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WHITE PAPER ON RESEARCH IN THE NATIONAL PARK SERVICE

By the Regional Chief Scientists, National Park Service

PURPOSE: The purpose of this document is to provide a concise opinion piece by all Regional Chief Scientists on the most significant issues affecting scientific research and its application in the National Park Service today and to suggest areas of needed improvement for general consideration and debate as stimulated by the recent NPCA "Gordon Commission" Report and the pending National Academy of Sciences review of the NPS research program.

I. Introduction

The National Park System was established before the advent of the sciences of natural resources management (e.g. forestry, fish and wildlife biology, range management, etc.) and ecology. The system was established for the purpose of managing National Parks and Monuments for public use leaving them "unimpaired for the enjoyment of future generations." In the early years, the National Park Service followed this mandate assuming that activities such as construction of visitor facilities in prime wildlife habitat, total fire suppression, elimination of predators, and establishing put-and-take fisheries to enhance recreational opportunities would not impair natural resources. History documents that such activities were fully acceptable to the public and Department of Interior administrations of the time. These early manipulations of natural systems were considered to be in full compliance with the 1916 Organic Act establishing the National Park System largely due to the lack of understanding of ecological principles. The first half-century of National Park management was dominated, therefore, by a pattern of selective protection guided by slow-to-change 19th century values as applied to native biota.

The 1940's and '50's saw the advent of scientifically oriented natural resource management and the **ecological approach** to studying natural systems. As other federal and state resource management agencies applied the principals of the new sciences to successfully accomplish management goals, critics of the original NPS resource management policies emerged. Numerous studies and reviews of NPS policies since the early 1960's have stressed the importance of a more holistic "ecosystem management" approach based on **amoral management** of all "natural" ecosystem components and processes. The more recently emerged sciences of "Conservation and Restoration Biology" and the increased awareness of the importance of maintaining **biological diversity** have strengthened this argument. Though significantly different from the policies of the first half-

century of National Park management, the **"natural process,"** or **non-manipulative approach** to park management currently dominates agency policy.

The science of ecology has now described a continuous and dynamic natural change, or "succession," for many natural systems. The amoral, natural process management philosophy accepts naturally occurring successional changes as desirable. On the other hand, **man-caused** impacts on ecosystems and their components are viewed as undesirable. Therefore it becomes incumbent upon NPS managers to adequately describe and document park ecosystems and to conduct subsequent studies to determine the scope of natural changes in order to detect any undesired man-caused changes. Management actions are then taken to prevent further unwanted ecosystem changes and to mitigate those already affected. This new **scientifically-based** management approach requires much technical information and, thus, the need for research to gather that information has become institutionalized without benefit of a formal explicit Congressional requirement for it. But while strongly supported at the "agency" level, research elicits a wide range of support and appreciation from individual park superintendents.

In addition to being scientifically-based, park management must now focus on **ecosystem boundaries** rather than legislated park boundaries. Parks do not function as islands. They are the products of evolution and the activities of man both inside and outside the parks. In order to protect ecosystems "unimpaired," the Service will have to be cognizant of resource impacts originating outside the parks. Also, since few National Parks are large enough to contain complete habitats for large mammals and other migratory animals, it is imperative that park management consider cooperative efforts with park neighbors to supplement park habitats and maintain migration corridors.

II. Need for a Legislated Mandate

As third world ecosystems succumb to development and exploitation pressures and economic growth, America's National Parks will take on a more important role than the respite for "pleasure seekers" targeted by the earliest park managers. For the very processes that provide for human life on earth can best be protected and studied in these places, unimpaired by a management philosophy with short-term or consumptive goals. It seems appropriate, then, that Congress act to clearly recognize the importance of scientifically-based management in maintaining continuity of the natural resources of our National Parks and the importance of research in providing the information necessary for scientific management. Congress should also define **impairment** in modern terms as it can be applied to the management of natural systems.

