SCIENCE AND RESOURCES MANAGEMENT IN THE NATIONAL PARK SERVICE

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS

OF THE

COMMITTEE ON RESOURCES
HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTH CONGRESS

FIRST SESSION

ON

RESEARCH OF OUR NATIONAL PARKS TO DETERMINE THEIR CONDITION, TO ADDRESS ANY THREATS TO PARK RESOURCES, AND DETERMINE THE BEST SCIENCE AND RESOURCES MANAGEMENT POSSIBLE

FEBRUARY 27, 1997—WASHINGTON, DC

Serial No. 105–3

Printed for the use of the Committee on Resources

U.S. GOVERNMENT PRINTING OFFICE
39–698 CC WASHINGTON : 1997

COMMITTEE ON RESOURCES

DON YOUNG, Alaska, *Chairman*

W.J. (BILLY) TAUZIN, Louisiana
JAMES V. HANSEN, Utah
JIM SAXTON, New Jersey
ELTON GALLEGLY, California
JOHN J. DUNCAN, Jr., Tennessee
JOEL HEFLEY, Colorado
JOHN T. DOOLITTLE, California
WAYNE T. GILCHREST, Maryland
KEN CALVERT, California
RICHARD W. POMBO, California
BARBARA CUBIN, Wyoming
HELEN CHENOWETH, Idaho
LINDA SMITH, Washington
GEORGE P. RADANOVICH, California
WALTER B. JONES, Jr., North Carolina
WILLIAM M. (MAC) THORNBERRY, Texas
JOHN SHADEGG, Arizona
JOHN E. ENSIGN, Nevada
ROBERT F. SMITH, Oregon
CHRIS CANNON, Utah
KEVIN BRADY, Texas
JOHN PETERSON, Pennsylvania
RICK HILL, Montana
BOB SCHAFFER, Colorado
JIM GIBBONS, Nevada
MICHAEL D. CRAPO, Idaho

GEORGE MILLER, California
EDWARD J. MARKEY, Massachusetts
NICK J. RAHALL II, West Virginia
BRUCE F. VENTO, Minnesota
DALE E. KILDEE, Michigan
PETER A. DeFAZIO, Oregon
ENI F.H. FALEOMAVAEGA, American Samoa
NEIL ABERCROMBIE, Hawaii
SOLOMON P. ORTIZ, Texas
OWEN B. PICKETT, Virginia
FRANK PALLONE, Jr., New Jersey
CALVIN M. DOOLEY, California
CARLOS A. ROMERO-BARCELÓ, Puerto Rico
MAURICE D. HINCHEY, New York
ROBERT A. UNDERWOOD, Guam
SAM FARR, California
PATRICK J. KENNEDY, Rhode Island
ADAM SMITH, Washington
WILLIAM D. DELAHUNT, Massachusetts
CHRIS JOHN, Louisiana
DONNA CHRISTIAN-GREEN, Virgin Islands
NICK LAMPSON, Texas
RON KIND, Wisconsin

LLOYD A. JONES, *Chief of Staff*
ELIZABETH MEGGINSON, *Chief Counsel*
CHRISTINE KENNEDY, *Chief Clerk/Administrator*
JOHN LAWRENCE, *Democratic Staff Director*

SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS

JAMES V. HANSEN, Utah, *Chairman*

ELTON, GALLEGLY, California
JOHN J. DUNCAN, Jr., Tennessee
JOEL HEFLEY, Colorado
WAYNE T. GILCHREST, Maryland
RICHARD W. POMBO, California
HELEN CHENOWETH, Idaho
LINDA SMITH, Washington
GEORGE P. RADANOVICH, California
WALTER B. JONES, Jr., North Carolina
JOHN B. SHADEGG, Arizona
JOHN E. ENSIGN, Nevada
ROBERT F. SMITH, Oregon
RICK HILL, Montana
JIM GIBBONS, Nevada

ENI F.H. FALEOMAVAEGA, American Samoa
EDWARD J. MARKEY, Massachusetts
NICK J. RAHALL II, West Virginia
BRUCE F. VENTO, Minnesota
DALE E. KILDEE, Michigan
FRANK PALLONE, Jr., New Jersey
CARLOS A. ROMERO-BARCELÓ, Puerto Rico
MAURICE D. HINCHEY, New York
ROBERT A. UNDERWOOD, Guam
PATRICK J. KENNEDY, Rhode Island
WILLIAM D. DELAHUNT, Massachusetts
DONNA CHRISTIAN-GREEN, Virgin Islands
RON KIND, Wisconsin

ALLEN FREEMYER, *Counsel*
STEVE HODAPP, *Professional Staff*
LIZ BIRNBAUM, *Democratic Counsel*

CONTENTS

	Page
Hearing held February 27, 1997	1
Statements of Members:	
Christian-Green, Hon. Donna, a U.S. Delegate from Virgin Islands	5
Cubin, Hon. Barbara, a U.S. Representative from Wyoming	36
Faleomavaega, Hon. Eni, a U.S. Delegate from American Samoa	3
Gibbons, Hon. Jim, a U.S. Representative from Nevada	5
Hansen, Hon. James V., a U.S. Representative from Utah, and Chairman, Subcommittee on National Parks and Public Lands	1
Hill, Hon. Rick, a U.S. Representative from Montana	4
Statements of witnesses:	
Boyce, Mark S., Professor, University of Wisconsin	33
Prepared statement	87
Fowler, Cliff, Assistant Director, National Parks Issues, General Accounting Office	6
Hill, Barry T., Associate Director, Energy, Resources & Science Issues, Resources, Community & Economic Development Division, GAO	6
Prepared statement	69
Kay, Charles E., Adjunct Assistant Professor, Utah State University	34
Prepared statement	95
Keigley, Richard B., U.S. Geological Survey	38
Prepared statement	90
Kennedy, Roger G., Director, National Park Service	53
Prepared statement	100
Linn, Robert M., Executive Director, The George Wright Society	21
Prepared statement	85
Policansky, David, Associate Director, National Research Council	20
Prepared statement	83
Pritchard, Paul C., President, National Parks and Conservation Association (prepared statement)	72
Schaefer, Mark, Deputy Assistant Secretary for Water and Science, Department of the Interior	56
Prepared statement	103
Wagner, Frederic H., Associate Dean, Utah State University	39
Prepared statement	92
Additional material supplied:	
DOI:	
Biological Resources Division scientists	59
NPS Budget in constant 1983 dollars	107
Working Relationships Between The National Biological Service and the National Park Service: A Survey of Managers and Scientists	135
Hill, Barry: National Park Units GAO Visited in 1995 and Studied in 1996	105
Kay, Charles: Attachment A—Do livestock or wild ungulates have a greater impact on riparian areas?	108
Pritchard, Paul: Summary of Recommendations	78
Science and Ecosystem Management in the National Parks (review), by W.L. Halvorson and G.E. Davis	129

SCIENCE AND RESOURCES MANAGEMENT IN THE NATIONAL PARK SERVICE

THURSDAY, FEBRUARY 27, 1997

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS, COMMITTEE ON RESOURCES

Washington, DC.

The Subcommittee met, pursuant to call, at 12:05 p.m., in room 1324, Longworth House Office Building, Hon. James V. Hansen (Chairman of the Subcommittee) presiding.

STATEMENT OF HON. JAMES V. HANSEN, A U.S. REPRESENTATIVE FROM UTAH; AND CHAIRMAN, SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS

Mr. HANSEN. I welcome my new ranking member, Eni Faleomavaega, from American Samoa. He is a good man even though he did go to BYU. We will not hold that against him. And we are grateful to have all of you here with us. We welcome you to the first hearing by the National Parks and Public Lands Subcommittee for the 105th Congress. I look forward to another productive, and bipartisan session of the Subcommittee.

While we were able to finish work on a number of important bills pending before the Subcommittee last session, we will have a number of major issues unresolved to work on in the 105th Congress. I only said that because the University of Utah and BYU are rivals and I went to U. of Utah.

I cannot think of a more important task for this Subcommittee than ensuring our natural and cultural heritage, as contained in our parks, is properly managed and protected. In order to accomplish those lofty goals, a strong interdisciplinary program of research is essential. Without research, it is simply impossible to determine the condition of our parks, or to address any threats to park resources.

It is well documented that the National Park Service has never had a strong research program. Over the last three decades, there have been no less than 15 major reports recommending an increased role for research in parks. Authors of several of those reports are here today.

For that reason, most observers were shocked in 1994 when Secretary Babbitt abolished the research function of the National Park Service after his legislative initiative to create a new agency to survey everything which "walks, crawls, flies or swims" blew up on Capitol Hill.

The Secretary moved about $20 million and 168 scientists and technicians from NPS to the new National Biological Survey. Today we will examine the aftermath of that reorganization.

Of course, the research program represents only a small portion of the overall funds available to the National Park Service to carry out its resource stewardship responsibilities. Over the last five years, Congress has appropriated over $900 million to the NPS for resource stewardship. Yet, according to GAO, NPS knows precious little about the resources entrusted to it by the American people.

Only 86 parks have complete lists of animal species, only 11 parks have complete vegetation maps, and not a single major park has a comprehensive resource monitoring program. As a result, NPS cannot determine the health of the parks, can only sporadically address threats to park health, and park managers are not held accountable for the condition of resources they manage.

These problems are not new, and not the sole responsibility of the current Administration. We realize that. But this Administration does not have a responsibility to correct these problems. Instead, the Administration has attempted to undermine the oversight efforts of this Subcommittee. The Administration refused to permit U.S. Biological Research Division employee, Dr. Richard Keigley, to appear as a witness as requested by the Subcommittee.

I believe that his testimony is critical to help members understand the importance of protecting the independent voice of research, as well as ensuring that park superintendents are not empowered to arbitrarily prevent research simply because they fear it may lead to conclusions inconsistent with their park policies. For this reason, the Committee was compelled to subpoena, and pay for the appearance of Dr. Keigley today.

