

**A SURVEY OF THE NATIONAL PARK SYSTEM:
ARE NATURAL RESOURCE MANAGERS ABLE TO PRESERVE
BIOLOGICAL RESOURCES WITHIN THE PARKS?**



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I wish to thank the Board of Trustees of the Allan Hancock Community College District for granting my sabbatical leave for the fall of 1997. They have allowed me to greatly expand my slide collection of America's natural resources, experience the splendor of visiting national parks other than in their peak visitor season, and gain a deeper insight into the problems involved in preserving them. All of these will be of great benefit to my overtaxed students of Zoology and Natural History. I wish also to thank my secretary, Susie Skidmore, for taking on the task of retyping this manuscript and creating the cover. She did a great job, and it is very much appreciated.

I would also like to acknowledge the cooperation of all of the National Park Service personnel, who so kindly shared with me their experiences in attempting to protect the natural resources of America's "crown jewels". Special thanks goes to those managers, who so patiently explained to me the Byzantine structure and history of the park service and the problems associated with making a bureaucracy accomplish anything so difficult as ecological management. It is to these always overworked, chronically underfunded, routinely neglected defenders of our national parks, that we all owe a great debt. And, it is to these dedicated public servants, who perform the often-thankless task of protecting our resources from ourselves, that this study is dedicated.

DISCLAIMER

As much as I tried to understand the details of the interviews, and as much as my contacts tried to explain them, it is not unlikely that some details expressed in this study are in error. I have checked and rechecked my notes to minimize this possibility; however, I must assume that any errors made are mine alone. Also, this cursory study was performed on a shoestring budget itself, being funded entirely by me, so it does not represent an in-depth report, by any means. I am convinced, however, that the basic findings of this study are correct. And with these cautions in mind, would hopefully remind readers of John F. Kennedy's remarks that, "It is better to know half the story in time, rather than all of the story when it is too late."

ABSTRACT

A personal survey of 28 National Park Service (NPS) units was conducted between 30 May and 18 November 1997. Twenty-two NPS resource managers and staff members were interviewed at 15 of these sites.

Findings indicate that the basic goals of inventory and long-term ecological monitoring of biological resources were not being adequately performed. Problems of budgetary and bureaucratic nature are indicated as the major reasons that these basic goals were not achieved. Budgetary problems include Congressional funding of unnecessary NPS projects, redirection of resource dollars by park superintendents, incessant search for "soft money" by resource managers, inequities between permanent and temporary workers, and the failure to meet resource management "funding thresholds". Bureaucratic problems include NPS reorganization, traditional neglect of resource management programs by the NPS, removal of researchers from the parks, poor communication, crisis management, human activities both inside and outside of the parks, difficulties in assessing resource management needs, and the insular nature of the parks themselves.

Examples of innovation by park managers in attempting to improve conditions and attain some of these goals are described. Conclusions of this survey are listed, and suggestions for improving this situation are made.

INTRODUCTION

The National Park System (NPS) was created by Congress over 80 years ago, in part to “conserve the scenery and the natural and historic objects and wildlife therein, and to provide for the enjoyment of the same in such manner and by such means, as will leave them unimpaired for the enjoyment of future generations.” (The Organic Act of August 25, 1916.) However, with the increase of human populations and their technological extension of human influence into even the remotest park units of the NPS, these resources have become increasingly threatened. The NPS, suffering from years of budget shortfalls, increased responsibility, reorganization, and internal strife, has reportedly found it increasingly difficult to manage park resources in an effective manner.

The NPS has traditionally facilitated the “enjoyment” of parks over that of leaving the resources “unimpaired”. Evidence for this can be seen by studying park histories, which show that promotion of visitation and expansion of facilities geared to bringing a greater number of visitors to the parks far exceeded their efforts to protect resources. It is significant to note that a biological science program was not present in the NPS until 13 years after its creation, and then was initiated only by private funding in Yosemite. Since this time, science has gradually entered the NPS, but has undergone periodic criticism from the National Academy of Sciences (NAS), and other external reviewers. In 1963, both the NAS and A. Starker Leopold produced studies that recommended that the NPS create strong, science-based natural resource management programs (R.W. Sellars, “Science or Tradition?” National Parks, January/February, 1997). This was followed by years of expansion of management programs, and a subsequent struggle within the NPS to move ecological considerations to the forefront of management plans. Unfortunately, this conflict has continued to the present, and has left subsequent reviewers to question the ability of the NPS to effectively manage the ecological problems encountered within park boundaries (National Research Council of the NAS, Science and National Parks, National Academic Press, 1997).

It was the purpose of this investigation, then, to visit a diversity of NPS units in Alaska and the lower 48 states, travelling from the west coast to the east coast, to determine to what extent, if any, funding or other problems have affected the ability of resource management staffs to effectively preserve the biological resources under their jurisdiction. The real question was, have the resources been left “unimpaired for the enjoyment of future generations,” and if not, what if anything is being done to ensure their protection?

METHODS

I performed this investigation by travelling to various units of the NPS and interviewing members of the resource management staffs. My mode of travel was primarily by private vehicle; however, in some instances, I flew up, boated over, or backpacked in to meet the appropriate park personnel. I also tended to stay in the area long enough to get a feel for the nature of the park, and to photograph resources and specific examples of problems mentioned in these interviews.

Interviews were conducted either in the field or in the offices of the resource managers. Non-disclosure of the identities of the resource staff being interviewed was a condition that I insisted on, in order to promote a less guarded discussion than may have otherwise occurred. Throughout this report, I have used the information gained from these interviews, and unless otherwise indicated, all information springs from these individuals. My own opinions are also expressed throughout. On occasion, I have inserted quotes from individuals, but again, I have not identified the specific authors of the quotes, in order to protect them from any retribution that may arise from the publication of this report. This also allows me to retain anonymous contacts in the NPS to follow-up on the current status of park resource operations.

In 26 weeks, I spent 116 days in the field, visited 28 NPS units in 27 states, drove over 12,000 miles and conducted 22 interviews at 15 separate locations. Five trips were made. In May and June, I visited California parks, in July, parks of the Northwest United States, in August, Alaskan parks, in early September, I rafted down the Colorado River through the Grand Canyon, and from late September through November, parks from California to Michigan, down to Florida and back to California. Field notes were taken of the entire expedition, and interview notes kept separately. All written materials remain on file.

FINDINGS

My original proposal, to find out whether or not the National Park Service (NPS) was funded sufficiently to preserve the biological resources within the parks was far too simplistic. If funding was the entire problem, then the solution would be much less complicated than that posed by the current situation. What I did find, was that the problems of resource management by the NPS were as often a result of issues not related to funding, as they were of issues related to insufficient funding. Thus, I have identified two major categories of issues that impact the ability of the NPS to properly manage the biological resources of the parks. Basically, these are Issues Related to Funding, and Issues Independent of Funding. The summary of these two categories and sub-categories appears below. Following this, I examine each category, citing specific examples for each.

Funding Related Issues

1. *Lack of Accountability of Funds.*

- a. Resource funds mandated by Congress may be redirected by the park superintendents to non-resource uses.
- b. Use of NPS funds to promote local "pork barrel" projects diverts funds from resource projects.

2. *Lack of Project Funds.*

- a. Inability to perform basic inventories of biological resources.
- b. Inability to perform long-term ecological monitoring of resources.
- c. Inability to perform extended projects as required.
- d. Inability to travel, in order to survey and protect resources, or to attend conferences with other resource managers.

3. *Budget Cuts and Effects on Staffing.*

- a. Problems with temporary staff (Volunteers, Student Conservation Association, Seasonal, and Term Contract Employees).
- b. Inadequate numbers of management and project personnel.
- c. Inability to assemble "critical mass" of managers to perform basic tasks and successfully compete for research funding.
- d. Selection of a small group of "generalist" managers, with few resource "specialists" to draw on for support.

4. *Excessive Reliance on "Soft Money".*

- a. Unpredictable block-grant funding precludes long-term projects.
- b. Repeated revisions of standing project statements to address specific requirements of available grants consumes excessive amounts of time.

5. *Possible Means of Augmenting Resource Capabilities.*

- a. Prevent Superintendents from redirecting resource funds.
- b. Develop outside sources of funding and equipment.
- c. Turn over non-critical functions to the private sector.
- d. Take better advantage of Student Conservation Association and Park Volunteers.
- e. Increase cooperation between park divisions to perform resource-related activities.
- f. Cease overhead charges between park-related federal agencies.

- g. Discontinue politically inspired “pork barrel” projects.
- h. Separate cost-of-living increases from resource funds.
- i. Obtain royalties and other fees for industrial, commercial, and foreign use of NPS resources.

The next category, Issues Independent of Funding, refers to the mostly unrelated nature of these problems to funding. The lack of adequate funding in the NPS, however, exacerbates the problems associated with these independent issues. Unfortunately, these issues would arise whether funding was adequate or not, though most are influenced by the lack of funding that characterizes the NPS. But, it is the NPS bureaucracy that ultimately creates these issues.