A clearly defined research role is necessary to foster continuity of support, both philosophically and fiscally, for scientific studies of NPS areas. As federal budgets expand and contract reflecting the nation's economic health and public opinion, the National Park Service's research program should be protected from radical fluctuations in level of effort, perhaps more so than some other projects. History has shown, however, that "studies" are often the first area considered for cuts when budgets are tightened. In reality, new roads and visitor centers can often wait for better times, but the application of a single ill-chosen management action within a natural system may compromise the values for which that system was originally set aside for years to come - or forever.

III. Need for a Variety of Research Activities

There is one type of research which enjoys relatively widespread support by NPS managers today. The term often used for this type of study is **MANAGEMENT-ORIENTED**, or **APPLIED RESEARCH**. Such research is generally initiated as a short-term study to gather information needed to solve, or mitigate, immediate management problems related to natural or cultural resources or to visitor use.

Management-oriented research is strongly supported when a park manager faces a real and pressing management decision and appreciates the need to gather scientific information before making that decision. In addition, it must be possible to complete the needed study within the manager's timeframe, usually within his/her tenure in the position. But even when strongly supported by management, research can rarely be conformed to fit perfectly with politically or socially established constraints. If it will take too long to gather sufficient data on which to make a scientifically based decision, a decision will probably have to be made without it.

We cannot expect park managers to eagerly support, with dwindling discretionary funds, scientific studies which may not yield management implications for many years. While annual investigator's reports, the occasional technical publication, and accumulation of knowledge may be enough reward for the scientist's personal satisfaction, these are rarely enough to justify the research to a Superintendent. It is, then, easy to understand the manager's reluctance to support research which will not likely yield implementable recommendations in short order.

While management-oriented research enjoys general support throughout the National Park Service, there are other types of research, each of which is necessary in a research program designed to gather all information necessary to set, and maintain, long-term direction for management. One is the type of study commonly referred to as **"INVENTORIES."** Inventories usually result in

descriptive information regarding physical and biotic components of ecosystems. Without this information, ecosystem processes cannot be scientifically characterized and natural change cannot be separated from undesired man-caused ecosystem impacts.

Once adequate inventories have been conducted and analyzed, a continuous **MONITORING** program should be established to detect changes in ecosystem components and processes. Inventories must be repeated at regular intervals to remain useful. Though much monitoring can be carried out effectively by a well-trained staff, establishment and maintenance of monitoring systems as well as interpretation of results require highly technical skills. Park monitoring programs, therefore, should be conducted by or with oversight of professional resource management or research personnel.

Another type of study necessary to a complete program is commonly called **BASIC RESEARCH.** This type of research involves the investigation of "axiomatic" relationships often hypothesized on the basis of little corroborative information and usually theorized by highly "creative" researchers. Basic research may or may not have immediately demonstrable "practical" (i.e. management) value but has a relatively higher probability of valuable new discovery than management-oriented projects. It differs markedly from management-oriented research in that the latter is usually an application of fairly well established information and investigative techniques to solve a documented management problem. A basic research component is important to a balanced program because it greatly enhances potential for significant "breakthroughs," or altogether new discovery, and development of wholly new theories and methods. Similar to adequate inventories, basic research is necessary to outpace undesirable resource impacts in order to prevent them rather than mitigate them after the fact.

While most research currently conducted by the National Park Service is clearly aimed at the need for information to manage park resources, gathering information for the **INTERPRETATION OF PARK RESOURCES** to the public is also an important function. Most often park interpreters will use information gathered for other purposes to develop park programs. But sometimes specific information needed for interpretive purposes may not compete well with management-oriented research for limited funds. Therefore, some portion of the research program should favor gathering information for interpretive purposes.

In many cases, the National Parks represent natural systems unduplicated in their relative freedom from human impact. These areas are ideal locations for public education efforts focused on environmental (i.e. ecological) concepts. NPS interpretation is responsible for a significant part of the "enjoyment" of park resources by the public which is mandated by the 1916 act. But a true education program should be coupled with a research program

which continually pushes the frontier of knowledge. Therefore, rather than simply interpreting the information ascertained for another purpose, educational research should seek information not necessarily immediately important to management, but which is unique to park ecosystems in order to most effectively interpret those ecosystems to park visitors.

