> "Wanted: A National Primeval Park Policy," *The National Parks Bulletin* 13 (December 1937), 13, 26; William P. Wharton, "Park Service Leader Abandons National Park Standards," *National Parks Bulletin* 14 (June 1938), 5.

<sup>192</sup> William P. Wharton, "The National Primeval Parks," *National Parks Bulletin* 13 (February 1937), 3-4.

tem. It was, in fact, criticized by individuals within the Service, from Cammerer to George Wright. Director Cammerer and his staff disliked the primeval parks proposal, believing it would divide the system into first and second class areas. And, writing in the *American Planning and Civic Annual* in 1938, former director Horace Albright, one of the principal proponents of Park Service expansion, attacked the very restrictive standards as being so "rigid" that they would "disqualify all of the remaining superlative scenery in the United States." Albright rightfully pointed out that parks like Glacier, Grand Canyon, and Yosemite, which had been grazed, mined, or settled before establishment, would not have become national parks had such standards existed in the past. He claimed that those who wanted only "unmodified territory" in the parks were actually allied with "other national-park objectors to prevent any more areas from being incorporated into the system."<sup>193</sup>

In a scathing letter to the National Parks Association, Interior Secretary Ickes voiced an opinion in accord with Albright's. Ickes wrote that opposition to legislation which would include cutover areas in the proposed Olympic National Park or allow recreation development downriver from the proposed Kings Canyon National Park "dovetailed perfectly with the opposition of commercial opponents." Thus he viewed the Parks Association as a "stooge" for lumber companies that also opposed the parks. George Wright's remarks on the matter were more tempered. In a speech to the American Planning and Civic Association given shortly before his death, Wright stated that he no longer feared that the system would be loaded with "inferior" parks—a position placing him

in disagreement with the Parks Association. But in any event, he believed the Service itself could adequately defend against "intrusion of trash areas." And more importantly, the failure to act on truly exceptional park proposals would be much more calamitous than allowing substandard areas to "slip in."<sup>194</sup>

It must be noted that criticism by the National Parks Association and others did not focus on any perceived need for greater research or for ecologically oriented management of natural resources. Rather, it centered on the amount of tourism development being allowed in the national parks and was thus focused on protection of the parks' roadless areas from development. Both Newton Drury's belief that the Service was becoming a "Super-Department of Recreation" and the National Parks Association's proposal for a primeval park system with only pristine parks being added stemmed from apprehension over excessive park development and the kinds of parks being brought into the system. Once an area was placed under the Service's administration, the specifics of its management of nature—the treatment of elk, fish, forests and the like—was not at issue. By implication then, where no development problems existed the parks were satisfactorily managed. Expressed largely in terms of opposition to various kinds of development, the critics' desire to protect both the parks and the system went against the tide of Park Service recreational growth and expansion under the New Deal. In the end this opposition had very little effect.

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<sup>193</sup> Watkins, *Righteous Pilgrim*, 554-555; Horace M. Albright, comments in *American Planning and Civic Annual* (1938), 31-32.

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<sup>194</sup> Harold L. Ickes to William P. Wharton, 2 May 1939; and William P. Wharton to Harold Ickes, 10 April 1939, Kent Papers. George M. Wright, "The Philosophy of Standards for National Parks, *American Planning and Civic Annual* (1936), 25.

## **Declining Influence of the Wildlife Biologists**

Writing to George Wright in the spring of 1935 on the need for highly qualified scientists in the parks, Joseph Grinnell stated "quite precisely" his high aspirations for the Park Service's biological programs. Grinnell believed that the country's "supreme 'hope' for pure, uncontaminated wildlife conservation" was the National Park Service, "under its Wildlife Division."<sup>195</sup> A year later the division had reached its maximum of 27 biologist—but Wright, its founder and chief, was dead. It is difficult to trace all of the reasons for the decline of the wildlife programs in subsequent years, but the loss of Wright's leadership clearly contributed to the decline.

Much later, Lowell Sumner recalled that among the biologists only Wright had the special ability to "placate and win over" those in the Park Service who increasingly believed "that biologists were impractical, were unaware that 'parks are for people,' and were a hindrance to large scale plans for park development." Wright had been able to exert a "reassuring influence at the top, [keeping] hostility to the ecological approach...muted." Writing Grinnell in the fall of 1936, Ben Thompson noted the frequently adversarial role of the biologists, with their negative "I protest" attitudes, which Wright had diverted and diplomatically finessed into "positive acts of conservation." Thompson stated that Wright had succeeded in establishing a division to "protect wildlife in the parks and make the Service conscious of those values." But the "immediate job" after Wright's death had been to keep the wildlife biologists

from "being swallowed...by another unit of the Service."<sup>196</sup>

These remarks indicated the vulnerability of the Wildlife Division. And by August of 1938, while forestry, landscape architecture, planning and other programs flourished within the Park Service, the number of biologists had dwindled to ten, with six of the positions funded by the CCC and only four funded from regular appropriations. The overall total was reduced to nine by 1939, as the transfer of the biologists to the Bureau of Biological Survey approached.<sup>197</sup> The transfer came not through any Park Service intention, but as result of a broader scheme—the compromises made when President Roosevelt rejected Secretary Ickes' attempt to transform the Interior Department into a "Department of Conservation." Ickes had also eagerly sought, but failed, to have the Forest Service moved from the Department of Agriculture to his proposed new Conservation Department. Instead he got the Biological Survey placed in Interior. Soon after (and apparently without Park Service protest) he brought all of the Interior Department's wildlife research functions into the Biological Survey, transferring the Park Service's biologists to the Survey's newly created Office of National Park Wildlife. While biologists located in the parks retained their duty stations, they nevertheless had become part of another bureau.<sup>198</sup>