Issues Independent of Funding

1. *NPS Organization.*

- a. External Influences:
 - (1) NPS – NBS – BRD (USGS) Conversion.
 - (2) Reorganization of BRD and NPS Regional Clusters.
 - (3) Prototype Parks and Protocols.
 - (4) Enabling Legislation.
- b. Internal Influences:
 - (1) Lack of Project Staff.
 - (2) Problems of Communication.
 - (3) Problems of Permanent vs. Temporary Employment Status.
 - (4) High Turnover Rates and Loss of Continuity.
 - (5) Lack of Divisional Cooperation within the Parks.

2. *Attitudes Within the Parks.*

- a. Crisis Management.
- b. Middle Management Pragmatism.
- c. Perception of Limited Capabilities.
- d. Reluctance to be Proactive.
- e. General Frustration with Current Conditions.
- f. Acceptance of the Deteriorating Situation.

3. *Extrinsic Problems.*

- a. Competing Outside Interests.
- b. Insular Nature of the Parks.
- c. Exotic Species.

4. *Intrinsic Problems.*

- a. Park Expansion without Staff Increase.
- b. Difficulty in Assessing Resource Management Requirements.
- c. Insular Nature of the Parks.
- d. Rare and Endangered Species.
- e. Non-Directed Research within Parks.
- f. Increased Human Influence in Natural Systems.
- g. Subsistence Use of Park Resources.

5. *Innovations.*

- a. Interagency Cooperation.
- b. Team Approach.
- c. Maintaining Morale.
- d. Incredible Expediency.

Issues Related to Funding

1. Lack of Accountability of Funds.

The attempt to decentralize control of the NPS and grant more local control of park funds has essentially elevated park superintendents from the role of “demigods to gods”. While superintendents have traditionally developed park budgets in consultation with chief rangers, which ultimately determines how much resource managers will receive, the redirection of external funds from their express purpose to more immediate uses is an often repeated story. The most notable of these concerned the Blue Ridge National Scenic Parkway, where \$500,000 was allegedly targeted for development of visitor centers and hiring of park biologists in each of the four districts of the Parkway. The superintendent diverted \$150,000 to ice storm damage repair, and \$150,000 to the superintendent’s fund, leaving \$200,000 for resource managers. As a result, one visitor center was developed and one biologist hired for the four districts, scattered over the length of the Parkway. I was told that these were Congressionally-mandated funds, but to date, the Government Accounting Office (GAO) and Office of Management and Budget (OMB) have yet to investigate this redirection of funds. Such a story implies that even if funding could be increased specifically for resource management, that it is doubtful that the designated funds would arrive at the targeted area intact. Again, this is not an isolated incident, and it is this lack of accountability that undercuts any attempt to solve resource management problems through blanket funding increases to parks. Superintendents have too much control over funds coming into the parks, and should be held accountable for decisions to transfer resource funds.

The ability of members of the United States Congress and Senate to procure funds for the construction and staffing of Visitor Centers in their own districts should be closely monitored. Roger Kennedy, former director of the NPS, stated that more money is spent on “Congressionally identified” initiatives, than on projects recommended by the NPS! Such projects suggest a very likely “pork barrel” function, which is more obvious than their NPS related function. For instance, Senator Robert Byrd (D-WV), Chair of the Senate Appropriations Committee, added money to the NPS budget to fund the construction of a visitor center at a train station in Thurmond, West Virginia (population: 8) at a cost of \$2.5 million. Within 20 miles can be found three more visitor centers of the New River Gorge National River, all within the borders of West Virginia (Frank Greve, Mercury News Washington Bureau, San Jose Mercury News 12 December 1997). Clearly, Senator Byrd has been busy mending political fence posts at the expense of the U.S. taxpayers, and more specifically the NPS, which cannot obtain funding for really necessary projects, due to lack of sufficient political influence. Again, this is not an isolated case. Such “pork barrel” projects abound, and should be investigated by the GAO and OMB as to determine their priority, with respect to those projects proposed by the NPS. Thus, Congressional involvement does not guarantee a quick solution to the problems of park resource management.

2. *Lack of Project Funds.*

In many of the parks visited, managers reported incomplete inventories and inability to perform long-term ecological monitoring (LTEM), due to lack of project funds. Nearly every manager interviewed stated that if new funding was received, they would put it into those two categories. Though baseline inventories and LTEM were required in their strategic management plans, the lack of project funds has precluded these surveys. In many cases, presence or absence of a species in the park was the total amount of information known. For too many species, even this was lacking. Modern resource management requires at least status and distribution data in order to formulate proper action plans. Unfortunately, though these data fail to exist, management plans are being formulated anyway. Thus, the reality is that guesswork sometimes takes the place of hard data in making management decisions. According to the Government Performance and Results Act (GPRA), a strategic management directive, the NPS must be up front with Congress concerning their management actions and their results. It is hard to do this when the essential data are missing, and the answers to their specific questions are simply not known. One resource manager told that, "It is criminal to continue to neglect these issues." I believe this sums up the attitude of most of the managers with whom I spoke.

The lack of funding also limits the ability of managers to restore damaged lands (e.g. trails), revegetate damaged areas (e.g. meadows), and acquire lands within the parks (e.g. abandoned mines and homesteads). This inability to perform the "stitch in time" is an ongoing problem in many of the larger parks, and those favored by backpackers. Backcountry trail crews have been severely reduced in recent years, yet the number of backpackers has remained high. Thus, trails and campsites have become eroded. Even backcountry ranger patrols have been cut back, or in some cases, eliminated entirely. Revegetation efforts are also limited. This is a wide-ranging problem that extends from the Channel Islands to Yosemite, up to Denali, and all of the way east to Great Smoky Mountains National Park. It is much easier to protect an area than revegetate it. But once damaged, a disturbed area becomes a refuge for more easily transported "weedy" exotic plant species, which exacerbates that problem. Also, many of the revegetation efforts are simply to repair damage caused by construction projects within the park, so in a sense, the extraordinary efforts by the relatively few revegetation specialists can only catch up to where they were previously, and not make any significant gain. Such is the case in Denali and Glacier National Parks. In Denali, I also saw a case where a lengthy revegetation project had managed to restore an old roadway into a semblance of the native landscape, only to have surveyors' stakes placed through it, designating the pathway of a new pipeline. In addition, the mountain parks have problems of visitors seeing grassy areas as places to walk unfettered, which results in continued erosion of meadows and grassy slopes. I watched crowds of visitors trample over a newly revegetated area at the Logan Pass Visitor Center in Glacier National Park, to get a closer photo of a mountain goat. There is no way, short of an electrified fence, to eliminate visitor impact in these heavily trafficked areas, and revegetation efforts are currently underfunded and unable to keep up with the impacts. And, one must remember that it is most likely the visitors who carry the seeds of exotic species on their vehicles and feet. So, while there is clearly a need for revegetation, the funding is lacking. Finally, the inability to purchase blocks of private land within parks (e.g. abandoned mines and farms) allows erosion to continue, and exotic plants to take hold and spread. Such areas should be restored to prevent future problems, but the funds are not present.

The lack of funding to perform extended projects means that detailed information concerning the ecological dynamics of specific habitats is not collected. Without these data, a system's functions simply cannot be known. In one place in Denali, Rock Creek, an extended survey is being performed. It is the only area in this park of six million acres, larger than the state of Massachusetts, that is being studied in some degree of depth. As such, data from this drainage are being used to formulate plans not only for the rest of the park, but for the other Alaskan parks as well. In effect, we have what I have termed, "a one point regression line." It is not that the resource managers really believe that what happens at Rock Creek exemplifies all of Denali's varied habitats, but it is simply that this is the only area they really know to any extent. So, it is the one area to which they can turn to try and figure out what is going on, both there and possibly elsewhere. Such limited knowledge and excessive use of extrapolation to formulate far-reaching ecological plans is ineffective.

The lack of travel funds places managers in a real bind. Large parks like Sequoia, Denali, Gates of the Arctic, and Wrangell-St. Elias (the largest in the system, equal to six Yellowstone in size) must use aerial patrols simply to survey the area. Such patrols are expensive, with the result that very few go out, and those that do are filled with workers engaged in several different tasks. Gates of the Arctic is funded to perform only four air patrols for 8.4 million acres. Logistically, there is no other way to establish any meaningful presence in the park and perform the necessary survey work, than through air transport, and the parks are simply not funded adequately for this. Additionally, ground transport, though less expensive, is still an ongoing drain on already limited travel funds. And very little, if any, funds in some parks are allocated for travel to conferences where resource managers may learn new techniques, applications, and gain information from other workers.

3. Budget Cuts and Effects on Staffing.

The NPS has a history of static or declining budgets that has aggravated a pre-existing condition. This is the problem of the "haves and have-nots." It should be noted that these perceptions are based on relative comparisons, because no park nor agency within the NPS is truly a "have". Simply put, some of the paupers are better off than others, but they are still paupers. In a very real sense, they are all truly "have-nots."