In summary, there are several types of research which should be part of a Servicewide program. These include (1) management-oriented research, (2) inventories and monitoring, (3) basic research, and (4) research for interpretive purposes. Because of the overwhelming support and documented need for management-oriented research, the other types will likely only be performed if "protected" by an organizational and budget structure which actively fosters a balanced program.

IV. Need for an Expanded Network to Conduct Research

The greater NPS research network currently consists of park-based research staff and research units, Cooperative Park Studies Units (CPSU's), Cooperative Agreements of many types, Interagency Agreements, and contracted research programs. There exists a variety of very creatively fashioned cooperative relationships between the NPS and other federal, state, and local governmental agencies; universities; and research institutions. There are at least two significant areas of concern for the current network.

First, the Servicewide network is not really a network in itself, but a compilation of ten ad hoc regional networks. The regional networks are, by-and-large, truly that since each has been fashioned, and is operated, by the Regional Chief Scientist. Some regions have embraced components pioneered by others but most feature a combination of the options which best suits the perceived regional (or park) needs and which represents the synergy of philosophies of the Regional Director, the region's Superintendents, and regional office staff. Most regional programs are shaped by, but match up poorly with, the sheer volume of needed work. Network protocols and oversight stop at the regional level thus leaving the Servicewide program without a national network function.

CURRENTLY, THERE EXISTS NO FORMAL RELATIONSHIP BETWEEN THE DOZENS OF NPS COOPERATIVE STUDIES UNITS AND SCORES OF RESEARCHERS ACROSS REGIONAL LINES AND, THUS, NO SYSTEM TO ENSURE COORDINATION OF RESEARCH AND FOSTER CONSTRUCTIVE CRITIQUE AND DEBATE, AND TO PREVENT DUPLICATION OF EFFORT ON A SERVICEWIDE BASIS.

Again, ad hoc approaches such as semi-annual meetings of Regional Chief Scientists, attendance at science conferences, and circulation of reprints and reports produced by NPS scientists are currently employed to meet these needs although many Washington-level coordination roles have been established or clarified in the

last few years. This trend, welcomed by most regional program managers, appears to be growing.

In the past, most Servicewide activities have been ancillary to, or supportive of, the respective regional programs. Enhancement of the Servicewide research programs without incorporation into a true Servicewide network will be perceived by many in the regions as internal competition for the limited fiscal support available. And all Servicewide research programs do not yet feature priority-setting processes which guarantee funding for each region's top priority projects.

The second significant problem with the current NPS research effort is, quite simply, the lack of resources necessary to address the overwhelming documented needs. The National Park Service employs only about 70 research scientists nationwide. Additional academic, cooperating agency, and private sector (commercial) researchers are supported through cooperative agreements and contracts. The total research budget of the Service has been estimated at $20 million annually. This represents approximately 2% of the annual NPS operating budget, the smallest for all federal land-managing agencies! Most of the others average 10-15% of their operating budgets dedicated to research. Two agencies, the DOI Fish and Wildlife Service and the DOA Forest Service, have received separate legislation establishing research mandates and creating "independent" research arms; independent, that is, from the line operating organizations. Although fraught with communication problems, many feel this independence is necessary to guarantee continuity in the level of the respective research programs.

The NPS regional research networks currently contain the several types of relationships, liaisons, and units necessary to provide adequate research for park management. These networks are severely handicapped, however, by (1) an often inefficient Servicewide organization and (2) by their very limited personnel and fiscal resources in relation to the well documented need.