Similarly, the Department's testimony is filled with hyperbole about the wonderful new research agency and how well it supports the research mission of the Interior bureaus. However, the testimony of park superintendents presents a very different picture. In a 1996 survey of park superintendents conducted by the NPS, the vast majority reported that creation of the new agency has hindered their access to science, and that many former NPS scientists have been discouraged from supporting parks they previously worked for.

I ask unanimous consent that this survey be made part of the record. Hearing no objection, so ordered. NPS personnel are also concerned about the overhead of up to 50 percent they will have to pay in order to get research help from the U.S. Geological Survey. For these reasons and others, the NPS is already beginning to backfill research positions vacated by the establishment of the new research program.

The Administration budget request includes $2.5 million to establish cooperative park study units which duplicate the role of USGS field stations in 45 States. One of the primary justifications for establishing this new research agency, avoiding duplication among bureaus, is already being undermined. Over time, I expect that we will see complete duplication, just as the NPS already has established its own water resource division, with substantially duplicates another USGS program.

Finally, I must mention that we have taken an opportunity to read some of the statements that will be presented today. It is not the place in this committee for any witness to take on any other witness. You can have your own opinions. You can say what you want to say. But I have noticed in the statements by a few of you that you are trying to personally attack other witnesses. That is not tolerated in this Committee or any committee around here. And as I head the Ethics Committee, I can tell you that is part of our rule.

And so if you have got that in your report, take it out or you are going to be called on it. I recognize that there is not a consensus among all scientists in regard to Yellowstone Park management. I welcome witnesses to provide evidence in support of their positions but please avoid any personal attacks on one or the other. This is not the arena to do that.

There are many questions here and a great deal of concern on behalf of this Member and most members of the committee. In the coming weeks, I will be seeking to work with others to address these very serious deficiencies of research in the National Park System.

Our witness list is made up of very distinguished people and I want to thank each and every one of you for taking the time and effort to be here, and I know a lot of work has gone into your reports.

Mr. HANSEN. Now I will turn to my ranking Member, the gentleman from American Samoa.

STATEMENT OF HON. ENI FALEOMAVAEGA, A U.S. DELEGATE FROM AMERICAN SAMOA

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. I appreciate your kind comments. The fact that I am a graduate of Brigham Young University, it is interesting to note that the University of Utah now has more Polynesian football players than BYU so you must be doing something better than BYU these days.

Mr. HANSEN. They are all related to you.

Mr. FALEOMAVAEGA. I think we probably export more sumo wrestlers than football players and rugby players probably than any other region of the country. But, Mr. Chairman, let me say at the outset that as the new ranking Democratic Member of the Subcommittee on National Parks and Public Lands, I do look forward to working with you and other members of the Subcommittee here of the 105th Congress.

Today's oversight hearing deals with an important topic. All of us love our national parks and we want to see the best possible care for them. The development and use of science and research are important matters to the management of the National Park System. It does not matter whether the scientific information is developed by the National Park Service, the Biological Research Division, or independent scientists.

What is important is that the National Park Service has available to it scientific information relating to the national parks and makes use of such information in developing and implementing management decisions affecting the National Park System.

As is so often the case different people can draw different conclusions from the same information. I hope we do not get into a debate of one scientific theory versus another. That I do not believe would be very productive. Instead, I do hope that we can focus on the need for the good science of our national parks and the use of that research in the management of our National Park System.

I look forward to hearing from our witnesses this afternoon and certainly welcome the members of our Subcommittee as well. Thank you, Mr. Chairman.

Mr. HANSEN. Thank you. I ask unanimous consent that all members of the committee may be given the opportunity to have an opening statement. Is there objection? Hearing none, the gentleman from Montana, our new member, Mr. Hill.

STATEMENT OF HON. RICK HILL, A U.S. REPRESENTATIVE FROM MONTANA

Mr. RICK HILL. Thank you, Mr. Chairman, and thank you for calling this hearing today on the nature of the current National Park Service science research program. This is an important opportunity to address the very serious problem that has been facing Montana for a very long time. Along the land bordering Yellowstone Park, we are seeing the results of poor scientific research in the form of bison being slaughtered as they attempt to escape an over-grazed Yellowstone Park.

The time is both right for good science and corrective action. Montana has received an undeserved black eye as the result of poor management practices within Yellowstone Park. Based on testimony we will hear today, I believe this committee will reach the conclusion that the bison slaughter is just a symptom of a much larger wildlife management problem within our park system.

It appears that the "let-it-burn policy" that led to the disastrous 1988 Yellowstone fire is now being repeated in the current "let-them-starve policy" regarding wildlife. For over 30 years Yellowstone Park has adopted a philosophy of natural regulation that in effect has resulted in a hands-off policy toward the growth in bison population and of coincident deterioration of our park resources.

This type of voodoo environmentalism has resulted in serious degradation of habitat within the park. It is troubling that an acknowledged expert in this field was not given full support by the Department of Interior in his desire to testify here today. This raises concerns as to whether the Department is interested in truly objective studies within the park.

I want to call on the park director to seek an independent review of the environmental conditions within our parks. I hope this hearing can be the beginning of a more cooperative atmosphere between the Park Service, the States, and the Congress. We need to work together to preserve the environmental beauty of our national parks.

I for one plan to devote as much time and resources as needed to see that the quality of our parks are maintained for all visitors. Mr. Chairman, we cannot leave these national treasures to the whimsy of chance. I look forward to listening to the panel today and trust we will find this effort a new responsible policy. Thank you, Mr. Chairman.

Mr. HANSEN. Thank you. The gentlelady from the Virgin Islands.

STATEMENT OF HON. DONNA CHRISTIAN-GREEN, A U.S. DELEGATE FROM THE VIRGIN ISLANDS

Mrs. CHRISTIAN-GREEN. Good morning, Mr. Chairman. I really do not have an opening statement. I would just like to welcome the witnesses and say how glad I am to have this opportunity to sit on the Subcommittee. With the parks in the Virgin Islands, parks are very important and dear to me and with a science background I know the importance of good solid research in helping us to make the kind of decisions that are necessary for proper management of our parks.

Mr. HANSEN. Thank you very much. The gentlelady from Wyoming.

Mrs. CUBIN. Mr. Chairman, I do not have an opening statement at this time.

Mr. HANSEN. The gentlelady from Oregon.

Mrs. LINDA SMITH. No opening statement, thank you, Mr. Chairman. I am just very interested in hearing the testimony. I found some of the preliminary information quite interesting.

Mr. HANSEN. I apologize for moving you from Washington to Oregon.

Mrs. LINDA SMITH. But I knew where I was from. Thank you. Let us get to the hearing. I am anxious to hear the testimony.

Mr. HANSEN. The gentleman from California, Mr. Radanovich.

Mr. RADANOVICH. No.

Mr. HANSEN.. No opening statement. The gentleman from Nevada, Mr. Gibbons.

STATEMENT OF HON. JIM GIBBONS, A U.S. REPRESENTATIVE FROM NEVADA

Mr. GIBBONS. Thank you, Mr. Chairman. As a freshman colleague at this end of the bench, I know you are glad when it always reaches this end to find that our opening statements are very short. However, I do look forward with a great deal of interest to serving on this committee and hearing the testimony we are about to receive today.

I want to thank you for your interest in bringing this issue forward. As many of you know, Nevada has a great interest in what goes on in this country with regard to our government interest. We have over 87 percent of our land publicly owned land and it drastically affects how we in Nevada conduct our lives.

So we share with Montana and other western States the concerns about how government is managing our public lands and I look forward to hearing the testimony from those people in the audience today. Thank you, Mr. Chairman.

Mr. HANSEN. Thank you. Our first panel is Mr. Barry T. Hill, Associate Director, Energy, Resources & Science Issues, Resources, Community & Economic Development Division, General Accounting Office. Mr. Hill, we welcome you here. We are grateful for your presence. Mr. Hill, may I ask you how much time you need?

Mr. BARRY HILL. Mr. Chairman, with your permission I will submit my formal statement for the record and just briefly summarize my remarks in four or five minutes.

Mr. HANSEN. Four or five minutes, all right. Mr. Hill, you will notice in front of you is a traffic light. When it goes on it is green and you start. When it turns yellow wind up, and if it turns red then you have to wind it up. So we would appreciate it if you would adhere to that.

Now I am going to ask all the witnesses to please adhere to that. Now on the other side of the coin if you have something that just has to be said and you need an additional minute or two, please let me know and I will give you the minute or two. Thank you, Mr. Hill. It is very kind of you to be here. We will turn the time to you, sir.

STATEMENT OF BARRY T. HILL, ASSOCIATE DIRECTOR, ENERGY, RESOURCES & SCIENCE ISSUES, RESOURCES, COMMUNITY & ECONOMIC DEVELOPMENT DIVISION; ACCOMPANIED BY CLIFF FOWLER, ASSISTANT DIRECTOR, NATIONAL PARKS ISSUES, GENERAL ACCOUNTING OFFICE

Mr. BARRY HILL. Thank you, Mr. Chairman, and members of the Subcommittee. It is a pleasure to be here. Before I begin, let me quickly introduce my colleague. With me today is Mr. Cliff Fowler, who is assistant director for national parks issues. Cliff has primarily responsible for much of the work that we will be discussing today in our testimony.

We are pleased to be here today to discuss our views on the National Park Service's knowledge of resource conditions within the park system. My testimony today is based primarily on reports that GAO has issued in response to a variety of resource management concerns raised by this and other Congressional committees over the years.

I will direct my remarks specifically to the following four points. First, sound scientific information about park resources is essential for effective resource management. Second, data on the inventory and current condition of many park resources are insufficient. Third, information on the extent and severity of threats to park resources is also limited. And, fourth, enhancing knowledge about resources will involve difficult choices about funding and management priorities.

Let me start by briefly discussing the importance of sound information on park resources. The Park Service is caretaker of many of the nation's most precious, natural, and cultural resources, ranging from the natural areas of Yellowstone and Yosemite National Parks to the urban areas of Gateway National Recreation Area in New York.

Over the past 30 years more than a dozen major studies of the park system have pointed out the importance of guiding the management of these resources through sound scientific knowledge. The recurring theme of these studies has been that to manage parks effectively managers need baseline data on the current condition of resources and information that allows for the detection and mitigation of threats and damaging changes to resources.