There exists the problem of permanent and temporary (seasonal) employees. Permanent employees are those who are salaried, enter at a higher level, are eligible for promotion, and receive health benefits. Seasonals are hired for the summer, given a limited number of hours to work, receive no health benefits, and have no job security. At the end of their time, they are dismissed. There is apparently no motivation for them to reapply for the job, other than their own dedication to the jobs they perform. They are often hired late in the spring, which gives them very little start-up time, are released before their projects are complete, and have no funded opportunity to write follow-up reports, nor analyze data collected in the summer. In short, they are simply there in the summer and used in that capacity. The seasonals in resource management areas often perform specialized tasks, wherein they have developed their own protocols. Seasonals I met with included Bear Technicians, Large Mammal Specialists, and Revegetation Specialists - all of whom require extensive training to place someone competent in the field. Shortened

start-up times preclude this training. Thus, the tendency to rehire the same individual trained in previous years is high. For a new person, fresh out of school, it is quite exhilarating to work in a national park. But once they have worked in the same park for several years, with no advancement, completion of projects, nor recognition in any significant way, the job begins to wear. Thus, a high turnover rate among seasonals, especially among the veteran seasonals that one would wish to retain, is common. This leaves park resource managers in a dilemma. On one hand, they would like to do more for the seasonals, on the other they have no funding to do this. So, they are forced to use them in this "burn out" fashion. This is clearly an intolerable situation, wherein the NPS takes the role of unappreciative exploiter of dedicated conservationists. The real problem is that funding is not sufficient to even hire enough low-paid seasonals to perform all of the projects necessary to be in compliance with the management plans. Thus, inventories go incomplete, LTEM is not performed, and the important information goes uncollected or not analyzed. And the managers know this, but are unable to provide a solution to the problem.

It is said that some managers have had the opportunity to better the conditions of the seasonals, and have chosen to place the funding elsewhere. I also heard that fear of imminent budget cuts prompted former managers to hire more management staff, in order to encumber funds before funding was lost. I must admit that this does look to be the case in certain large parks where management positions abound. This is an "all chiefs and no Indians" situation, wherein the resource managers and branch chiefs outnumber the seasonals. Regardless of how the situation occurred, at present it still poses a real problem in terms of limited capabilities for resource management. And until it is corrected, the safety net will continue to rip.

There also exists the inability to utilize relatively inexpensive personnel to supplement the seasonals. The Student Conservation Association (SCA), which places college students in parks during the summer at less than half of the cost of a seasonal, is one of these programs. A drawback is that it takes some time to train the SCA people on arrival, which means some staff member must be assigned to this. In parks where staff is limited, this is simply one more burden and deemed not worth the effort. Some parks with adequate staffs to train SCA members admit, "We'd be out of business without the SCA." So, the SCA represents an untapped resource to many managers, simply because their staffs are already overburdened. The same may be said of NPS Volunteers. These unpaid workers are utilized by some, and not others, for much the same reason. Volunteers are often found at Visitor Centers, but at Isle Royale, Volunteers and one part-time ranger comprise the backcountry presence. So, Volunteers represent another untapped resource as a result of funding shortfalls.

Finally, the use of term contracts to hire workers to perform specific tasks has been effective at completing projects at Wrangell-St. Elias National Park. This process allows researchers to become quite familiar with the workings of the park ecosystem. They receive salaries and benefits commensurate with their level of expertise, are active team members, and submit completed project reports. Unfortunately, they may only work for a total of four years, after which time they are released. So, just as the managers get researchers that really know the system, they are turned loose.

In addition, a park's failure to support a large enough management staff means that they are at a real disadvantage, when it comes to competing for external funds. The Natural Resource Preservation Funding Program (NRPP) is the source of most funds competed for by park managers. If a staff is large and diverse enough, expertise can be drawn on to present a better application for these grants than would one harried manager at a small park. Thus, the "have" parks are favored over the "have-not" parks when it comes to competing for these grants.

This same process that has allowed the "have" park managers to develop more specialized staffs, has resulted in the evolution of "generalist" managers in the "have not" parks. Unfortunately, the same requirement to manage all of the resources must be met by a much smaller staff. The manager winds up trying to pick up the slack. These people are very aware of their need for specialized input and do the best they can to obtain it. However, with no local specialist to draw on, their requests often go unmet. Unfortunately, the lack of specialized information precludes the formation of effective management plans. So, these "generalist" managers are forced into more of a caretaker than a managerial role due to this lack of specialized information and, "small items slip through the safety net", as one manager told me. Also, lacking this type of data further lessens the ability of "generalist" managers to compete effectively for NRPP funds. In effect, the status quo is reinforced, and the safety net is left open.

4. Excessive Reliance on "Soft Money".

Resource managers attempt to make up for budget shortfalls by applying for block-grants, many provided by the NRPP. Unfortunately, the unpredictable nature of this process precludes the use of such funds for LTEM and other long-term programs. In spite of this, managers do use these forms of "soft money" to conduct some studies that may be extended to longer terms, if they are fortunate to obtain additional grants. Still, it is a very tenuous situation.

Because inadequate budgets have compelled NPS managers to seek additional funding elsewhere, grant writing has grown in intensity. Seeking these block-grants has become a primary activity of managers, consuming large amounts of staff time. Some managers reported up to 45% of their time was dedicated to grant acquisition. Fortunately, the criteria by which grant applications are evaluated have been standardized; however, each grant apparently addresses a separate concern. So, grant applications must be "buffed up" for each new grant, a different spin for each separate concern. Thus, a manager may rework a grant application as many as six times before it is successful. The managers are simply trying to find a way to carry out their duties, but are made to perform the never-ending task of reworking their applications. I believe the situation is reversed from what it should be. The managers should be able to indicate what they need, not try and match another agency's expectations of what they think the park needs. It is an endless wasteful game, and I found no one who was supportive of the current scheme.

5. Possible Means of Augmenting Resource Capabilities.

The means of augmenting resource capabilities for NPS managers involve a combination of common sense and real innovation. These means do not depend on blanket

increases in the NPS budget, though increases are needed; they must be targeted to addressing specific resource management needs.

a. Prevent superintendents from redirecting resource funds. The previously stated example of park superintendents redirecting resource management funds indicates a problem that is widespread through the NPS. This practice must stop. Superintendents must be held accountable for the funds they receive. If resource management is not able to protect resources in a proper manner, the park has failed in its primary responsibility, and the superintendent should be held responsible. Funds must go to where they are targeted, or the entire budget process will remain an exercise in futility. Resource protection must be recognized as the primary goal.

b. Develop outside sources of funding and equipment. The NPS had already implemented this suggestion to some degree, the establishment of foundations at Yellowstone and Yosemite being the most successful endeavors. Last year, they received \$900,000 and \$750,000 respectively, sizeable contributions that allowed some spillover to resources. In Yosemite, the "bear boxes", so necessary to reduce the problem of pillaging bears, have all been purchased by the Yosemite Fund. This is not to say that all parks are equally situated to tap such a resource. Glacier Park's Foundation was more in the neighborhood of \$500. But, it does indicate a potential source of funding that has not been adequately realized by the NPS. I believe a concerted effort by the NPS to tap this public goodwill for the parks would be much more productive than they presently experience. Perhaps a systemwide program that targets specific needs of specific parks (e.g. resource management, infrastructure, interpretive programs, etc.), and seeks tax deductible contributions to address these problems would work to more fully exploit this potential source of income. Presently, however, it is up to the individual parks to make this effort, with the reported varying degrees of success. Also, such a systemwide program would require close scrutiny, to ensure that such contributions did make it through to the desired target area. In addition, the bureaucratic tendency to subtract base funds equal to that of contributions must not be allowed. These should be net increases to the targeted areas, not paper increases followed by paper decreases. The idea is to help solve a problem, not continue to prolong it.