Like the national park system, the Biological Survey's wildlife refuge system had expanded greatly during the 1930s.

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<sup>196</sup> Sumner, "Biological Research and Management," 15. Ben H. Thompson to Joseph Grinnell, 9 November 1936, Ben H. Thompson file, MVZ-UC. Thompson did not identify the unit interested in absorbing the wildlife biologists.

<sup>197</sup> A.E. Demaray to the Acting Secretary, Department of the Interior, 30 August 1938, Central Classified File, RG79; Sumner, "Biological Research and Management," 15.

<sup>198</sup> Watkins, *Righteous Pilgrim*, 587-590; National Park Service "A Review of the Year," 34.

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<sup>195</sup> Joseph Grinnell to George M. Wright, 16 April 1935, George M. Wright files, MVZ-UC.

The refuges in effect served as "game farms," which, along with aggressive predator control, augmented the Survey's efforts to assure an abundance of game for hunters. Thus the Survey's management practices differed critically from those advocated by the biologists who transferred from the National Park Service. In June 1939, about six months before the transfer, Ben Thompson wrote E. Raymond Hall, Joseph Grinnell's successor at the Museum of Vertebrate Zoology, asserting that the Survey had "never liked the existence of the NPS wildlife division."<sup>199</sup> Thompson did not explain the cause of the dislike, but differences in management philosophies and policies, plus growth of the Park Service's own biological expertise under George Wright (which very likely diminished the Biological Survey's involvement in national park programs), probably had caused tension between the Survey and the Wildlife Division.

Aware of the policy differences, in late 1939, Park Service director Cammerer and the Biological Survey's chief, Ira N. Gabrielson, signed an agreement whereby the national parks would be managed under their "specific, distinctive principles" by continuing the Service's established wildlife management policies. The agreement spelled out the policies, using most of the recommendations included in Fauna No. 1.<sup>200</sup> Nevertheless, as Lowell Sumner later observed, the transfer weakened the biologists' influence in the Park Service. To whatever degree the scientists had been considered part of the Park Service "family and programs," Sumner wrote, "such feelings were diluted by this involuntary transfer to another

agency."<sup>201</sup> Although the biologists were returned to the Service following World War II, it would still be almost another two decades before scientific resource management in the national parks would experience any kind of resurgence.

### Retrospective

Viewed within the context of the New Deal, the National Park Service's declining interest in ecological management becomes comprehensible. The New Deal changed the Park Service fundamentally by emphasizing—and especially, funding—the recreational aspects of the Service's original mandate. The Park Service, which under Mather had stressed development of the national parks for public access and enjoyment, used the recreational and public use aspects of its mandate as a springboard during the New Deal, justifying involvement in ever-expanding programs. And the emergency relief funds appropriated by Congress during the Roosevelt administration enlarged the breadth and scope of Park Service programs to a degree undreamed of during Mather's time. In such circumstances the Service continued to respond to its traditional utilitarian impulses, influenced by what its leadership wanted and by its perception of what Congress and the public intended the national park system and the Service itself to be.

Even the Park Service's first official natural resource management policies did not move national park management far from its utilitarian base. The forestry and fish management policies allowed continued manipulation of natural resources, largely as a means to assure public enjoyment and appreciation of nature in the parks. The policy on predatory animals, issued by Albright in 1931, contained sufficient qualifications

<sup>201</sup> Sumner, "Biological Research and Management," 15.

<sup>199</sup> Ben H. Thompson to E. Raymond Hall, 13 June 1939, handwritten, Ben H. Thompson files, MVZUC.

<sup>200</sup> Arno B. Cammerer and Ira H. Gabrielson, Memorandum for the Secretary of the Interior, 24 November 1939, Central Classified File, RG79.

to permit continued control. Yet, even easing up on control met with resistance, including that of Albright himself, who feared the parks' popular game species were threatened by predators. Moreover, the Service's commitment to strict preservation through the research reserve program was never fulfilled. Almost alone among national park policy statements, Fauna No 1's wildlife management recommendations, with the expressed intent of preserving "flora and fauna in the primitive state," encouraged an ecological orientation in the Park Service. Yet the ecological attitudes that did emerge were inspired by the wildlife biologists, who failed to gain a commanding voice in national park management.