V. Need for a Consistent, "Competitive" Organizational Structure for Research Administration and Resource Management throughout the Regions

There has been only one attempt at the Servicewide level to "standardize" the regional science and resource management organizations in many years. In 1986, Dr. Richard Briceland proposed, and Director Mott directed the ten Regional Directors to establish Associate Regional Directors for Resources Management with the requirement they be filled from the appropriate professional classification series. Also required was the establishment of professional-series "Chiefs of Resources Management" answering directly to the Superintendent in "all parks."

This directive met with severe internal criticism and, as a result, the directive was made discretionary by the Director in early 1987. Although two regional offices currently house "Associate Regional Directors for Resources Management" (or "Resource Services"), neither are obligate professional series positions. Only a handful of parks Servicewide have Chiefs of Resource Management answering directly to the Superintendent. Most are aligned under the park's Chief Ranger and most are filled with career ranger series personnel rather than professional series incumbents.

Resistance to such moves arises, understandably, from a long institutional history of "decentralized" control within the Service. Inherent in the traditional concept has been a high level of independence for park Superintendents and Regional Directors. This approach is supported by the fact that each individual NPS unit is unique with its own management constraints defined by Congress or implied by local politics thus apparently negating the significance of a **SERVICEWIDE** approach to managing individual park units.

A strong deterrent to the 1986 directive (alone, probably significant enough to have killed it) was the fact that no new "FTE's" (full-time equivalencies, i.e. positions) or funds were available for implementation. Understandably, Regional Directors could not have been expected to unconditionally support efforts to "standardize" the **SERVICEWIDE ORGANIZATION** at the expense of their own organizations and staff - especially when such moves may have reduced the effectiveness of the regional organization they had been instrumental in bringing to fruition.

There are, of course, good reasons, other than tradition, for protecting some level of flexibility in organization of research (or any function) across regional lines. There are also some reasonable limits to that flexibility if Servicewide continuity and effectiveness are desired. As discussed in earlier sections, a balanced research program will probably not evolve without a new initiative featuring dedicated funds and FTE's and with some level of centralized oversight. As one commenter recently put it: "not one visitor in a hundred will complain to park staff about a lack of research but probably half will note the poor condition of roads and facilities some time during their stay."

The Research Grade Evaluation Guideline provides for classification of NPS research scientists as high as the GS-15 level based on technical accomplishment regardless of where they are aligned in the organization. Several other Federal Government agencies have research scientists without management responsibilities graded as high as GS-16 and -17. The NPS Research Grants Grade Guideline places stricter limits on the career ladders of NPS research managers and administrators. Research administration positions, which carry the Service's most stringent professional requirements,

are effectively limited by the grants grade guideline to the GM-13 or -14 levels for regional program responsibilities.

For the GM-15 level the guideline requires a national or international scope to an individual's "assignment characteristics" and "level of responsibility." Since the ten regional chief scientists are not aligned organizationally with the servicewide program (i.e. the Associate Director for Natural Resources), it is practically impossible to attain Servicewide (i.e. national) assignments and responsibility, and thus qualify for the GM-15 level. The Grants Grade Guideline has effectively limited the grades of park research administrators to GM-13 and regional administrators to GM-13 or -14 regardless of program size or impact of accomplishments. The guideline has also provided the potential to GM-15 for almost any Servicewide program coordinator. We do not believe this was the original intent of the guideline.

It would seem appropriate that a thorough analysis be conducted comparing the grade structure (e.g. career ladder) of NPS researchers and research administrators related to skill-level requirements with those of other comparable Federal agencies, academia, and private industry. A determination should also be made as to adjustments needed to balance the grade classifications of NPS researchers and research administrators with other NPS managers. The Research Grade and Grants Grade Guidelines should then be amended as appropriate.