In a related manner, a systemwide effort to obtain equipment (e.g. vehicles, construction equipment, computers, monitoring equipment, etc.) by approaching private corporations may pay off, with contributions that could offset the expenditures associated with running the parks. A sign that proclaims, "This vehicle was donated by General Motors," could save an individual park \$15,000, which could release this money for use in resource management. Likewise, most managers routinely hunch over NPS purchased computers, that might well have been contributed by a manufacturer. Again, this requires a systemwide approach. Individual managers and superintendents just do not have the necessary contacts or influence to effect such a scheme.

c. Turn over non-critical functions to the private sector. The running of the buses in Denali Park is an example of this. It is not critical to use the park budget to hire drivers, manage ticket sales, and purchase and maintain buses. Concessionaires have taken over this operation, to no observable detriment to the park or its resources. There are several other areas of park operations, where it is not necessary to have NPS personnel directly involved. Of course, the concessionaires must be regulated to ensure a reasonable return to

the park, continued fair treatment of the public, and protection of resources. But, every dollar that can be saved in turning over non-critical jobs to the private sector is a potential gain for resource management. The only directly critical jobs are resource preservation and law enforcement within the parks. All others can be contracted out and supervised by administrative park personnel. Obviously, this is an oversimplification, but the message remains that the direct use of NPS personnel to perform all aspects of running a park may not be the most economical means of accomplishing the mandate of the parks. And if it is not, then privatization may be a means of cutting back on park expenses. Keeping the savings within the park would be an obvious corollary to this proposal, with a large portion of these gains targeted to resource management.

d. Take better advantage of the Student Conservation Association (SCA) and Park Volunteers. Given adequate personnel to train and direct SCA members and volunteers, a number of neglected lower level tasks can be unloaded from the shoulders of resource managers. The key here is that either adequate time or additional personnel must be allocated to orient and train these inexpensive replacements. Having worked with students in the field for over twenty years, I know the high level of ingenuity, enthusiasm, and dedication that they can bring to a task. They are barely tapped as a resource by some parks that desperately need SCA people, and are least able to train them. All managers should have equal opportunity to train and employ SCA members as part of their team. Concerning Park Volunteers, many of these people bring extensive training with them to the jobs assigned. While many are naturally placed in high traffic areas such as Visitor Centers and campgrounds, others may have experience that would allow a more specialized application (e.g. performing biological surveys, revegetation projects, or exotic species removal, monitoring of endangered species, etc.). Earthwatch actually charges volunteers to work at field sites and collect data. Couldn't resource managers be given a time release or additional personnel to develop similar schemes using Park Volunteers, that would accomplish some resource tasks? I know it can be done, because I helped collect seeds with a revegetation specialist in Denali Park, without any prior knowledge of the species involved, and it allowed her to accomplish this task in half the allotted time. Volunteers are productive. They simply need direction. Parks should invest this time to use this free resource.

e. Increase cooperation between park divisions to perform resource-related activities. Within a park, the lack of cooperation between the resource division and other divisions wastes a valuable opportunity to really stretch the resource dollar. Revegetating an area, only to have a park construction project tear it up again, is a waste of time and money. I directly observed this in two parks. Certainly, some minor cooperation between resources and maintenance would minimize such waste. Additionally, law enforcement (LE) rangers could be directed to support resource projects. While it is recognized that their first responsibility is to law enforcement, there are many hours (e.g. quiet periods of the day and after peak seasons) when LE rangers are still on patrol. They are rangers first, and should be expected to know the resource. Why not have them perform surveys of large mammals in Denali and Yellowstone? Why does a resource worker have to count elk or caribou? Why are bears only censused by resource personnel? The LE Ranger may be the best choice for this job, especially if these animals are normally encountered on their patrols. Moving LE rangers into more of a resource role would bring more of a team effort to resource management.

f. Cease overhead charges between park-related federal agencies. When the NPS contracts out with the Biological Resources Division (BRD) of the United States Geological Survey (USGS) to employ a researcher, they must pay overhead to the BRD. Why? It is not necessary for federal dollars to be spent twice on running the same office. In the days before the removal of biological researchers from the NPS and their inclusion in the National Biological Survey (NBS), dollars spent on research in the park did not involve overhead expenditures to put those investigators in the field. Now, in addition to inflation, overhead costs can further erode the ability of resource managers to perform a project. Eliminating this overhead would effectively stretch resource management dollars.

g. Discontinue politically inspired "pork barrel" projects. Enough is enough! The use of the NPS budget as a political "pork barrel" must stop. GAO and OMB should closely scrutinize all park projects that do not originate within the NPS. At least, NPS-initiated proposals should be approved before those originated from outside the agency. These "pork barrel" projects give the false impression that the NPS budget is large enough to address its needs, when the true story is that conditions are allowed to deteriorate within certain parks, while political favor is curried in others.

h. Separate cost of living increases from resource funds. When the Alaskan park personnel were given a 25% increase in salary to compensate for the higher cost of living in this state, it came out of the static park budgets, and was not accompanied by an increase in the park budgets. Consequently, operating budgets were cut to accommodate this pay increase. Clearly, the intent was to benefit the individuals on duty in Alaska, but it also decreased their ability to manage resources, which was not the intention of the adjustment. Any salary or benefit increases should be funded separately from operating expenses, and the two should not be linked.

i. Obtain royalties and other fees for industrial, commercial, and foreign use of NPS resources. The use of NPS resources for industrial purposes without substantial gain to the NPS units is best seen at Yellowstone National Park. Here, thermally stable enzymes, the foundation of genetic engineering, were isolated from thermophilic bacteria of the hot springs of the park. If the NPS had been able to inventory and patent these bacteria, these billion dollar industries would have had to pay royalties to them. Instead, the bacteria and their irreplaceable enzyme were free for the taking. Motion picture companies frequently use the splendid scenery of national parks for filming. These multimillion-dollar projects, which often earn many millions for their producers, should also be assessed fees that more closely approximate the real value of the NPS resource to their films. Commercial trips that explore parks could also be assessed higher fees. And finally, citizens of other nations could be assessed an elevated fee for entry into parks, in that they do not pay federal taxes to support the NPS. Again, it is assumed that this would benefit resource protection, if a high proportion of these increased fees would be targeted for resource use.

Issues Independent of Funding

1. NPS Organization

a. External Influences.

(1) NPS - NBS - BRD (USGS) Conversion. The history of the NPS in the 1990s reads like that of the Indian Treaties of the 1870's and 1880's. It is a history of great and broken promises. Denali National Park exemplifies this history. In the early 1990's, funds were made available to professionalize the resource management staff. In 1992, its resource staff had seven diverse wildlife and botanical specialists, ranging from wolf and caribou experts, to a plant ecologist, to LTEM specialists. In 1993, the Secretary of the Interior established the National Biological Survey (NBS) to be a central clearinghouse for biological research conducted in the Department of Interior. The NBS effectively pooled biologists from a group of federal agencies into one unit, to be available to all parks. Thus, the biologists and base funding for them were pulled from the NPS and transferred to the NBS. Budget shortfalls followed, however, and many biologists, and their funding, were lost to the NBS. This effectively left Denali with no biologists on staff. This pattern was repeated in many other parks including Glacier, Voyageurs, and Isle Royale. Such was the nature of the supposedly "seamless transfer." Finally, in 1996, the NBS was dismantled and remaining biologists transferred to the newly formed Biological Resources Division (BRD) of the United States Geological Survey (USGS). Relations between the life scientists of the BRD and the physical scientists of the USGS are tenuous. According to one BRD specialist, "The USGS has no clue as to what I do, and I have no clue as to what it is the USGS thinks I do." Further, he felt that the USGS is not "progressive" enough to manage the BRD. Unfortunately, the removal of biologists from the NPS effectively removed the scientific perspective from the parks. The BRD scientists are no longer tied to the parks, and are less aware of species that should be studied. Also, the team effort is lost when a client relationship is substituted. It is telling that the parks where BRD personnel are making their best contribution, are those in which they are permanently stationed.

Perhaps the most damaging feature of this conversion, and subsequent loss of biologists from the system, is that the expertise required to formulate and carry out projects is not always available at the regional office of the BRD. Kenai Fjords is in dire need of a marine mammalogist. The Anchorage office of the BRD has only a bear specialist to cover large mammal research. Thus, the cupboard is bare, as far as Kenai Fjords is concerned. And this pattern, too, is repeated throughout the NPS. One cannot cut staff in as specialized an area as biological research and expect the survivors to pick up the slack. Thus, for some NPS units, the BRD is currently functioning with an apparent lack of direction, poor communication, and inadequate staffing to perform the basic research responsibilities of the agency.

(2) Reorganization of the BRD and NPS Regional Clusters. Recent reorganization has left the BRD downsized, and the NPS regional parks shuffled into a series of related clusters. While attempting to streamline the system, the result has sometimes been to break up good working relationships between the BRD and NPS, and between parks and their regional personnel. The best examples are the aquatic parks of the Great Lakes. In one reorganization, the fishery biologist of the BRD was transferred from the Michigan

Science Center at Ann Arbor to the Missouri Science Center at Columbia. Thus, a very productive working relationship between the Great Lakes parks and Ann Arbor was broken. With it, access to scientific expertise of an aquatic nature was lost, with no adequate replacement. Thus, both Voyageurs and Isle Royale National Parks were left without the scientific expertise in fishery biology, that they both formerly enjoyed.

The formation of NPS regions into clusters has also affected the Great Lakes cluster. Good working relationships between the Great Lakes parks and a talented regional manager were broken, when he was transferred to the Great Plains cluster. Such effective working relationships take years to develop, and all of the leadership, trust, and cooperation generated during this time are not easily replaced, once these bonds are broken. Ironically, I have most recently learned that these clusters have now been abolished. Clearly, the ability to maintain good working relationships is at risk in the face of such frequent reorganizations and transfers.