Without these data, the Park Service cannot adequately perform its mission of preserving and protecting these resources. Our work has shown that while acknowledging the importance of such information the Park Service has made only limited progress in develop-

ing it. Frequently, baseline information about natural and cultural resources is incomplete or nonexistent, making it difficult for park managers to have clear knowledge about what condition the resources are in and whether the condition of those resources is deteriorating, improving, or staying the same.

At the same time, many of the parks face significant known threats to their resources. These threats range from air and water pollution to vandalism and the development of nearby land. However, our studies have found that sound scientific information on the extent and severity of these threats and their impact on effective resources is limited, yet preventing or mitigating these threats and their impact is at the core of the Park Service's mission to preserve and protect park resources.

As you mentioned, these concerns are not new to the Park Service and in fact the agency has taken steps to improve the situation. However, because of many competing needs that must be addressed, the Park Service has made relatively limited progress to correct this information deficiency.

Our '95 study found that recent Park Service funding increases have been mainly used to accommodate upgraded compensation for park rangers and to deal with additional park operating requirements such as safety and environmental regulations. In addition, we found that to some extent these funds were used to cope with higher number of park visitors.

Making more substantial progress in improving the knowledge base about resources in the park system will cost money. However, the park system continues to grow with 37 new units having been added since 1985. In addition, the Park Service faces an estimated multi-billion dollar backlog of costs relating to just maintaining existing park infrastructure such as roads, trails, and visitor facilities.

We believe that to improve the knowledge about our national park resources, the Park Service, the Administration, and the Congress will have to make difficult choices involving how national parks are funded and managed. Given today's tight fiscal climate and the unlikelihood of substantially increased Federal appropriations, our work has shown that the choices for addressing these conditions include the following.

One, increasing the amount of financial resources made available to parks are increasing opportunities for parks to generate more revenue; two, limiting or reducing the number of units in the park system; or, three, reducing the level of visitor services. Regardless of which, if any, of these choices is made, without an improvement to the Park Service's ability to collect the data needed to properly inventory park resources and monitor their condition over time, the agency cannot adequately perform its mission of preserving and protecting the resources entrusted to it.

This concludes my statement, Mr. Chairman. I would be more than happy to respond to any questions that you or others members of the Subcommittee may have.

[Statement of Mr. Hill may be found at end of hearing.]

Mr. HANSEN. Thank you very much. We appreciate your statement. The gentleman from American Samoa.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman.

Mr. HANSEN. Just a minute. I want my colleagues to realize on the questions we will recognize you for five minutes and you are going to do the same thing when you see the lights come on. If you would stay within your time, I would appreciate it. The gentleman from American Samoa.

Mr. FALEOMAVAEGA. Thank you. Mr. Hill, you mentioned in your statement that in your best opinion you feel that the Park Service has not adequately addressed those issues that you raised. How do you suppose that the Park Service was not able to fulfill its commitment to those things that you have addressed in your statement?

Mr. BARRY HILL. How was it they were not able to?

Mr. FALEOMAVAEGA. Yes.

Mr. BARRY HILL. Well, the Park Service, I am sure that Mr. Kennedy who will come up here will tell you that it is basically because of the competing demands that they have had to face with the budgets they have been operating under. Over the years the park system has had generally an increase in visitation to some extent.

That is somewhat debatable based on whose numbers you are looking at, but certainly the parks that we audited during our recent studies about two-thirds of the parks that we were at, there was an increase in visitation and along with that increase in visitation comes a rise in costs of operating the parks and maintaining the types of things that the visitors need while they are there.

Mr. FALEOMAVAEGA. So you would agree basically it is not the fault of the Park Service at all, it is the fact that you have limited resources to try to meet the high demands of the number of visitors that have made visitations to our National Park System.

Mr. BARRY HILL. I would say that is a contributing factor. I would not say that the Park Service is totally not without fault. I think our position has been that this is a real problem and this really gets to the essence of the mission of the Park Service to preserve and protect the resource as well as to allow the public to enjoy them.

It is really their responsibility. They have to find a way to manage their budget and to direct enough resources into this area to address the situation. And, quite frankly, with the situation they have it is nothing that they are going to resolve overnight. This will take them some time to do but we would like to see a more concerted effort on their part in terms of focusing and directing staff and financial resources in to getting better scientific information.

Mr. FALEOMAVAEGA. I note in your report that you say there is approximately a $4 billion backlog of costs. Do you suppose that perhaps this $4 billion reporting—in the first place, does the Park Service agree with your assessment that there is approximately a $4 billion backlog of needful appropriations or funds for them in order for them to accomplish their mission?

Mr. BARRY HILL. Let me clarify that. That $4 billion estimate is not ours. That is the Park Service's estimate. We have never done any work that validates or refutes that that is the correct amount. There is no doubt there is a backlog of maintenance but that basically is their estimate.

Mr. FALEOMAVAEGA. Has the GAO made an approximate assessment of the needed funds that the Park Service would need in order to complete its——

Mr. BARRY HILL. We have not made a system wide estimate of the total expenses but I will say based on the work we have done at individual parks, we have seen the problem of backlogged maintenance at those parks.

Mr. FALEOMAVAEGA. OK, the fact that now you have corrected the situation the $4 billion figure that we have was the figure developed by the National Park Service. Has GAO made an assessment or analysis of this $4 billion assessment?

Mr. FOWLER. We have not but we would like to do that work. I think that needs to be looked at.

Mr. FALEOMAVAEGA. How soon do you think GAO might be able to be helpful to this Subcommittee by conducting this analysis or assessment? Well, you know, gentlemen, I am serious, it is very easy for us to be pointing fingers at the Park Service for whatever deficiencies that they may have but it would also be helpful, I am sure, to the members of the Subcommittee if we know whether or not this $4 billion is truly an accurate figure if the Congress is to look forward in authorizing and appropriating more funds for the Park Service to complete its assignment or whatever.

Mr. BARRY HILL. May I interject something here? I think you are raising a legitimate point in terms of the Park Service and the Congress needs to get a handle on just to what extent there is a problem with maintenance. In terms of funds that are available, I might point out that the Congress in the past five years have appropriated funds specifically for the resource information stewardship effort.

So they may have a problem in terms of in their estimation of having sufficient funds to manage their backlog problem but I think it was the intent and the direction of the Congress in authorizing those additional funds that the greater level of effort be directed toward developing the scientific information needed to manage and provide stewardship over the resources.

Mr. FALEOMAVAEGA. Has your recommendation included recommendations to the National Park Service on how to improve its ability to collect scientific data?

Mr. BARRY HILL. The recommendations we made to them back in, I believe it was in our '95 report, focused on the need for them to incorporate into their resource management plans more effort and more attention toward identifying the specific internal and external threats that parks are facing and in turn by using that information to get a better handle on the condition of the resources which would then allow them to better prioritize the limited funds they do have into the areas demanding and requiring the greatest attention.

Mr. FALEOMAVAEGA. Thank you, Mr. Hill and Mr. Chairman, my time is up.

Mr. HANSEN. Thank you. The gentleman from Montana, Mr. Hill.

Mr. RICK HILL. Thank you, Mr. Chairman. I just have one question: in your report you make reference to the lack of a benchmark that would help us determine whether the park is deteriorating or improving.

Would you say that establishing a benchmark should be the priority if we are going to invest additional dollars on research? Is it your judgment that this effort should be a funding priority?

Mr. BARRY HILL. Your question is if additional funds were invested should it go there. I think a greater level of emphasis should be going there. To what extent that would require additional funds and how much that would be, I really cannot address. Our point is that there is not sufficient emphasis going into developing that baseline scientific data and information to really get a good handle on just what threats are being imposed upon the resources at parks, what are the conditions of our natural and cultural resources at the parks, which ones are being threatened, why are they being threatened, and what do we do about preserving and protecting them for future generations.

Mr. RICK HILL. Thank you.

Mr. HANSEN. The gentlelady from the Virgin Islands.

Mrs. CHRISTIAN-GREEN. I have no questions at this time, Mr. Chairman. Thank you.

Mr. HANSEN. The gentlelady from Wyoming, Mrs. Cubin.

Mrs. CUBIN. Thank you, Mr. Chairman. I just have a few brief questions. Over the last seven years, I believe it is, the Congress has increased funding to the National Park Service by 69 percent. Yellowstone's share of that has been about 21 percent approximately.

Did you look in your study at how the funds were allocated to different park entities because some parks got a lot more obviously and usually it is the smaller parks and they need more. You cannot compare on a dollar for dollar basis, I understand that. But I just wondered if you looked at the allocations between the different park units.

Mr. BARRY HILL. We did not look at the relative parks.

Mrs. CUBIN. OK. Due to the good staff work of Subcommittee staff member, Mr. Hodapp, last year, he went to Yellowstone and looked at the books and brought back a study for us and then I went to Yellowstone, met with the superintendent and all of the heads of the different divisions over there and had a lot of questions answered.

I am not making a judgment on this particular issue whether or not the Park Service was right because I discovered that I think if they are not right at least their actions were defensible. And the action I am talking about is we had appropriated money for certain services and the money was not used in the way we had instructed it to be used.

And as I said when I questioned specifically about those issues, I did not agree but they were defensible. It was not my decision to make and so I did not think it was something I could scream about terribly a lot. But do you think that runs rampant through the Park Service, and if you do, do you think the Congress needs to do something about fixing that?

Mr. FOWLER. We run into that quite a bit. The park managers, park superintendents, are given a lot of discretion, intentionally so, by the Park Service on how they spend the money that flows down to the parks. And day to day, week to week they are making prior-

ity decisions on where to best spend that money to meet the goals of the park.

They have a lot of things to balance and it is a tough job. As we have thought about that issue the gap seems to be not that they have a lot of discretion and sometimes do not spend the money where others think perhaps they should spend the money, but more making them accountable for how the money is spent.

What are they doing with the money, what are we as taxpayers getting for the money that they are spending and holding them responsible for that. That is the piece to us that seems to be missing.