It is significant that during the 1930s no public organizations adamantly demanded scientific management of the parks' natural resources. Pressure from the Boone and Crockett Club, the American Society of Mammalogists, and other organizations which helped bring about the 1931 predator control policies seems to have been focused on that issue alone. It also seems to have subsided following promulgation of the predator policies. Likely, the National Parks Association's urging that the parks not be overdeveloped constituted the chief criticism faced by Park Service management during the decade. Without a vocal public constituency specifically concerned about natural resource management issues, the wildlife biologists were alone in their efforts to influence natural resource management. For what support they did get, the biologists had to rely on shifting alliances within the Park Service, depending on the issue at hand. In this regard, the 1930s would differ markedly from the 1960s and 1970s, when influential environmental organizations backed by increasing public understanding of ecological matters would

bring strong outside pressure on national park management.

While the number of wildlife biologists dwindled during the last half of the 1930s, the National Park Service's growth and expansion greatly enhanced the influence of professions like landscape architecture and forestry—and led to the ascendancy of landscape architect Conrad Wirth as a major voice in national park affairs. After waiting in the wings during the administration of Newton Drury, Wirth would become director in December 1951. And the next great era of park construction and development would begin in the mid-1950s with Wirth's "Mission 66" program. Beyond construction and development, Mission 66 would include extensive planning for new parks—yet it would provide almost no support for scientific resource management. The efforts of George Wright and his fellow wildlife biologists seemed to have come to naught. Only with the rising conservation movement of the late 1950s and the 1960s—which would sharply criticize Park Service management and Mission 66 in particular—would the wildlife biologists' vision of the national parks re-emerge, to become in time a significant aspect of national park management.

Finally, it must be said that, unlike attitudes of the landscape architects or foresters, the wildlife biologists' vision of national park management was truly revolutionary. The biologists were insurgents in a tradition-bound realm. They would leave in a natural state the windfalls of Andrews Bald in Great Smoky Mountains National Park, the blackened and dead timber of Glacier's McDonald Creek area, the native insects that killed green forests, and the predators that fed on popular wildlife species. For the most part, they would accept that sometimes "nature goes to extremes

if left alone" (to use the words of Park Service forester Lawrence Cook).

Much more than that of their contemporaries in the Park Service, the biologists' vision penetrated beyond the parks' scenic facades to comprehend and appreciate the significance of the complex natural world. This vision found clear expression in Fauna No. 1, the report that had helped launch National Park Service biology programs in the early 1930s. The authors of that document (George Wright, Joseph Dixon, and Ben Thompson) had written that the nation's heritage was:

richer than just scenic features; the realization is coming that perhaps our greatest national heritage is nature itself, with all its complexity and its abundance of life, which, when combined with great scenic beauty as it is in the national parks, becomes of unlimited value.

"This," they concluded, "is what we would attain in the national parks."<sup>22</sup>

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<sup>22</sup> Wright, Dixon, and Thompson, *Fauna of the National Parks* (1933), 38.

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## Abbreviations Used in the Footnotes

### **BL**

Bancroft Library, University of California at Berkeley

### **GRSM**

Great Smoky Mountains National Park Archives

### **Hartzog Papers**

George B. Hartzog Papers, Clemson University

### **HFLA**

Harpers Ferry Library and Archives, National Park Service

### **Kent Papers**

William Kent Papers, Yale University Library

### **Leopold Papers**

A. Starker Leopold Papers, Department of Forestry and Resource Management, University of California at Berkeley

### **MVZ-UC**

Museum of Vertebrate Zoology, University of California at Berkeley

### **RG79**

Record Group 79, Records of the National Park Service, National Archives

### **YELL**

Yellowstone National Park Archives

### **YOSE**

Yosemite National Park Archives

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## End

*This is the third and final installment of a three-part series, excerpted from Richard West Sellars' forthcoming history of natural resources management in the U.S. national parks.*





# About the GWS...

The George Wright Society was founded in 1980 to serve as a professional association for people who work in protected areas and on public lands. Unlike other organizations, the GWS is not limited to a single discipline or one type of protected area. Our integrative approach cuts across academic fields, agency jurisdictions, and political boundaries.

The GWS organizes and co-sponsors a major U.S. conference on research and management of protected areas, held every two years. We offer the FORUM, a quarterly publication, as a venue for discussion of timely issues related to protected areas, including think-pieces that have a hard time finding a home in subject-oriented, peer-reviewed journals. The GWS also helps sponsor outside symposia and takes part in international initiatives, such as the Global Biodiversity Conservation Strategy.

## Who was George Wright?

George Melendez Wright (1904-1936) was one of the first protected area professionals to argue for a holistic approach to solving research and management problems. In 1929 he founded (and funded out of his own pocket) the Wildlife Division of the U.S. National Park Service—the precursor to today's science and resource management programs in the agency. Although just a young man, he quickly became associated with the conservation luminaries of the day and, along with them, influenced planning for public parks and recreation areas nationwide. Even then, Wright realized that protected areas cannot be managed as if they are untouched by events outside their boundaries.

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