(3) Prototype Parks and Protocols. Four parks were selected as prototype parks, to develop resource management protocols for distribution to other parks with similar management challenges. Channel Islands, Shenandoah, Great Smoky Mountains, and Denali National Parks were selected to receive additional funds to initiate LTEM programs and develop and distribute protocols. Not all parks were funded equally, Denali receiving the lowest amount. At Denali and Great Smoky Mountains, the NPS - NBS - BRD shift removed funding and positions from the parks, a fate missed by Shenandoah and Channel Islands, because they were already operational. BRD overhead further reduced the funding for this task. Also, micromanagement at upper levels tended to hinder the development of protocols. So, while these parks have enjoyed a funding increase over other parks, their ability to develop these protocols has been diminished, because of these and other problems. Many park managers complained that the protocols have not yet been distributed, and some protocol park resource managers expressed doubts as to the applicability of their protocols throughout the entire NPS, reasoning that they would be more appropriate for parks of a like composition in the same region. In addition, more parks are on line waiting to attain the status of prototype park. The question remains as to whether this program has been worth the expense, because these are expensive programs, and the cost must be borne by all NPS units. Are they getting their money's worth? Was there a better use for these funds in an already underfunded organization?

(4) Enabling Legislation. There are logical inconsistencies in the enabling legislation that establishes the NPS and its goals. The Organic Act of August 1909, which created the NPS reads in part, "...the fundamental purpose of the said parks...is to conserve the scenery and the natural and historic objects and wildlife therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." No park that I visited protected its resources to the point of leaving them "unimpaired" for future generations. Each park had real problems attempting to balance human activities with resource protection. Subsistence hunting and fishing, sport hunting and fishing, commercial raft trips, off-road vehicle activities, motor vehicle congestion, air pollution, snowmobiles, jet skis, motor boats, low flying planes, construction activities, fire suppression, overcrowded hiking trails and campsites, are but some of the impacts generated by human activities as they "enjoy" the parks. Clearly, the writers of the enabling legislation did not envision a time, when human impacts would increase to a level that threatens the very nature of the parks that they hoped

to protect. Yet, every park that I visited during this investigation, and every park I have ever seen, has shown the wear and tear associated with these human activities. And, this is not a problem restricted to the original founders of the NPS. Kenai Fjords poses a more recent example of logically flawed enabling legislation. Here, the park is charged with the protection of all marine resources within the park; however, its jurisdiction only extends down to the waterline! The Alaskan Department of Natural Resources has the actual jurisdiction over the marine resources. So, at once, the NPS is charged with maintaining the status of populations of marine birds and mammals, with no ability to execute this charge. This is the type of situation that led one manager to say, that they can only hope to "slow the slide" of resource destruction.

b. Internal Influences.

(1) Lack of Project Staff. While primarily caused by inadequate funding and possibly, in some cases, a rush to encumber funds in management staff, before new budget cuts surfaced, this problem has now become institutionalized in many of the parks visited. Some parks had extensive bureaucracies of division heads, several branch chiefs, and numerous rangers, but few, if any, permanent project personnel. When asked where they would put new funding, it was toward uncompleted projects, equipment, or land acquisition, and not personnel. Though all expressed a great dissatisfaction with the current situation involving seasonals, none were willing to commit their limited funds to its solution. This compounds the budgetary cause of the problem, by instilling in managers a reluctant acceptance of the idea that they will never have enough project personnel, so they may as well accomplish what projects they can by using seasonals. So, in this way it has become an internal problem, separate from the budget. And it is this perception that poisons the relationship of managers and seasonals.

(2) Problems of Communication. Some managers reported difficulty in communicating their resource needs to their superintendents. This was attributed to the necessity of communicating needs through their chief rangers, who may not share their degree of concern about resources, when balanced against more pressing needs of the park. These more pressing needs often dealt with visitor services and infrastructure repairs. As one resource manager said, "Visitors scream, trees don't." So, there is a tendency to "grease the squeaky wheel", and let the resources fend for themselves. The managers know this tendency well, but it is sometimes the silence of chief rangers at regional advisory meetings where some funding decisions are made, that is particularly vexing. Summarizing the comments of several managers, the chief ranger can make or break resource management.

But, poor communication does not end at the managers' desks. Similar frustrations were reported by personnel serving under managers. The most frustrated appear to be the seasonals. Several interviewed reported that they talked with their respective managers, but felt they weren't heard. In effect, they felt isolated, unsupported, and totally on their own, with little respect given to the jobs they were doing. They saw little coordination of research projects, felt they lacked direction from above, and thought nothing much was being done with the data they collected, or the procedures that they had modified. And more importantly, they felt the managers were making no credible effort to improve the situation. Thus, the poisoned relationship previously mentioned serves to further diminish the ability of managers to adequately protect resources.

(3) Problems of Permanent vs. Temporary Employment Status. Again, while budget shortfalls may have produced this problem, it has now become institutionalized in many of the parks. It is almost a knee-jerk response of managers to hire seasonals to perform summer projects, with little regard to addressing the previously stated problems of temporary employees. The "us-versus-them" mentality persists from season to season, the poisoned relationship continues, and the inability of the temporary workers to break the "seasonal-permanent barrier" further demoralizes them. However, at Wrangell-St. Elias, efforts to improve this situation by hiring temporary workers with term contracts, that include health benefits and salaries commensurate with the level of their job responsibilities, have helped to bring them into the fold. Also, by including term contractors in the project planning process, and listening to what they have to say, a real team has been forged, that actually sets the planning goals and moves to achieve them. Here, projects are completed, and reports are submitted, as a requirement for the completion of term contracts. Resources are being skillfully managed. Though the number of workers is reduced, the quality of their work and the resulting team effort more than compensates for this reduction.

(4) High Turnover Rates and Loss of Continuity. As a result of seasonal employee discontent and other factors, there is a high turnover rate of NPS resource personnel. Thus, the training cycle must be repeated each year, and time is lost accordingly. Further, local and regional contacts are cut, resulting in a less effective performance by the new workers, because it takes years to cultivate new contacts. After observing several of these turnovers in as many years, bus concessionaires at Denali this year stayed away from the mandatory bear orientation, because they interpreted the rush to start up after the late hiring of bear technicians, as an apparent lack of commitment of the NPS to the bear management program. Why should they attend, if the NPS didn't care enough to field and train the technicians earlier on? And when a permanent employee leaves, the impact is even greater, as when the plant ecologist left Denali. The position is still vacant two years later. Thus, the specific programs supervised by this position remain in limbo, and the remaining staff is overburdened trying to cover all bases. It should be seen that these high turnover rates are symptomatic of an undesirable working environment.

(5) Lack of Divisional Cooperation Within the Parks. The inability of a park's divisions to cooperate in achieving a common goal has little to do with the budget. The already overburdened divisions simply do not have the time or inclination to take on new responsibilities. So, construction activities continue to tear up landscape, and revegetation crews attempt to restore them, only to have the pattern repeated in the next few years. Resource managers continue to worry about wildlife data that is not collected, while LE rangers drive by the animals on their daily patrols. Why? Budget shortfalls do not command this isolation of divisions. Granted, overworked people are less likely to break out of this self-imposed isolation, but mostly, it has been institutionalized. Our division does this, your division does that. In this case, it would take the wider vision of a chief ranger or superintendent to identify a common goal, and set the pieces in motion to achieve that goal. It is not likely that such cooperation will arise from the divisions. This is a problem of leadership, or more correctly, the lack of leadership.

2. Attitudes Within the Parks.

a. Crisis Management. In nearly every park I visited, the standard story about the "crisis of the week" was told. These "crises" usually arose from a source external to the management division. A sudden call from the chief ranger to drop everything and get on this, a charge of mismanagement from a wildlife conservation group or their opposites - a hunting group, or the appearance of visiting Congressmen. All are enough to cause the managers to radically modify their schedules to deal with these all-too-frequent "crises". So, projects are postponed, meetings cancelled, surveys delayed until the "crisis" passes. Then, the pieces are picked up and work resumes until the next "crisis" arrives. And there is always a next "crisis". It is one of the least effective means of management, and it is one of the most pervasive. And, the result is that managers tend to develop an attitude of dealing with the "crisis" that is immediately before them. This attitude precludes any type of proactive action and limits the effectiveness of managers.

b. Middle Management Pragmatism. Perhaps, crisis management results from the pragmatic practices of middle managers. Caught in the middle between administrators and specialists, the middle managers must maintain some semblance of order. After several sessions of dealing with "crises", while setting planned projects aside, an unspoken, but very predictable priority emerges. Specifically, it is better to prevent a negative situation from getting worse, than it is to promote a positive situation. That is to say, the best news that a middle manager is often able to report, is that there is no problem to report. Success, measured in the eye of the manager, is that they have survived another week without a major screw-up. That is, no news is good news. So, instead of operating a system geared to promote positive aspects, this has become a system geared to correcting negative aspects. This may reflect the leadership style of higher administrators, who tend to cordially accept good news, but go ballistic when there is bad news. Thus, the pragmatic goal of damage control tends to replace the idealistic goals of resource protection, that most managers brought to the job.