I might say on that point a recent congressional initiative as we all know, I think, is the law called the GPRA, Government Performance Results Act. As that proceeds, and the Park Service is now implementing that as other Executive Branch agencies are, that is certainly a tool that will afford the opportunity to address this kind of thing. The nature of that legislation and what it is about is to hold agencies accountable for how the money is spent and more importantly what they are accomplishing with that money.

And in the case of the Park Service it is going to flow down to the park level where most of the action occurs. So there is a tool there and there is potential there and in theory that could work.

Mrs. CUBIN. Thank you, Mr. Chairman, I have nothing further.

Mr. HANSEN. Thank you. The gentleman from Massachusetts.

Mr. DELAHUNT. I have no questions, Mr. Chairman.

Mr. HANSEN. Thank you. The gentlelady from Washington, Mrs. Smith. The gentleman from Michigan, Mr. Kildee.

Mr. KILDEE. I have no questions, Mr. Chairman, thank you.

Mr. HANSEN. The gentleman from California, Mr. Radanovich, has no questions. Oh, I know the next gentleman will have a question. The gentleman from Minnesota, the distinguished gentleman is recognized for five minutes.

Mr. VENTO. I would not want to disappoint you, Mr. Chairman. I have not had a chance to read the entire GAO statement but a lot of the questions being asked by the GAO are based on some of the requests that we had previously made in past Congresses.

I think it is very good a basis to talk about the need for information. The point is, in terms of the discretion of the Park Service, that the individual superintendent I think is a good thing that all of the decisions are being made in Washington as we look at increases.

In the Park Service we have to recognize that some of that is earmarked money for various projects. And so there may be some units that receive more or less. I guess you would have to know what the assessment is. I think that there has been an outstanding request for information with regards to—on the Park Service information regarding the Alaska lands and the vast increase in terms of parks that occurred in Alaska, as an example, in terms of getting baseline data so that the Park Service and Congress could make assessments of the current situation as they move forward.

Now the issues that are raised in places like the Everglades. We have a lot of crisis situations going on in terms of information gathering, don't we, Mr. Hill? We have a lot of crisis funding for infor-

mation going on, for instance, in the Everglades or in the Dry Tortugas or in Alaska?

Mr. BARRY HILL. Yes, there have been a number of special appropriations made to those types of things, yes.

Mr. VENTO. And so that money has, I guess, generally been expended properly to get the baseline data. Do you have a separate—since you are talking about baseline data here and getting information on everything from biological to cultural to the other physical resources that make up these magnificent landscapes, did you come up with any type of a budget or any assessment? What is the Park Service's estimate for dollars they need to bring this information system up to speed?

Mr. FOWLER. I have not seen any such figures, sir. I do not have an estimate.

Mr. VENTO. Is that included in the $4 billion backlog?

Mr. FOWLER. No.

Mr. VENTO. It is not.

Mr. FOWLER. It is separate. That is a separate issue.

Mr. VENTO. The backlog really deals with certain capital projects and so forth, doesn't it?

Mr. FOWLER. It includes a lot of things.

Mr. VENTO. The Director is saying yes. Let the record show the Director is saying yes. In fact, almost half that backlog I think is roads or something.

Mr. FOWLER. I am sorry? Roads, a lot is roads.

Mr. VENTO. Rehabilitation and new construction.

Mr. FOWLER. Right.

Mr. VENTO. So I think it is important for the committee members that went back and worked on this backlog at one time, Mr. Chairman, if you recall, someone suggested it was $7 billion. Part of it is for purchase of in holdings, I know something that is near and dear to our hearts, and filling out and purchasing those lands.

But the information base, have you looked at this since the National Biological Survey or the Biological Research Division was instituted?

Mr. FOWLER. In terms of the impact they have had on this?

Mr. VENTO. Yes.

Mr. FOWLER. We have not.

Mr. VENTO. Because many of the questions raised in your testimony seem to indicate a biological focus which would obviously now be a responsibility that would flow to the Biological Research Division.

Mr. FOWLER. As I understand it, sir, it is the responsibility of the Park Service to do this with the advice and consultation from the people from Biological——

Mr. VENTO. I do not know, maybe they can describe that more fully. I would just make the observation, Mr. Chairman, that I do not know that the witnesses are going to come forth to talk about this, but of the land management agencies, in terms of those committed to science, the Park Service probably had the smallest corps before the Biological Resources Survey or Biological Survey was instituted.

They have the smallest number of individuals. One of the issues here, of course, is in the preservation of landscapes you embrace

a lot of different qualities in terms of fauna, flora, geologic and other features and cultural resources that make up these units.

And the consequences, if you understood it all perfectly in preservation of that entire landscape is you hopefully embrace and protect most of it until you can further understand it. I suppose if we want to allocate a lot of dollars we could probably get—we need that baseline information but how far we go, I guess, is always an open question.

I know you have got other witnesses, Mr. Chairman, and I know the focus today is apparently on Yellowstone which is one of our most magnificent units so let me just yield back the time. Thank you.

Mr. HANSEN. The gentleman from Nevada, Mr. Gibbons.

Mr. GIBBONS. Thank you, Mr. Chairman. I have just a couple of brief questions. I know not all parks have the same attendance. Did you look at attendance at individual parks and the rise or the change in attendance levels at parks when you did your assessment?

Mr. BARRY HILL. Yes. And here again I mentioned earlier I think the visitation figures are much debatable in terms of what figures are being used, what has been happening, but the specific parks we went to, I would say about two-thirds of them were experiencing increases. For example, for eight of the 12 parks we went to during the '95 review eight of the 12 parks experienced increases. The average increase was about 26 percent in those eight parks.

It ranged up to 54 percent of an increase. Individual parks, some individual parks, are showing quite dramatic increases. For example, Mr. Hansen, the Arches National Park has become very popular with an increase of about 130 percent since 1985. So I think what you are finding is there are some very, very popular parks that have experienced some dramatic increases.

Mr. GIBBONS. Of course some new parks are also going to experience a dramatic increase in their visitation simply because they are new to the scene, aren't they? Great Basin National Park in Nevada. That has only been around for what, ten years? As soon as people find out about it the visitation numbers start rising. But not all parks are rising, are they?

Mr. FOWLER. No, sir, they are not.

Mr. GIBBONS. And the other one-third, what about the third we did not talk about?

Mr. FOWLER. The visitation has gone down.

Mr. GIBBONS. It has gone down? So overall across the board in America's park system, has visitation dramatically risen, stayed average, slightly decreased? What is your opinion?

Mr. FOWLER. According to Park Service figures that I have seen most recently it has pretty much stabilized in the last few years.

Mr. GIBBONS. So it has.

Mr. FOWLER. But there is difficulty with that figure and it has been a source of a lot of discussion and the Park Service constantly sort of revises its counting methodology and improves its counting methodology and revises the figures.

Mr. GIBBONS. It counts people who have gone into the park and not come out twice?

Mr. GIBBONS. Maybe, I do not know.

Mr. GIBBONS. When you look at rising population or rising attendance figures of national parks, did you compare the fees assessed for those parks with the needs of the park system based on the demand or the utilization of the park?

Mr. FOWLER. The entrance fees?

Mr. GIBBONS. Yes.

Mr. FOWLER. We had some numbers on those on what it would take, for example, to cover the operating costs of the park in terms of fees.

Mr. GIBBONS. Was there any relationship that you found in terms of the fees, were they adequate to sustain the operation of the park?

Mr. FOWLER. No sir.

Mr. GIBBONS. Is there any fee that would be adequate at this time that America would be settling or would be satisfied with to visit a park?

Mr. BARRY HILL. You would have to ask the Americans that. Certainly the Park Service is now experimenting in 100 parks with increased entrance fees, essentially doubling the fees. Whether that amount that they are charging is too much, not enough, we cannot say, but certainly for the next three years they will be experimenting with increased entrance fees and a portion of those fees would be staying within the park which is certainly different than has been happening in the past and that should really help them, I think, in terms of fulfilling some more of their needs but it will not cover the deficit.

Mr. GIBBONS. Thank you, Mr. Chairman.

Mr. HANSEN. Thank you. Regarding your last question, we are still working on park fee legislation. NPS was given the right to collect fees at a few select parks which they have done. I think it is a healthy step forward. I think we will have to come up with a park fee bill. I think it has got to be. I do not know how else we can avoid that.

Mr. Hill, as I look at your testimony it just seems to come down that they need—the parks need this information and we just do not know the current condition of the parks. That seems to be the problem. We just do not seem to know where they are. And in the current year NPS has been allocated about $200 million for resource stewardship, is that correct?

Mr. BARRY HILL. That is correct.

Mr. HANSEN. And I do not know if Congress has placed any limits on the expenditure of these fund. To me if I may respectfully say so it is a matter of priorities with the Park Service and they really have not made a priority of using it for that area, therefore, they probably do not know the condition of the parks.

Now in relation to the gentleman from Minnesota he talked about the Biological Survey, doing reasearch in lieu of the NPS. Our studies indicate the Park Service is back filling themselves coming up with park people so they would have a better handle on this rather than having the Biological Survey do it. I personally have not seen the Biological Survey be a real successful situation and I think it was better when the National Park Service conducted their own research.

Your testimony, and this is just kind of a statement on my part, but your testimony indicates the national park visitation has increased. Well, this comes right from the Park Service. Here is their own facts on this, their own figures, and you notice that in '88 was the high point, much higher than it is from '89 up through '95.

Mr. BARRY HILL. Mr. Chairman, and correct me, Cliff, if this is not correct, but I believe they made an adjustment to the way they calculate the visitation around that period so it really is difficult to say what the trend has been.

Mr. HANSEN. Would not it be a more correct statement to say that it has kind of flattened out over the last four or five years? Now here is the thing that bothers this committee. We see the amount of money going in increasing but we do not see visitation, I mean the lines do not go together. They do not parallel each other. One stays flat and the other goes up.

On the other hand, as everyone has pointed out, we got some tremendous problems with the park. As the gentleman from Minnesota said, we do have a road problem. We have problems with in holdings. All these thing we have not squared away. A lot of that is the reason for this hearing so we can find out exactly the condition of the parks and where the money really ought to go. Do you agree with that?