The ad hoc regional approach to research administration has further impact on the functional effectiveness of regional program managers. Some regions have developed sophisticated program hierarchies with all research scientists working through Cooperative Park Studies Units (CPSU's) at universities, or on details to parks, but ultimately for the Regional Chief Scientist. At the other end of the spectrum are regions with few, or no, staff scientists, or no CPSU's, or no line supervision of staff scientists at the regional level. One region combines the Regional Chief Scientist position with the Unit Leader of the region's CPSU who is duty-stationed many miles from the regional office. Another nearby region's Regional Chief Scientist is entitled "Deputy Associate Regional Director for Park Operations" and is, obviously, stationed in the regional office. While these inconsistencies no doubt contribute to an individual region's overall program effectiveness, they also contribute to a **Servicewide research program with limited cohesiveness.** Yet, the individual (i.e. local) effectiveness of each unique regional program supports the traditional concept that decentralization contributes to program effectiveness.

Certainly, if the NPS ad hoc science program is to evolve into an equally effective **SERVICEWIDE** program, a rational and systematic approach to organization must replace the current ad hoc system. The new system must incorporate the effective components and

processes of the ten regional programs, a "competitive" organizational structure (competitive, that is, with other NPS functions for management's attention and support), improved interregional and Servicewide coordination, protection for long-term program continuity and growth, an appropriate level of flexibility, and reasonable career ladder aspirations for the Service's researchers and research administrators.

VI. Need to Establish a "Formalized" Relationship between the Associate Director for Natural Resources and the Regional Research Programs

It has been discussed in several earlier sections that the ten regional research organizations exist and operate independently from the Servicewide hierarchy; i.e. Regional Chief Scientists serve as staff to the Regional Directors. Some reviews of the NPS science program have suggested the research function should be independent of the line management of the Regional Directors, similar to the U.S. Forest Service program. There currently exists no consensus among NPS Regional Chief Scientists that the regional programs should be removed from the line authority of the respective Regional Directors and organized under a Servicewide Chief of Research. There is, however, strong support for an "advisory" function to be formally established between the Associate Director and the Regional Chief Scientists and for a strong Servicewide program to support the regional programs as well as Servicewide needs. Of course, any major standardization effort of the regional organizations or modification of the Servicewide organization should carefully reconsider the WASO-region/CPSU-park research connection.

Currently, the Associate Director utilizes the services of the Regional Chief Scientists in an advisory capacity to the Servicewide programs. The Associate Director has now assumed the responsibility of facilitating one of the two semi-annual meetings of the regional chiefs which were begun on an ad hoc basis in 1986. On the other hand, the regional chiefs now look to the Associate Director as the "flag-bearer" for research in the National Park Service. His aid has been sought in each region for various services and advice and the Servicewide program he manages has grown and evolved into an effective, communicative system with widespread support. It would follow that a "formalized" organizational relationship, describing the current advisory function, linking the Regional Chief Scientists on a collateral duty basis to the Servicewide program of the Associate Director, should enhance the effectiveness of the agency's research activities. This relationship would be especially useful in clarifying the respective roles of Regional Chief Scientists and Servicewide program managers regarding Servicewide issues. These objectives might be achieved simply through an expansion of the "Role and Function Statement" recently approved by the Associate

Director or through a more detailed "Research Plan for the National Park Service."

VII. Need for a Much Enhanced Professional Resource Management Corps to Identify Research Needs, Monitor Ecosystem Components and Functions, and Implement Research-Based Recommendations

Most of the previous discussions have focused on the NPS research function. However, research effectiveness, in an operational sense, is only as good as its application. NPS resource managers are directly responsible for application of information gathered by researchers, past and present, to the management of park ecosystems. Traditional NPS institutional thinking has accepted the professional requirements of researchers but not for those challenged with applying research results.

Other federal and state resource management agencies have long ago institutionalized the need for professional researchers and resource managers. In fact, the training requirements for the two follow the same programs and principles. The researchers typically undergo an extended coursework and "internship" (i.e. thesis research) program under the supervision of established academic researchers.

The NPS has professional resource management classifications but most Service resource managers remain in the "025," or "Park Ranger," classification series. Most NPS resource management activities are currently performed as **COLLATERAL DUTIES** by park rangers. NPS tradition has favored the "flexibility" of hiring from the ranger series. Since many rangers hold college degrees, even though not required for the 025 classification series, managers have generally felt rangers with "professional" backgrounds were available for assignments which required special expertise.