c. Perception of Limited Capabilities. After years of declining or static budgets, managers have a tendency to "think too small". Tight budgets were the proximate cause of this problem, but again it has become institutionalized. Thus, initially intolerable conditions become tolerable with time. The lack of specialists, dependence on "soft money", reliance on seasonals, incomplete inventories and LTEM, all become part of the normal working conditions of the veteran managers. That the system has operated at all to this point, is mostly due to managers' dedication to their jobs, not due to the support that they have received. But, the cost of running such operations on a shoestring for so long, is that some managers have begun to accept their perceived limited capabilities as reality. Good ideas such as proactivity, resource enhancement, reintroduction of fire through prescribed and controlled burns, all desirable, seem too far out of reach. It's not that managers are unimaginative. Nearly every one I spoke with had ideas on what they would do to improve resource management at their parks, but far too many felt it would not happen on their watch. This is the hidden human cost of years of tight budgets. And it permeates the NPS like a gloom.

d. Reluctance to be Proactive. The proactive ability to head-off a problem and actually improve the condition is one of practical optimism. The "stitch-in-time" is

actually a necessary step in keeping a system running. Unfortunately, the combination of budget shortfalls, crisis management, insufficient staff, and unpredictable funding has made this necessary ingredient an option that is seldom pursued. Managers are aware of the problems that are brewing up. They are aware that certain resources are going downhill, but they are also aware that other resources are declining even faster. So, they manage one crisis at a time, with little hope of heading off these developing crises. This again suggests that their reluctance has become institutionalized. It is one of the most aggravating parts of their job. And it is evidenced by the project statements that follow their Resource Management Plans. Each manager has assembled lists of desired projects that await funding. The Alaska Region alone lists over 55 unfunded projects (Unfunded National Park Service Research and Resource Management Project Opportunities in the Alaska Region, May 16, 1997). These represent the attempts of managers to be proactive. However, they are not funded, and most will remain unfunded for years. Thus, a reluctance to pursue this proactive option is understandable, but still symptomatic of a dysfunctional system.

e. General Frustration with Current Conditions. It is not surprising to find that professional managers are displeased with the current situation. On the one hand, they are charged with performing inventories, LTEM, and resource protection, but on the other hand, they are denied the means to carry out this charge. They are educated, experienced, knowledgeable supervisors, dedicated to their profession, able to see the consequences of continued degradation of their parks, and unable to effectively prevent this decline. From the managers down to the seasonals, the inability of the NPS to respond to the challenge of resource protection is grating. Whether funding or non-funding related, the issues that limit their ability to respond to these ecological problems continue to erode their confidence in the NPS in general, and their own role in protecting park resources. Their comments reflect this frustration. "We don't know enough to make educated guesses."; "Our knowledge of the resource is pathetic."; "We're mostly caretaking, and not really inventorying and monitoring."; "It's not really scientific analysis."; "We're losing ground! We're not really dealing with it."; "I'm tired of writing the need for NRPP funds 50 different ways."; "NPS lacks hard-core science types."; "We're forced to cut back on field operations, in order to analyze the data that's already collected."; "This is a strange way to do business."; and, "This crisis management, and trying to determine what to save, is grinding me down." The message is clearly one of diminished confidence in the system, their supervisors, and themselves to effectively manage park resources.

f. Acceptance of the Deteriorating Situation. NPS personnel that I spoke with, saw little hope that these frustrating conditions would soon improve. Most are resigned to stick-it-out and do the best they can to "slow the slide". But, as one manager stated: This is at the continued cost of "revised ideals", and a career distinguished by major defeats "punctuated by minor successes". And one researcher, complaining of the lack of Congressional funds to support the BRD stated, "Something should be done quickly, before it all falls apart." So, there is a realization that this deteriorating situation cannot continue indefinitely. Also, there is a suspicion that somewhere down the line it will collapse, and a real ecological crisis will occur. Whether this occurs or not is debatable. What is not, is that the deteriorating situation of park resource management has been accepted as the status quo.

3. *Extrinsic Problems.*

a. Competing Outside Interests. National parks as public lands are heir to the same problems that other public lands experience. Competing interests from hunters, fishermen, conservationists, recreational boaters, campers, and backpackers within the parks, and developers, farmers, ranchers, energy producers, commuters, lumber companies and encroaching municipalities outside park boundaries all serve to make managers' abilities to protect resources all the more difficult. While all parks share this problem, some specific examples of extrinsic impacts are highlighted below:

At Yellowstone National Park, over 1,100 bison were killed last year, due to the fear that Brucella abortus, the causative agent of bovine Brucellosis and supposedly carried by bison, may infect the surrounding cattle ranches of Montana, a Brucellosis-free state. Though the evidence for this fear is hardly scientific, the systematic destruction of nearly one-third of the bison herd of Yellowstone is a reality. Also at Yellowstone, the recent court decision to recapture or destroy recently released wolves from Canada has caused even greater problems for its resource managers.

At Denali National Park, the Wolf Management Program encounters problems from hunters, who wish to take more pelts, and also the Alaska Wildlife Alliance, a wolf conservation group, that has accused the park of mismanagement and mistreatment of wolves. Both groups' demands must be addressed by resource managers with already strained staffs.

At Great Smoky Mountains National Park, power plants from the Tennessee Valley Authority and as far away as Ohio, impact the air quality of the park. The same is true of Grand Canyon National Park, and the air pollution generated by commuters in the Los Angeles Basin.

At Everglades National Park, decades of water diversions and farmland conversion dried much of the region, and negatively impacted the plant and animal species of the park, and quite likely produced the deterioration of adjoining Florida Bay.

At Channel Islands National Park, the continued ranching on Santa Rosa Island has polluted the waters of the California coast. Additionally, excessive harvesting of Red Abalone at San Miguel Island threatens that population.

At the parks of the Great Lakes, use of jet skis disrupts the quiet waters where waterfowl breed. Both here and in Yellowstone, snowmobiles likewise disturb wintering populations of large mammals.

At Olympic National Park, and also at Redwood National Park, clearcutting by surrounding lumber companies has created problems of surface runoff for each park. Also at Olympic, over eight rivers have headwaters in the park, and the park is entirely surrounded by managed drainages. So, regulation of salmon fisheries is an ongoing process, that involves coordination with both State and Native-American tribal representatives.

At Glacier National Park, keeping the "Going to the Sun" Highway open and at maximum capacity is an ongoing concern of park managers. Every day that it is closed raises a storm of complaints from surrounding communities, that are dependent on tourist dollars for their livelihood. And the resource managers strain to accommodate this heavy flow of traffic over fragile alpine habitats, with continuous efforts at revegetation.

Resource protection poses a large enough problem for understaffed and underfunded management divisions, but the continuous effect of these competing outside influences, is that of diverting what scant resources are available from that task. In a large part, the crisis management that characterizes resource divisions, is due to these outside influences.

b. Insular Nature of the Parks. Initially, parks were conceptually set aside as "islands", where certain elements were to be preserved for posterity. Today, many parks have become virtual "islands" of resources, surrounded by a sea of human influences. Conceptual "islands" still exist in Alaska, vast areas where preservation is the rule and human influence is restricted. But, in the lower 48 states, even large parks like Yellowstone feel the pinch of encroaching civilization. As evidenced by the Bison slaughter of the winter of 1997, human activities can harm even this greatest of the parks of the contiguous United States.

To understand the true problems that parks face, a brief review of island biogeography is necessary. These theories first proposed by Robert MacArthur and E. O. Wilson in their 1967 work, The Theory of Island Biogeography, state several important findings. First, that larger areas are able to maintain larger numbers of species than smaller areas, second, that colonization of disturbed areas is easier for smaller, easily transported seeds of "weedy" exotic species, and third, that "edge effects" extend the conditions of surrounding areas toward the interior of islands. Simple enough ideas, but the application to parks is of considerable importance.

Many parks are large in area, so theoretically should be able to maintain a high number of species. But, as we see at the Great Smoky Mountains National Park, size is not the entire story. The park is cut up by heavily trafficked roads, punctuated by private inholdings, and abutted by large communities. Thus, the "island" nature of the park becomes exposed through the combined effects of these factors on its resources. First, the park becomes subdivided by the traffic corridors. Then, the inholdings become refuges for colonizing exotic species, which enter in along these roads. And the "edge effect" extends human influence into the park, to the detriment of the native species. The insular nature of this park is discussed below.

There is no buffer zone at Great Smoky Mountains National Park. When the White Oak acorn crop failed this year after several consecutive years of good crops, the amount of mast necessary to support the surplus of Black Bears present was insufficient, so the bears moved out of the park. In the first day of hunting season, 60 black Bears were killed near the park, an example of the insular nature of the parks in a sea of humanity.

c. Exotic Species. Exotic species have invaded the Great Smoky Mountains Park from a variety of sources. Fungal blights arising from ornamental plants outside the park continue to attack and kill Chestnuts and Butternuts. Cades Cove, an inholding, continues to maintain cattle and horses on a grassy farm within the park boundaries. Heavy traffic through this region ensures an easy dispersal of the seeds of “weedy” species along the park roadways. Introduced species of Rainbow and Brown Trout continue to impair the recovery of the Eastern Brook Trout. Wild pigs, turned loose by hunters near the park, are extremely destructive of park habitat, and are barely kept in line by three wildlife technicians, who make tremendous efforts to control the population. Finally, the most devastating effect of exotic species is seen in the destruction of 75% of the Fraser Fir forest by exotic Balsam Woolly Aphids (family: Adelgidae). so, the combination of “edge effect” and exotic species again demonstrates the insular qualities of Great Smoky Mountains National Park. As human population and visitation increase, these problems will increase in other parks as well.