Mr. BARRY HILL. I agree with that and I also point out that the work we have done has shown that since '85 there has been a real increase in their operations budget of 52 percent. That is adjusted after inflation. And certainly regardless of what figures you use visitation would not be keeping pace with that rate so I think your assessment in terms of the Congress has been providing additional funds compared to the increase in visitation is a correct one.

Mr. HANSEN. We are concerned about additional funds for the parks so we find ourselves in a situation where Mr. Kennedy, if we wanted to drill him, he could tell us all kind of horror stories and he could be right. It is the idea of using the money smarter, I guess, but we will get into that at another time and probably additional hearings.

I notice that the gentlelady from Idaho has joined us. Does the gentlelady from Idaho have any questions for the witness?

Mrs. CHENOWETH. Thank you, Mr. Chairman, I have no questions.

Mr. HANSEN. Thank you. Thank you, Mr. Hill, gentlemen, we appreciate you being here. Oh, the gentleman from—hand on just a minute. The ranking member has another question.

Mr. FALEOMAVAEGA. I just have one more question. And, Mr. Chairman, I do like to particularly note the presence of our distinguished friend and gentleman from Minnesota certainly having served as the Chairman for the Subcommittee for ten years I certainly trust and have a confidence in his opinion in our operations here of the Subcommittee.

I do want to follow up on a question that was raised by the gentlelady from Wyoming, as well as the gentleman from Minnesota, and that is on the question of whether or not as a matter of public policy and law to continue the authorization of some 350 park superintendents, authorizing them the discretion of basically

how to reprogram or reassess the priorities once the funding is given for the usage of that particular park.

And I would like to ask Mr. Hill if that is still good public policy or do you wish to allow Washington to set the priorities. I think that seems to be one of the basic fundamental problems that some of the members have is that when money is given to that particular park the superintendent turns around and says, no, I have a different set of priorities because the circumstances have changed.

Do you think we should continue to allow that policy to be in force, give discretion to the park superintendents and let us not hassle with it in terms of how he can best utilize the use of those funds for that park?

Mr. BARRY HILL. I will not totally agree with that. I do believe that the park supervisors—we have to allow the park supervisors to manage the parks. They know their park better than anybody. They know what the needs are and what the daily challenges and demands that they face.

What we are concerned about is the lack of accountability in terms of the park supervisor reporting back how he is managing that park, and let me give you an example. The $200 million that has been authorized for the past few—on a yearly basis for the past few years to do the resource stewardship work, when that gets translated down to the park level those funds are intermingled with other park resources. They are not kept separate.

We cannot track just to what extent those resources which the Congress intended to go toward the resource stewardship area, how much of that is actually going there and how much is being used for other demands that the park supervisor is facing on a daily basis. So we would like to see a little more accountability in the process.

I think the Park Service supervisors need to manage the parks but they have to be accountable to how they are managing it and report that back both to the Washington Park Service headquarters, as well as to the Congress.

Mr. FALEOMAVAEGA. Do you think it might be more practical that perhaps by executive order for the Secretary of Interior to do it or do you need legislation from the Congress to do the very thing that you suggest? I mean point well taken.

Mr. BARRY HILL. I think there has been plenty of legislation and Mr. Fowler mentioned earlier the GPRA requirements which will certainly strengthen that, the chief financial officer's requirements that supposedly will strengthen the financial management and accounting systems.

There has been plenty of legislation passed. I think what is needed now is some additional oversight and some attention being directed——

Mr. FALEOMAVAEGA. So in your best opinion we have 350 little kingdoms going around the country without any accountability, neither to the Congress nor to the people. Is that your basic assessment?

Mr. BARRY HILL. I would not call them kingdoms but I would certainly like to see like strength in accountability being exercised throughout the system.

Mr. VENTO. If the gentleman would yield.

Mr. FALEOMAVAEGA. I gladly yield to the gentleman.

Mr. VENTO. Mr. Chairman, with your indulgence I would just suggest that the process of reassessment and levying, taking money back by the Director has not been unknown in the Park Service. Finding a balance between the on-the-ground hands-on superintendent and the role in terms of public policy here is a very big task.

I am certain that whether it is in Minnesota or California or Utah that the superintendent has to have some responsibility on the ground. This balance is one that I would suggest you pay a lot of attention to because it gets into concessions and a lot of other activities.

Furthermore, of course, the issue here is one of collaboration in terms of collecting this data. We have had—this is not the only thing. It was not just the National Biological Survey, now the Biological Resource Division, that had responsibility for a certain sector of science. It is also that the Park Service itself reorganized how they do the science so that they do not have a scientist in the park but they have a cluster of scientists that serve because of the greater degrees required.

And the other aspect was that we passed legislation dealing with the cooperative research program so that the Park Service now is working with universities across the country, including some in Minnesota, and I am sure some in your States. Montana, I am certain, would have a big responsibility with the Forest Service and the Park Service.

And so the whole issue of this data collection and baseline data is a collaborative one with the States. We all get into our fixation about the feds and the confrontation but there is a lot more collaboration here and there probably needs to be even more.

As we know, the Park Service does not manage the fish and game within the State. They do within the parks supposedly but not within the State. That is something the States zealously guard and have done a pretty good job with it. I just wanted to add that. Other than this if you look at these reports a lot of the responsibilities of these parks are not longer de facto. They are cutting right up to the borders of them.

We have got external threats. The reports that the GAO did pointed out that the leading number of threats are external threats to the park. The activities going on, the dams that are being built, the cultivation that is going on, the pesticides that are being used, all of this of course is dramatically impacting the parks.

You need more than simply to do research on it. Of course, the whole supposition here as you get information is that you are going to do something with it. I think that most of us probably have sort of a pause in terms of trans-boundary types of activities in terms of what the parks are going to do with it.

We could all ask for more information but the question is are we going to act on that information. We are going to get it but what are we going to do about it when we get it.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman.

Mr. HANSEN. I appreciate the gentleman's comments. The time of the gentleman is up. Let me point out to the members of the committee that we are going to go out of this room in two hours

and five minutes and we have got three panels ahead of us and we are out and another group is in. It is really warm in here. Take your coats off, it will make you more comfortable. For some reason it is really heated up in Washington today.

Thank you, Mr. Hill, gentlemen. We appreciate so much your being with us. We will ask our next panel: Dr. David Policansky, Associate Director, National Research Council; Mr. Paul C. Pritchard, President, National Parks and Conservation Association; and Dr. Robert M. Linn, Executive Director, The George Wright Society, if you gentlemen would please come up. Paul, if it is OK with you, we will start with you and go across, is that all right?

Mr. PRITCHARD. Yes, sir. Thank you very much.

Mr. HANSEN. Everybody knows the rules. Five minutes. Does anybody have a strong objection to that? Hearing nothing, we will accept the five minutes as the time period. Mr. Pritchard, again thanks for being with us. We will turn the time to you, sir.

STATEMENT OF PAUL C. PRITCHARD, PRESIDENT, NATIONAL PARKS AND CONSERVATION ASSOCIATION

Mr. PRITCHARD. Thank you, Mr. Chairman. Let me begin by saying how much I appreciate the leadership that you and Mr. Vento have long shown on this issue. If the committee and all the people who are here and all of us who have been concerned about this issue are not aware of it, you both have shown a continuing commitment and concern about the need for science, and the National Parks and Conservation Association is aware of that and appreciates this particular role of leadership that you have shown.

I represent 500,000 private citizens. We do not seek, we do not accept government funds. We are a private citizen group that was founded in 1919 to preserve the National Park System and we are proud of that legacy. And one of our original goals in 1919 was to thoroughly study the national parks and to make known to the public the information gained from the national parks.

Mr. Chairman, I would like to submit my testimony for the record and an appendix in detail so I would just summarize that testimony.

Mr. HANSEN. Without objection.

Mr. PRITCHARD. Thank you, sir. Over the past 35 years there have been 15 studies that have been dealing with this issue. Two of them funded by my association largely have dealt with the issue of what we need to properly manage the National Park System. The most important, I think, the most recent one for us was in 1989. The Chair of the Yale School of Forestry, I wish it would have been Brigham Young or one of the more western schools, but Yale was the school renowned in forestry and Dr. John Gordon chaired that.

And in that report which was very well done by a cross section of historians, naturalists, all sorts of talents, they came to a simple conclusion which I would like to suggest to you today is paramount in your deliberation. And that is you cannot manage what you do not understand. The Park Service does not have the capacity today to manage what it does not understand.

That study was followed up by another study which you will hear about in a few minutes, a study which paralleled the recommenda-

tions from the Gordon Commission. In 1996 the Park Service looked at the impact of having transferred its scientists to the National Biological Survey. I would just like to summarize one conclusion from the Park Service's own study.

That conclusion was that managers before the transfer were likely to have interface with scientific information in over 32 percent of the research decisions that they make with the scientific community. Today they have less than 11 percent of an opportunity to have any scientific input into management decisions, a drop from 32 percent to 11 percent in just a matter of a few years, and the details of that study are further pointed out.

Mr. Chairman, we believe that legislation which is outlined on page two of my testimony and in detail would clearly show that this would be beneficial and must be established for the Park Service; that it will help avoid conflict; it will save a great deal of money, now wasted dollars; and that it will give the sense to the public that there is proper management being carried out in the national parks.

I would like to specifically refer you all to that page two because there are six points there which we would suggest, but they basically are highlighted, that we need a scientific mandate, that we need a science management program, that we need to have scientists used for decisionmaking in the Park Service, that the public has a right to know that information, that we need to have a continuing budget.

These are the recommendations that we would make to this committee. And every park that we are talking about here today, you have talked about the Everglades and the death of the Florida Bay. Critical issues needing study. You have talked about your home State and the problems just across the border in Death Valley.

I was there. We have a terrible problem with the water supply and the regime flowing into Death Valley from Nevada. We need to know what is happening there. We need to know in a number of other parks information on clean air. We did a study on the status of global warming. We found that 49 of the 54 units of the National Park System are threatened by global warming.