Park Rangers traditionally perform to high standards of dedication and with outstanding and unique ranges of skills commonly referred to as "professional" even though no college degree requirements exist for the series. The term **"PROFESSIONAL RESOURCE MANAGER"** often enlists disdain from rangers as implying that rangers doing resource management are, by definition, not "professionals." The concept of a professional resource management corps simply includes institutionalization of a professional (i.e. **APPROPRIATE COLLEGE DEGREE**) requirement for those performing the most significant resource management activities and to provide a full career ladder for them obviating the need to leave the profession and transfer to ranger or park manager positions in order to advance in the organization.

A majority of NPS Superintendents and Regional Directors are classified in the ranger series, having followed the traditional NPS career ladder which has no college education requirement.

Many, however, do hold college degrees. It is understandable, then, that these key leaders of the agency feel that they are certainly "professionals" in every sense, since they have both college education and a career history of dedicated and accomplished work as a Park Ranger.

A contemporary issue which will further exacerbate the ranger/resource manager controversy is the potential for 20-year, rather than 30-year, retirement for rangers involved "primarily" in law enforcement or fire-fighting through those years. Once this issue is better defined, the Service must decide whether to move towards law enforcement and fire fighting as the primary purpose for ranger positions, or toward professional resource management as the primary purpose. This decision may represent a turning-point in the history of the Service and will have far-reaching effects on both the ranger and resource management "professions."

VIII. Funding Considerations

As discussed earlier, funding for NPS research remains among the lowest (if not the lowest) of all federal land-managing agencies both in terms of absolute dollars or as a percentage of its operating budget. Unmet needs to address "threats to park resources" totaled some five times the research expenditure of the Service in 1980. They would surely be several times that today. Recent attempts to provide the kind of "quantum leap" needed for NPS research to surge ahead of the documented need (e.g. the fee enhancement program) have not been successful. Decision makers must ultimately come to grips with the huge crevasse between the "health" of our National Parks when passed on to the next generation and the cost to gather the information necessary to ensure that condition is acceptable.

IX. Conclusions/Recommendations

It is the consensus of the ten Regional Chief Scientists of the National Park Service that :

1. The National Park Service is seeing its mission expanded beyond one of "protection" of resources for public enjoyment to a more pro-active role in the understanding and preservation of ecosystems of global importance. This more ambitious mission will require a much enhanced research and resource management capability.

2. A clearly defined research role should be recognized through Congressional action to reduce wide fluctuations in funding for science and to elevate the importance of scientific information in decision making and the importance of the parks as unique natural laboratories.

3. A variety of research activities (e.g. management-oriented/applied and basic research, inventories and monitoring,

and research for interpretation) is necessary for an effective, balanced research program.

4. An expanded research network is required to efficiently conduct and administer needed research.

5. A more consistent organization for research and resource management among the parks and regions is desirable to foster efficiency in operations and communications. An analysis should be made of career ladders for researchers and research administrators in the Service as compared to comparable positions in other agencies. The Research Grade and Grants Grade Guidelines should be reviewed for possible revision to remove unintentional de facto advancement limitations.

6. The relationship between the Regional Chief Scientists and the Associate Director for Natural Resources and the Servicewide program managers needs to be clearly defined in a Role and Function Statement.

7. The Service needs a much enhanced professional (i.e. college trained) resource management corps to identify research needs, conduct monitoring programs, and implement the recommendations resulting from research projects.

8. The aforementioned recommendations would cost several times the current research and resource management budgets of the National Park Service. The Service, and the Department of the Interior, will have to come to grips with the cost to implement needed changes and, if necessary, reprioritize initiatives if the potential results of research enhancement are deemed of sufficient priority. Several of the recommendations could be implemented without additional funds. The Service should consider such moves in an orderly fashion and in concert with other important management initiatives.