4. *Intrinsic Problems.*

a. Park Expansion without Staff Increases. Recently, acquisition of new lands by the NPS has expanded the areas of responsibility for resource management, without a concomitant increase in staff or funds. Thus, already strained resource divisions are further stretched to accommodate these new additions. Similar conditions occur, when new responsibilities for resource management are mandated without follow-up funding. Such “unfunded mandates” include compliance with new environmental laws, often in the form of new reporting procedures. This expansion of responsibility, without increase in staffing or funding, is one of the factors behind the drive to obtain “soft money” to backfill new activities not covered by the base budget.

b. Difficulty in Assessing Resource Management Requirements. The systematic assessment of the needs of resource managers followed an innovative approach to fire management, after the controversial fires of Yellowstone in 1988 and Yosemite in 1989. “Fire-Pro”, a computer data base fire profile of each park and their needs related to fire management, was a successful program that gathered and analyzed data, to determine what type of organization and equipment was required by each park in a “normal” fire year. Based on “Fire-Pro”, adequate staffing, equipment, and funding were to be received by each park, in order to manage fire. It was an objective, evenhanded approach, that most view as being quite successful. Attempts to quantify the needs of resource managers have been less effective.

The Natural Resource Management Assessment Program (NR-MAP) attempted to duplicate the methods of “Fire-Pro”, by collecting and analyzing data in a similar manner. Unfortunately, the manner of data collection and analysis has not been as well received as “Fire-Pro”. It is very difficult to determine a method of data collection and analysis that addresses the resource needs of each of the 375 units of the NPS. For instance, area determination by tallying the number of 7.5-minute Quadrangles within a park unit failed to assess the proper area of Denali Park, because its maps are in the 15-minute format. The result was that Denali was assessed at only half of its actual area. Resource managers unable to report data for which none existed (e.g. number of lakes, number of acres of exotic species, miles of shoreline, etc.), were not allowed to enter “no data”, and instead a zero was input. Thus, the larger parks, and those with smaller staffs, were less able to

respond to NR-MAP's inquiries, and were subsequently inadequately represented. Also, special considerations based on region were neglected. Subsistence, a major issue in Alaska parks, and farming, a major issue in some eastern parks, were minimized by NR-MAP. So, at present, while many managers consider NR-MAP to be an imperfect tool for assessing the needs of the parks, they also consider it the best instrument they presently have. While NR-MAP may exaggerate some needs and neglect others, its message is still clear. NR-MAP estimates that the average NPS unit receives 24% of the funding necessary to manage its resources. Whether this number varies up or down by 5%, this is still a national disgrace. Surprisingly, NR-MAP has shown that it is not necessary to achieve 100% of projected funding to effectively manage resources. Those parks that were at or above the 50% funding level were able to more effectively manage resources than others. Here, a critical mass of specialized staff could be assembled to divide the labor, obtain NRPP funds, and employ and train volunteers. So, though NR-MAP may be flawed in certain respects, the notion that an effective funding threshold exists is its major message. And that threshold appears to be at or above the 50% level. The parks that I visited ranged from 16% to 83% of projected funding, and the existence of this threshold and its effect on resource management was quite apparent.

c. Insular Nature of the Parks. As previously stated, parks now comprise resource islands. One of the problems associated with limiting the area of once continuous ranges of plants and animals is the problem of "relaxing down", the term given to the loss of large species from islands. Partitioning of former extensive ranges, by establishing new or more heavily trafficked roads, serves to decrease the effective size of areas actually required by large animals. Thus, larger animals with biological requirements for more extensive undisturbed home ranges than now exist are threatened. It is no surprise to biogeographers, that parks that were once established to protect large and spectacular birds and mammals, are now losing them. The parks are still islands. Diminishing the actual area utilized by large animals, through human activities, is not without consequence. Changing the ecological characteristics of these habitats is also not without consequence. A case in point is the condition of water levels at Voyageurs National Park. Voyageurs Park comprises a reservoir contained by three hydroelectric dams, two American and one Canadian. The storage and subsequent release of water reverses the natural flow, so now levels are highest in the fall and lowest in the spring, with seven to eleven foot annual fluctuations. The high fall levels flood waterfowl nests, requiring later nesting attempts. Nestlings face the approach of winter, when they should have already grown and migrated south. In the winter, low water levels strand aquatic mammal dens built during higher fall levels. Thus, otters, muskrats, and beavers freeze to death in dens no longer insulated by a protective cover of water. The species protected within these resource islands are impacted by intrinsic changes, that reduce the size or alter the natural condition of areas within the confines of the parks.

d. Rare and Endangered Species. The emphasis on rare and endangered species is quite apparent, when reading management plans and project statements of the NPS. It is understandable, in that many laws now govern the management of such species. However, the elaborate attention given to endangered species has other causes. In funding NRPP applications, particular attention is paid to eight criteria addressed in project statements. The first of these criteria for funding, asks if this project is related to rare or endangered species. So, it is no surprise to find that management plans and project statements abound with references to rare and endangered species. It is the first obstacle to overcome in the

quest for “soft money”. Indeed, the management plans for the Mojave National Preserve seems to be built around the Desert Tortoise. Though other Federal agencies may be charged with the responsibility of protecting these species, every NPS unit must still proclaim that its project will address the needs of its own rare or endangered species. It is a classic case of the tail wagging the dog. Instead of addressing the unfunded needs of the parks, the NRPP tells them what they need. And the first need is to address the rare and endangered species, regardless of what other Federal agencies are already doing for them. It would be interesting to see what the effect of dropping this first criteria would have on project statements and management plans. Perhaps critical species, not on the rare and endangered list, would receive more attention.

e. Non-Directed Research Within Parks. Universities are often cited as the natural area to approach to obtain researchers for park projects. The problems with this avenue are, that universities often take a substantial percentage of funding dollars as overhead before researchers ever enter the park, and that professors are often interested in only a very narrow focus, which may not fully address resource managers’ concerns. So, while some research has been of considerable benefit to the parks (e.g. Rolf Peterson’s wolf studies on Isle Royale), other research has been less beneficial to an overall understanding of park natural history. The previously discussed problem of undirected seasonal research also falls in this category.

f. Increased Human Influence in Natural Systems. The pervasive influence of human activities in the natural systems of parks is increasing. Overflights, vehicular access, boating, hiking, backpacking, all introduce human impacts to areas previously unaffected. And the very nature of the systems changes. Air pollution damages the trees and waterways of the eastern parks, with subsequent impacts to the smaller plants and animals within their microhabitats. The Grizzly Bears of Denali offer an interesting example. Since the mid-1970’s, when State Route 3 was connected to Denali National Park, bear behavior has changed. Between 1917 and 1972, only four bear-human interactions produced injuries. Since then, ten such incidents have resulted in injuries. Before the advent of large numbers of humans in the park, bear encounters were relatively few, and the bears reacted with either hostile behaviors or fear of humans. Now, bears either ignore humans or are curious, which leads to more encounters. Some are still hostile, but a change in the basic behavior of the Grizzly Bear has resulted from the increased intrusion of human activities into formerly remote regions of the park. These human impacts further work to complicate the management of park resources.

g. Subsistence Use of Park Resources. Both in Olympic National Park and the Alaskan units of the NPS, subsistence hunting, fishing and gathering are major issues. Here, native populations have established long traditions of tribal use of these resources. And, the NPS has become aware of their traditions, and has worked to accommodate their needs. Managing the salmon runs in Olympic Park is a real problem. Three NPS biologists work on the salmon issue for the entire park. The tribes have up to 30 biologists working on the same issue, on only two rivers. In that 22 species of birds and mammals within the park depend on salmon to some degree, the conflicts concerning this resource are apparent. A depletion of the salmon stock from overfishing would have significant ecosystem effects. Thus, this is a sensitive management issue, with potentially long-term consequences.

Subsistence use is not limited to Native-Americans in Alaskan parks. Any rural Alaskan resident, who can demonstrate a subsistence use of resources prior to 1980, is eligible for continued subsistence use. As such, they may hunt, fish, and gather within park preserve boundaries. Thus, subsistence use poses a unique and additional problem to the managers of Alaskan parks. One that is complicated by the inclusion of many non-native rural Alaskans as subsistence users.