This study was done by NPCA in cooperation with the Climate Institute. There is no research that we know of that is going on in the Park Service that can clearly help us plan for this very significant and disturbing conclusion that was found by the scientists who worked on this study.

And finally in Yellowstone. Over 1,000 of the bison have died, yet the Park Service's own study, which we understand is coming out, says there is no overpopulation of bison in Yellowstone and yet 1,000 bison have been killed, slaughtered or have died for no logically scientifically based reason. There is no scientific documentation that brucellosis is transferred to cattle in the wild.

We need to know the answers to this and that is what the American people deserve. Mr. Chairman, we believe that there is bipartisan support for this, there is conservation support for this. The academic, the research institutions, the American people would support the leadership of the committee in carrying out this mandate.

Without this, this crisis that exists in the National Park Service will continue because the Park Service cannot manage what it does not understand. Thank you, Mr. Chairman.

[Statement of Mr. Pritchard may be found at end of hearing.]

Mr. HANSEN. Thank you, Mr. Pritchard. Dr. Policansky. I hope I pronounced that right.

Mr. POLICANSKY. Yes, sir.

Mr. HANSEN. We will turn the time to you, sir.

STATEMENT OF DAVID POLICANSKY, ASSOCIATE DIRECTOR, NATIONAL RESEARCH COUNCIL

Mr. POLICANSKY. Chairman Hansen, and members of the Subcommittee. I am David Policansky. I am the Associate Director of the Board on Environmental Studies and Toxicology at the National Research Council. Your name tag gives me way too much credit. And the National Research Council, as you all know, is a private nonprofit organization which is the operating arm of the National Academies of Sciences and Engineering and the Institute of Medicine.

I have testimony on the report that the National Research Council prepared "Science and the National Parks," which was published in 1992. Copies of the report are available to you. I will briefly summarize the testimony and ask that this be put in the record.

Mr. HANSEN. Without objection.

Mr. POLICANSKY. And I would just remind you that the study was done in the early 1990's before many of the researches at the National Park Service were transferred to the National Biological Service. Many people this morning have talked about the need for science and research in the national parks so I will not spend more time on that.

I will tell you that the National Research Committee concluded that there was not a clearly defined science program at the National Park Service. It was combined with the resource management program and other aspects of the management of the parks and so it was not separate. And this lack of a defined science program hampered research planning, tracking of expenditures and accountability for results.

The lack of formal structure and clear NPS leadership also made assessing the program difficult. The National Research Council committee spent much time deliberating on appropriate recommendations, recognizing that so many reports had made recommendations before without any significant changes.

One particular problem was controversial to the committee as it had been in the past and that was the question of whether the leadership of the Park Service's science program should be centralized or decentralized. The committee came down on the side of more centralization because the decentralized approach is often inefficient and because, as Mr. Pritchard has just alluded to in an example of this, many scientific challenges have a broader scope than individual parks or even in the whole NPS individual region.

The committee made three major recommendations. The first was that there be an explicit legislative mandate for a research mission. Others have said this many times and it seems clear that

without it, it is going to be difficult to get an adequate scientific basis in the National Park Service for science.

The committee made this recommendation to eliminate once and for all any ambiguity in the scientific responsibilities of the Park Service. In addition to needing this for understanding the parks themselves, the national parks because of their relative lack of human disturbance and long-term protection provide excellent opportunities for scientific research.

Thus, the committee recommended an approach that included what it called "science for the parks" and "the parks for science." Science for the parks is what a lot of people have been talking about here today, what science do we need to understand and manage the properties in the National Park Service.

The parks for science was using the national parks as wonderful, undisturbed laboratories to answer broader and longer term scientific questions that are puzzling the community and the globe, and our committee felt that this was a very important opportunity that was essential to take advantage of.

The second recommendation was that the science program should have separate funding and reporting autonomy. The Park Service should elevate and give substantial budgetary autonomy to its science program. This should include both research planning and the resources needed to conduct a comprehensive program of both natural and social science research. The program should be led by someone who really understands science.

And the third recommendation was that the credibility and quality control of the science program both need enhancement. To achieve this, the committee recommended that the Park Service elevate and reinvigorate the position of chief scientist. The incumbent should be a scientist of high stature in the scientific community and the sole responsibility of that position should be the administration and leadership of the science program. This should not just be one of many duties of the individual.

The committee also recommended that the Park Service in cooperation with other agencies establish a competitive grants program in order to encourage more external, i.e., non-Park Service scientists to do research in national parks. And, finally, the committee recommended that the Park Service establish a high-level scientific advisory board to provide long-term guidance in planning, evaluating, and setting policy for the science program.

The parks are national treasures. As the report pointed out, pressures on the parks are increasing even if not necessarily visitation. It would be a waste of a unique resource not to use the parks with the proper safeguards to help understand and address the scientific challenges faced throughout the biosphere. Thank you, Mr. Chairman, and members of the Subcommittee.

[Statement of Mr. Policansky may be found at end of hearing.]

Mr. HANSEN. Thank you, Doctor. Dr. Linn.

STATEMENT OF ROBERT M. LINN, EXECUTIVE DIRECTOR, THE GEORGE WRIGHT SOCIETY

Mr. LINN. Thank you, Mr. Chairman. We have already covered the fact, I guess, that the values of parks are outstanding and must be somehow preserved in perpetuity. If we really expect the Park

Service to maintain these values in perpetuity, the Park Service must be given the tools and abilities needed for the job. At a bare minimum, the Service should have the authorization to carry out or obtain research needed for protection in perpetuity of lands and objects and funding needed to do that.

Now one of the subjects I wanted to cover, perpetuitous research, was done in the 1950's and the 1960's in Sequoia National Park. It was proven by several researchers that the putting out of low ground fires in Sequoia National Park would be responsible for the eventual disappearance of the Giant Sequoias and that was just perpetuitous research. I do not know if it had not been done at the time or whether it has been done since.

There are a number of things like that and it is unfortunate. We have been seeing these things in various kinds of words and reports for years. I think it is just simply time we get down to making it work. I sincerely recommend that there be an explicit legislative mandate for the National Park Service to perform or obtain somehow necessary research to carry out its Organic Act mandate, and supplying the National Park Service with sufficient funds to carry out or contract for required research.

And, three, supporting the USGS Biological Resources Division in its important mission of strategic research in cooperative activities with the National Park Service. That is the end of my statement, Mr. Chairman.

[Statement of Mr. Linn may be found at end of hearing.]

Mr. HANSEN. Do you need another minute?

Mr. LINN. Pardon me?

Mr. HANSEN. Did you need some more time?

Mr. LINN. No, I do not. I think everything has been said that I wanted to say.

Mr. HANSEN. Thank you very much. The gentleman from American Samoa. You are recognized for five minutes.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. Mr. Pritchard, I have heard every word you mentioned earlier about the National Park Service cannot manage what it does not understand, and I am sure you have a wealth of experience in dealing with these issues, and I noted in your statement that this has been an ongoing effort on the part of your council and the association.

It seems to give me a sense that the committee has not been listening to your recommendations or am I correct that the committee has taken seriously some of your recommendations and have in effect enacted legislation to accommodate those concerns that the council has advocated for all these years?

Mr. PRITCHARD. Congressman, I would say that we always want more than what we get from the committee. That is the very nature of our business and we understand that. I think the commitment of the committee in the 1980's was to focus on this issue and in particular our call for greater commitment to not the physical capital in the parks, we find these numbers to be elusive, never have been documented, and so we would raise the question to the committee, what is this $4 billion, $5 billion. We have no idea what it is.

What we are concerned, sir, is for the intellectual capital of the National Park System. The scientists, the interpreters, the re-

source managers, that is the crisis in the national parks. And we would suggest that unless there is a health and safety issue that this Congress not spend one more dollar on the infrastructure of the National Park System until you have the proper science and until you have the talent in there, the three fields that the Park Service represent. We feel very strongly about that and we think that would lead to good public policy.

Mr. FALEOMAVAEGA. So it is your honest opinion on behalf of the 500,000 citizens, good citizens of our country that represents the council that the scientists, if we have any in the national parks, you are seriously questioning the fact that they can adequately do the job that you are suggesting here?

Mr. PRITCHARD. Yes, sir, I do—I am sorry.

Mr. FALEOMAVAEGA. You are suggesting that the NPS just does not have the scientific caliber that you feel they ought to have to provide the scientific data that the Park Service seriously needs in order to carry out its functions.

Mr. PRITCHARD. Yes, sir. What happened, I think, was a move in the right direction after the Gordon Commission and the National Research Council's report, and the Park Service began to build a scientific staff. When the Park Service staff were transferred to the National Biological Survey we saw the end of a fledgling program that really had never existed since George Wright tried to make it happen back in the 1930's.

We would argue that it is time to carry out this legislative mandate that all three of us have called for and decreed a clear mandate that no decision be made in the Park Service without well-documented science.

Mr. FALEOMAVAEGA. You are also suggesting that the Congress should establish an independent research division or arm within the National Park Service? I am not clear on your suggestion here. Independent in the sense that it should be on its own and not be subject to any supervision or administration of the Park Service or what do you suggest?

Mr. PRITCHARD. No, sir. Our recommendation is that you have the chief scientist which you had in the past and that that scientist report directly to the Director of the National Park Service, and that that person be accountable in an annual report which I referred to in my testimony on how well the Park Service is using science to make the decisions so that you, the members of the committee, know that these dollars are being properly invested.

Mr. FALEOMAVAEGA. How do we go about in the selection process that you know that these scientists are not only of the caliber of their expertise but are not taken or prejudiced by the politicians or even by the bureaucrats, to suggest that these people are simply going to do the instructions or, you know, the kind of pressure that says, hey, I want you to bend this way.

It is just like a computer, garbage in and garbage out. I am not suggesting our scientists are a bunch of garbage but I am suggesting how would you go about selecting a panel of scientific persons that the Congress as well as the Administration can feel comfortable that they truly will work and act as an independent group giving objective and truthful scientific information and data that is needed?

Mr. PRITCHARD. It is a crucial question you ask. We recommend several solutions. First of all, another part of the problem—I spoke with the Dean of one of the prominent research park study programs in the country. He said you also have to worry about today calcification just of knowledge, that many scientists you might hire are not going to be able to keep up on things.

I believe the universities can offer tremendous asset. I believe they should be engaged. I believe also the private sector should be. It must be an advisory council that oversees this process. And, finally, I think that we should have an annual report and all those decisions that are made should be well documented before they are made.

I think the problems we have at Yellowstone today are because we have not had that process in place so I am in full agreement with the direction of your questions and I hope I have given you some thoughts on how we would resolve it.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman.

Mr. HANSEN. Thank you. The gentleman from Montana.

Mr. RICK HILL. Thank you, Mr. Chairman. Mr. Policansky.

Mr. POLICANSKY. Yes, sir.

Mr. RICK HILL. You made some reference to Yellowstone Park in your testimony and in your answer, and I would just like to probe that whole area a little more since I represent Montana. In your testimony you make reference, and in fact the statements says one-third of Yellowstone National Park's buffalo have been sacrificed because the National Park Service, the U.S. Department of Agriculture and the State of Montana——

Mr. POLICANSKY. Excuse me, sir. I think that you are confusing my testimony with somebody else's.

Mr. RICK HILL. I am sorry. Mr. Pritchard. I apologize.

Mr. POLICANSKY. I would be happy to have him answer though.

Mr. RICK HILL. I apologize. Well, refused to base the management on facts. I will finish my question. What facts have the National Park Service and the State of Montana refused to recognize in your opinion?

Mr. PRITCHARD. Sir, you are asking me that question. A number of facts. First of all, we have no winter use plan. The governor has called for it. We believe there should be a winter use plan. I think that is a very important missing link. Secondly, I think the relationship of the bison and the snow grooming and the trails are a very important issue that has not been fully understood, and that is what is causing a lot of the conflict with the private property owners.

Thirdly, the whole scientific issue which is not the Park Service's responsibility, the APHIS issue though is one that must be looked at. I think this is a very confused and nonscientific slaughter that is occurring today, sir, and I think it is a disgrace. So I would be happy to go on but those are the key facts.

Mr. RICK HILL. Yesterday Mary Meagher, who has studied the bison for 38 years, basically said that what has occurred will ensure the herds' future. The drop in numbers exactly is what the system needs, she said. About half of Yellowstone's bison herd has been decimated so far. There is no cause for any fear of immediate extinction of the animals.

And she went on to basically support the fact that the bison herd needs to be managed to a level of less than 2,000. Would you agree with her comments or disagree with those comments?

Mr. PRITCHARD. Dr. Meagher and I have talked several weekends in a row. I find her opinion very important. I think it is a shame that she is not able to be more involved in the day to day management decisions. I am not a scientist. I am not going to suggest to you that her opinion is right or wrong. I think there are other scientific opinions.

For example, the interior herd has not been studied and the death right there is phenomenal. We have no idea what is causing it and we have no way of solving the problem. The assumption, Congressman, that we can leave nature to itself to manage itself today is foolhardy. I think we all realize that mankind has had such significant intrusion in the natural parks that we need to have more science and that is simply all we are asking for.

But one scientist does not make a valid decision or opinion. And what has happened is we have far exceeded the level of death of that herd that she even agreed to so even within those numbers we are still going to see that number drop well below the 2,000 level.

Mr. RICK HILL. Thank you, Mr. Chairman.

Ms. CHRISTIAN-GREEN. Thank you, Mr. Chairman. I do not have a question but I want to thank the witnesses for their testimony. I commend all of you for your steadfastness to a mission and for coming in today to reiterate recommendations that have been made time and time again.

And I would like to highlight the fact that in your report, Mr. Pritchard, you point out 15 recommendations that were made in 1988 and repeated in 1992. And of those 15 recommendations three had some action. One actually became worse, and 11 of those 15 no action was taken and I hope that we can change that with this Subcommittee.

Mr. PRITCHARD. May I respond, Doctor? Well, first of all, let me—I am very pleased, may I say that you have an excellent opportunity in the Virgin Islands, some of the most leading researchers in the whole issue of the very important park system you have there. And I hope that we can get them the resources to properly not only learn from the Virgin Islands but also transfer that to the other islands.

And I am glad that you are part of this committee especially with your personal background in this area. So thank you for being so attentive to that issue.

Ms. CHRISTIAN-GREEN. Thank you.

Mr. POLICANSKY. May I make a brief response? I would just like to point out, and thank you for your comments, that in the Natural Research Council's report it identified several researchers at the National Park Service that are considered to be outstanding national class researchers.

And so based on the way the Park Service was in 1992 certainly there was a nucleus to be built on. It did point out that the Park Service had a smaller proportion of its staff in research than other land management agencies, only being about 2 percent compared

with about 8 or 9 or 10 percent for others. But it was not that there were not outstanding individuals in the Park Service. There were.

Mr. HANSEN. The gentlelady from Wyoming.

Mrs. CUBIN. Thank you, Mr. Chairman. I am going to address Mr. Pritchard first. I represent the State of Wyoming. We have, as you know, about 90 percent of Yellowstone National Park in our State. And I want you to know that I agree with you, with all three of you, much, much more than I disagree with you. But there are a few points that I would like to clarify.

You stated earlier that the National Park Service manages the wildlife within the park while the States manage the wildlife outside the park. Now where did you get that information, and the only reason I am asking that is because in Yellowstone the management of the bison has been called natural regulation which is nothing more than letting nature taking its course.

And while I think it appeared from your testimony you thought that or think that the brucellosis problem is the only one that comes into play with those bison leaving the park, I would submit that there is a lot bigger problem than that and that is overpopulation. And I do not know if you have ever seen a starving animal but I have seen those buffalo and they are starving. They have been starving for months.

And there just is not enough resource there to sustain that many buffalo, that many bison, in the park. So I just wondered if that was in statute or what, where you came up with that that the National Park Service manages all of the wildlife within the park, and would you consider natural regulation managing wildlife?

Mr. PRITCHARD. If I may, I would like to go to the second question first. I do not believe natural regulation makes sense today and so I agree and I think we have terrible problems that we have not even addressed with the elk and truly probably, I am not a scientist, but I assume with overpopulation. And I think that is an issue which I would like to see the Park Service look quickly at.

Regarding the bison themselves, the Park Service has done some research. I hope it will be divulged today but their feelings are that the bison are not overpopulating the resource. That is what we have been told. We look forward to seeing that study so you may wish to ask the Park Service and possibly I was told incorrectly.

Regarding the issue of who manages wildlife in the national parks, of course it depends on the legislation that the Congress passes. In many park units it is in fact the State wildlife agency that does, for example, in Alaska. We believe the Park Service should be responsible for it and Yellowstone is responsible for the wildlife there.

But I think the Chairman's introductory comments were very important and that is the lack of real understanding of the wildlife regimes, the ecosystems, the lack of monitoring that information in the National Park System. And so really what it comes down to is the opinion of those who are in the park and I think that is an unfortunate assumption based upon that natural regulation which was based upon a commission many years ago that that was the way it was best to leave them be. I do not believe we can go forward with that theory.

Let me also commend Wyoming. I think your approach to brucellosis makes a lot of sense. As a cattle rancher myself having grown up in that family knowing some, Bill Resor, and others in the Jackson area, I have talked to them also, Wyoming has a logical approach.

I wish that APHIS would recognize that in Montana also. I think we could have solved this problem. And we as an association even offered to pay for the inoculation in Montana, so we have been trying to find solutions.

Mrs CUBIN. Unfortunately, I do not know if you are aware, the State of Alabama put a quarantine on any cattle from Wyoming today or the announcement was today, which is kind of ironic when Wyoming is brucellosis free and Alabama is not brucellosis free, but they have not accepted or given credit to the efforts that we have made in inoculating the elk and our program has proven that it really does work.

Mr. PRITCHARD. May I just add, I think that that points out what I said earlier and that is that I think the Yellowstone brucellosis issue is one of the most confusing unscientific actions that has ever been perpetrated on the wildlife in the national parks and on the American people and I think it is a shame.

Mrs. CUBIN. Well, I have to take up for the State of Montana here because the State of Montana is caught right in the middle of two Federal agencies and on the one hand, well, they are damned if they do and they are damned if they do not. And I am anxious to—I hope I am here when the superintendent of the Park Service comes up because I feel a great responsibility for those 1,000 bison that have been killed but I understand that we have to respect private property rights and that when you are caught between two agencies of the Federal Government you are just in a real tough situation. And I hope that the Park Service can feel some sense of responsibility about that too. Thank you.

Mr. HANSEN. The gentleman from Massachusetts.

Mr. DELAHUNT. Thank you, Mr. Chairman. And just briefly I would provide some geographical balance here. It is interesting to hear about Yellowstone and the issues of the bison. However, I would be interested, and I direct this to Mr. Pritchard and other members of the panel, in terms of the science and resource management as it relates to our national parks, would you or any of you, for that matter, have any observations or comments how it relates to parks such as the National Seashore Park on Cape Cod and in terms of our new initiative back in Massachusetts, the Boston Harbor Islands initiative.

Mr. POLICANSKY. Mr. Delahunt, our report mentions the Cape Cod National Seashore as an example where science was successful at helping bring a reasonable resolution to the question of off-road vehicles, protection of beaches, and other such examples, and that is an example that I think the Park Service should be pleased with.

There are other examples both of successful application of science and areas where more science is needed in the east. But, as you know, sir, most of the properties in terms of the land area are in the west so the number and scale of problems are larger in the west for that reason.

Mr. PRITCHARD. May I add, sir, that one of our recommendations is the tremendous need for more science regarding cultural resources which of course is the backbone of all the parks nationwide, every park. Cape Krustenstern on the western shore of Alaska all the way to the great seashores and all the historic sites to the Virgin Islands and Salt River Bay. The whole system, there is very little knowledge about the cultural resources.