5. *Innovations.*

a. Interagency Cooperation. It has been a directive of the NPS to develop cooperative arrangements with other agencies charged with the protection of natural resources. Thus, most managers were able to cite examples of their cooperation with other resource staffs. Some of the most effective efforts were seen at Channel Islands, Denali, Glacier, and Everglades National Parks. At Channel Islands Park, seven sailings a year are made to survey the kelp forest. The NPS supplies the boat and core staff, while the other half of the team comes from other agencies. At Denali Park, principal investigators from the NPS, BRD, and United States Forest Service (USFS) have been teamed to report on the physical and chemical characteristics of all waters within the park. This “super project” greatly exceeded the requirements of the individual contracts, and has attracted the attention of the Environmental Protection Agency (EPA). At Glacier Park, international cooperation between Canada, the Blackfoot Indian tribe, U.S. Fish and Wildlife Service (USFWS), USFS, and the NPS is used to manage both Grizzly Bears and Bull Trout populations. And finally, at Everglades Park, a multimillion-dollar effort to clean up Florida Bay, involving a number of Federal, State and County agencies is coordinated by the NPS resource manager. This pooling of efforts to achieve management goals beyond the capability of any single agency, is truly an example of the dedication and competency of the resource staffs in all of these agencies. Such efforts should be encouraged and supported throughout all resource agencies.

b. Team Approach. The interagency approaches described above are similar to examples of team functions found within the NPS resource management staffs. These efforts at team approaches tend to be independent of funding. At Wrangell – St. Elias Park, funded at 17% of its projected NR-MAP level, and at Great Smoky Mountains Park, funded at 82% of its projected level, two excellent examples of team approaches can be found. It is apparently a leadership function that defines the success of such team efforts. At Wrangell – St. Elias Park, the relatively small staff works as a team, not an aggregation of individuals. Goals are set and carried out as a team. The primary goal of this team is to protect the resource, and all efforts are made to accomplish this task with what means are available. At Great Smoky Mountains Park, the team approach extends to a larger staff, and also incorporates Volunteers and SCA members as participants of this team. Whatever the qualities are that define such leadership, they are necessary, if the resource manager is to direct a true team effort to achieve the management goals. Again, this type of innovation tends to be independent of funding!

c. Maintaining Morale. Incredibly, I found that morale issues were also relatively independent of funding. Some of the better-funded parks in a region had lower morale than poorer parks. Morale, in this sense, seems to extend from the ability of the management staffs to see that their efforts to protect resources are paying off. If a staff can see that its efforts are achieving this goal, then morale tends to be high. If they can't see

their efforts as making any substantial contribution to protecting resources, then morale tends to be low. Thus, a relatively well-funded park, with little communication and little inclusion of its members in a team effort can be expected to have the lowest morale. Yet, a relatively poorly-funded park, such as Wrangell – St. Elias Park, can have a very high morale, due to the incorporation of the staff into a true team effort. The individuals must buy into the notion that they are part of a team. This can be accomplished in different ways. Hiring workers subject to furlough would give job security, promotion potential, and health benefits, while hiring term contract researchers would give them an expectancy to be around for at least a few seasons. This allows them to buy into the team concept with some degree of status, and not feel as much like second-class citizens. And finally, these team members must be able to see the results of their efforts. They must know that their dedication and hard work are making progress to some clearly defined goal. They are professionals, and they must feel the efficacy of their profession. Again, accomplishing this team effort and visualized goal is a leadership issue, and is relatively independent of funding.

d. Incredible Expediency. Perhaps the most outstanding effort of expediency that I observed was at Yellowstone National Park. Here, the resource manager became concerned with the status of microbes in the park. Unable to attract much academic interest in this inventory problem, he took a National Science Foundation (NSF) short course on molecular biology techniques to develop Polymerase Chain Reaction (PCR) protocols for the identification of thermophilic bacteria in the hot springs of the park. PCR is the basic technique used by all genetic engineering companies to commercially develop new genetic stocks. The thermally stable enzyme (Taq polymerase) used by these companies to perform the essential task of PCR was initially isolated from Thermis aquaticus, a microbe from Yellowstone's hot springs. Though the NPS missed obtaining a patent for this microbe, future industrial uses of similar species of thermophilic bacteria could prove profitable to the park. Ten other such species of bacteria have since been identified in the park, a remarkable accomplishment.

A year later, he took a second NSF short course to develop protocols for the identification of Brucella abortus in bison. This technique, developed by substituting primers, now allows workers to determine the presence or absence of this bacteria without killing the bison. This identification technique may be instrumental in heading off the bison slaughter that so depleted the herd in 1997, by identifying infected bison and allowing the uninfected ones to pass unharmed. Clearly, this is one resource manager that has demonstrated the remarkable dedication, ingenuity, and competency that one hopes would characterize all others.

Necessity is the mother of innovation. And, resource managers of the NPS have shown a tendency to be innovative. But, there is a limit to how far the shoestring can be stretched. A case in point is the conspicuous rarity of the use of Geographic Information System (GIS) technology by managers. This computer-based spatial analysis tool is used in some parks, but most managers complain that they lack the GIS specialists to employ it. Thus, the NPS, charged to inventory and monitor of all its resources, has generally failed to apply this most expedient state-of-the-art method of inventory analysis.

The most pressing problem, however, defies solution through innovation, and this is the lack of inventory data. The loss of two species of amphibians, the Foothill Yellow-Legged Frog and the Red-Legged Frog from Yosemite, went almost unnoticed by wildlife managers. They had little warning of the frogs' decline and very little data suggesting why these frogs disappeared. So, very little was learned from this episode, and no amount of innovation will substitute for the uncollected field data. Whatever trends marked the decline of these species will remain unknown. Thus, managers are left to speculate why they disappeared, and are unable to gain from this sad experience knowledge that would be useful in heading off the decline of remaining amphibian populations (e.g. The Yosemite Toad).

The NPS cannot rely on expediency alone to perform its basic function of resource management. Neither can "soft money" fix the situation. Support in the form of targeted base funding to perform basic inventories and LTEM is essential. And no amount of ingenuity can substitute for an adequately funded program.

CONCLUSIONS

My survey of the NPS units and management personnel led me to the following conclusions:

1. NPS natural resource staffs are inadequately funded to perform the numerous tasks assigned to their divisions.
2. Inadequate funding of resource management programs characterizes the history of the NPS.
3. The NPS has been slow to address the needs of resource management staffs, which reflects a tradition of neglect.
4. Superintendents have far too much influence over the allocation of funding to resource management programs.
5. The basic charge to adequately perform inventories and long-term ecological monitoring is not being met by the NPS.
6. Inadequate management of resources within the NPS is due to both funding shortfalls and bureaucratic problems.
7. Failure to meet "funding thresholds" prevents managers from assembling adequate staffs to perform basic tasks and projects.
8. Funding shortfalls compel managers to spend too much time competing for limited block-grants.
9. Bureaucratic reorganizations of NPS units have disrupted formerly working partnerships with other agencies.
10. Removal of researchers from the NPS has weakened the ability of managers to collect necessary data for planning purposes.
11. Communication problems, unequal status of temporary workers, and high turnover of staff make management teams ineffective.
12. Crisis management, pragmatism, and a history of deteriorating conditions limit the capabilities of resource managers.
13. Human activities outside of park boundaries consume much management time and impact biological resources of the NPS.
14. The insular nature of NPS units triggers problems of species decline, exotic species invasion, and habitat conversion.
15. Management staffs have shown varying degrees of innovation in attempting to achieve their strategic management goals.

RECOMMENDATIONS

Addressing the resource management problems of the NPS to ensure adequate resource protection will require changing both funding and management procedures. Based on the conclusions of my survey, the following recommendations are made:

1. Determine the basic goals of the resource management staff of each NPS unit. These are already printed in a variety of management directives, and should include both inventory and long-term ecological monitoring.
2. Determine the "funding threshold" necessary to meet the basic goals of NPS units. The NR-MAP method is an approach to this.
3. Allocate resource funds to each NPS unit as a separate category, free from manipulation by superintendents. This targeting of funding will discourage unauthorized redirection of resource funds to other park needs.
4. Periodically audit NPS accounts to determine that targeted resource funds have actually been used to manage resources.
5. Annually review and adjust resource funding, to ensure that it is adequate to achieve the set goals of resource management.
6. Eliminate the NRPP block-grants. "Soft money" is not a solution to the problem of inadequate base budgets. If the budgets are adequate, block-grants are unnecessary.
7. Cluster parks according to region and similarity of composition (i.e. Great Lakes parks, Great Plains parks, Eastern Hardwood parks, Desert parks, Alaskan Coastal parks, Alaskan Interior parks, etc.).
8. Move the BRD out of the USGS and station its researchers in appropriate parks. Increase the size and specialization of the BRD to meet the needs of NPS units within its region. This will give each NPS unit a biological perspective.
9. Address the problems of temporary workers. Convert seasonal positions to "hire subject to furlough" when a permanent needs exists, especially in technical areas. Promote the use of SCA and Volunteer labor. Establish and maintain a team approach to managing resources at the divisional and park level.
10. Promote interagency cooperation to perform basic inventories and surveys required for long-term ecological monitoring and the management of rare and endangered species.

About half of these recommendations will require an increase in funding for the NPS, but effective resource protection would result. The good news is that if this "'stitch in time" is taken, then the original charge to the NPS may be achieved, and our "crown jewels" may survive "unimpaired for the enjoyment of future generations".

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