It was not until Mr. Vento and the committee several years ago called this in the case of the Park Service that we finally had an inventory of—just a basic inventory of—the cultural resources in the National Park System. That has been done in the last ten years. Before that, you could literally walk into a building across the street, the U.S. train station when it was under the Park Service, and walk into rooms that were not locked and pick up artifacts from Abraham Lincoln.

This is woefully and inadequately a crying need in the National Park System. It begins with inventories and it begins with dealing with cultural resources as much as it does natural resources.

Mr. DELAHUNT. In my own experience with the National Seashore, the National Park Service has done an extremely good job of identifying historic and cultural artifacts and points of interest in terms of at least that particular entity.

Mr. POLICANSKY. Let me just mention another example, if I may, sir. The Cape Hatteras National Seashore, the Cape Hatteras lighthouse, was and is facing risk from being washed into the sea and you from Massachusetts are familiar with that with the older lighthouses, particularly Great Point on Nantucket.

The Park Service did what I think it should have done. It sought scientific advice, actually came to the National Research Council, and we recommended that the lighthouse be moved. Now that hasn't happened. I am not convinced that that was the Park Service's fault, but at least there is another example where they did use science in identifying both the natural and the cultural resources and how to manage them.

Mr. DELAHUNT. I think that also happened twice on Cape Cod in terms of Nauset Light and Highland Light.

Mr. POLICANSKY. Highland Light was moved. Cape Poge was moved. Many of them up there.

Mr. DELAHUNT. Very good. Thank you.

Mr. HANSEN. The lady from Idaho.

Mrs. CHENOWETH. Thank you, Mr. Chairman. I join the lady from Wyoming. I appreciate your statements. I do have some questions though that appear to be—well, I think maybe I just better ask because I need more information. Mr. Pritchard, in your testimony you talk about the cultural resources in the southwest portion of our country being damaged by the Park Service and so therefore we need more science and an investigation into this. What has the damage been?

Mr. PRITCHARD. I am sorry if my testimony suggested there has been damage by the Park Service. I certainly did not mean to say that. What has happened is the damage has occurred by the lack of the money, the funds to do the research to understand the proper mortar, to do the maintenance on those structures, and the Park Service has initiated a program in that area to deal with those.

Those cultural resources depend on having a year round staff of technicians who largely come from the pueblos and the communities and many of them are retiring or leaving the Park Service. And so this is a good example and a good question that you ask because the need is to train the next generation of individuals who will maintain those structures, who will understand the very delicate nature of those structures, will use the right implements, the tools, the mortar, all those various items.

It is a very fine art and one in which the Park Service cannot skip a generation. It must continue to have that knowledge. And without that it will be lost forever.

Mrs. CHENOWETH. You may want to make a correction for the record to your testimony. It is on page nine. But specifically what has been the damage that has occurred to these prehistoric places?

Mr. PRITCHARD. Well, this is—may I ask just for a second?

Mrs. CHENOWETH. Is this on my time, Mr. Chairman?

Mr. PRITCHARD. Fortunately for me I have a very competent staff and they suggest that in fact there is no need for us to amend our testimony, that in fact in the excavation of the archaeological resources there was damage done, that the damages that were done were in part felt to have been done because of improper excavation procedures. And so that is the reason why the term "damage" is referred to here.

Mrs. CHENOWETH. By the Park Service, right? The Park Service did the excavation?

Mr. PRITCHARD. Yes. In some cases these are done by contractors working for the Park Service under supervision of the Park Service. I would say this is a minor—as far as I am aware in my 25 years of working with the Park Service, I think the issue is one which as I said before the Park Service is very concerned about the preservation of the vanishing treasures. The excavation is a major problem because of the lack of tutorial facilities for the restoration and the maintenance of that.

Mrs. CHENOWETH. And was this just one incident with regard to excavation?

Mr. PRITCHARD. We would be happy to come back to you with documentation on other incidents.

Mrs. CHENOWETH. Would you. Also on page nine of your testimony you talk about the fact that the basic research on areas in Death Valley with regards to the area's hydrology has not been done and if landowners and park lovers are at odds over the allocation of water in the area that there is little that we can do to resolve the conflict unless we have more baseline information.

Does not the Department of Water Resources in California have very well-qualified hydrologists who have studied the groundwater if there is much in California, and in Death Valley how many adjacent landowners live in Death Valley to compete for the scarce resource, the water? How much development is going on in Death Valley?

Mr. PRITCHARD. It is a very good question. There is no development in Death Valley. Of course, it is a park that straddles the State line. The water issue is largely to the northwest of Las Vegas and a very important aquifer that is being sought for water for the tremendous growth that is threatening in the Las Vegas area.

And there are native communities that are making claims for that water into those areas. I visited that area, met with the Park Service scientists, and there is grave concern about the aquifer which is largely in Nevada as it flows into California. That is the assumption. Again, that is not well documented, but it is needed to keep replenishing those areas of endangered species, especially the pup fish and the other plants and animals that are in that area.

Mrs. CHENOWETH. In Death Valley?

Mr. PRITCHARD. In Death Valley, yes, ma'am. The water coming from Nevada into Death Valley.

Mrs. CHENOWETH. And then also you talk about the recent informal review conducted by the NPCA has shown that 49 of our 54 national parks could lose their most significant features to global climate change and you say this is due to global warming. I think that—I see my red light but I think that in the art of forming words to get ideas across that the overstatement is something that we need to worry about.

I share with you the concern that we make good decisions based on good science but there is so much conflict about whether there really is global warming or not and to base an allocation of a large amount of money on the fact that 49 of our 54 national parks may lose their most significant features sometimes may appear to be an overstatement. It does to me, sir.

And I do want to work with you. I want to learn from you what you know because you have spent so many years working with the national parks and your association is very dedicated. But one of your organizations that you—one of the grass roots organizations in Yellowstone called Yellowstone Park Watchers' Network. Are you familiar with that?

Mr. PRICHARD. Yes, ma'am, I am.

Mrs. CHENOWETH. Well, in their most recent newsletter they state that Yellowstone is facing some of the greatest threats ever to its world famous geothermal wonders including Old Faithful that are vulnerable to development and we do want to study that.

But they also go on to say that in the winter the air is so polluted by snowmobilers that park rangers have to wear gas masks and that is in their own newsletter. And it is just not true unless Mr. Kennedy has some testimony to shed some light on it.

Mr. HANSEN. Do you want to briefly respond? We will have to go on.

Mr. PRITCHARD. I think that is exactly what we are talking about is that we need to have scientific information. The study you refer to on global warming which we stand by was done in cooperation with a very prestigious group, Climate Institute, and we would be happy to share that, but we would ask the Park Service to begin monitoring to see the impacts of global warming.

And regarding the water use plan as we were talking about before, and I think the governor of Montana and I are in full agreement that there needs to be a winter use plan and until we see that but there are pollution problems there in other parks and they are very serious. So I welcome the opportunity to work with you and I appreciate your questions and I think they are appropriate ones that we will respond to.

Mr. HANSEN. The gentleman from Minnesota.

Mr. VENTO. Thank you. The air pollution problems in parks, of course we have held hearings on ozone damage in Yosemite Valley and so I do not know if there is any relationship between geothermal air quality in combination with the exhaust of snowmobiles but there are a lot of other problems, I can tell you that.

One of the basic mandates of the Park Service is to do research science. If you look at the Organic Act they are supposed to. I think the issue is how far can they do it in terms of the cutting edge. I think it should be clear to all of us that we are going to march forward with the other planning and management agencies who hold knowledge on how we can best facilitate that process and then use the information.

And we have here a pretty distinguished scientist from Wisconsin at Superior. I was a student incidentally of Dr. Lasko at River Falls, one of your other ecologists from Wisconsin in the State university system so we are very pleased. The testimony that you have, I would just direct my colleagues' attention to that on their table from pages three through four and five. I am sure you will find it a lot more exhaustive than his brief statement that Dr. Linn made.

He of course invites us to utilize the science of ecology. We have for about the last three or four years run into major battles over something called ecosystem management. And that is going to continue because we are not just dealing with the fauna and flora, the biological aspects of it, but I think the many other physical aspects of what takes place.

We have been asking questions about that. I suppose if we put it under the umbrellas of ecosystem management or eco setting ecology that that causes problems for some of us. But his testimony really comes before the next panel and anticipates some of it. And since there is a focus on Yellowstone, I guess one of the purposes today is to take an example of how it is working, although I think that the issue with regard to the southwest is good within the Park Service.

We understand when you take a building and expose it to the air quality and other problems of 1997 you do end up with problems. You are better off leaving them encased unless you are going to use them for interpretation. In any case, he goes on to point out, and I just want to give you an opportunity, Dr. Linn, to explain that telling that science in the 60's is not appropriate as it applies to the 1990's with regard to how we manage the populations of bison, elk, bear, and reintroduction of the wolf.

And so he points out three factors that are criticized, that is, the vegetative modification by the various populations in Yellowstone, principally bison and elk, the brucellosis problem which he refers to that the preposterous uniform methods of rules under United States Department of Agriculture, APHIS, plus he goes on to point out the full nature—the issue of historically what man did in Yellowstone.

So, Dr. Linn, I would like to give you a minute or so to amplify what I have outlined here with regards to the Yellowstone management and the concept of the necessity to call.

Mr. LINN. If I recall, I hired Mary Meagher, Dr. Mary Meagher, who I regard as an extremely careful and honest scientist. In the 1960's the same brucellosis scare existed in Montana and it was proven by Mary Meagher and one other scientist in the Yellowstone area at the time that brucellosis can be carried by elk or deer or even flies.

But whether it ever takes or not in cattle is another question. I do not think there has been very much proven that it does so that is my experience with the brucellosis thing.

Mr. VENTO. Well, I appreciate your comments, the written comments, that you have made with regard to vegetation and with regard to that modification of vegetation and historic activity based on paling the logical evidence with regard to pollen studies for mud flies. It gets into a lot of details.

But I think what this points out is that we need a broader based science. We need to use the information and accept it. I am pleased, Dr. Linn, that you follow in the footsteps of many other from Wisconsin from Sand County and other environs in Wisconsin, a guy by the name of Leopold. And I am very pleased to have that association with the system as an undergraduate and graduate student and to have your testimony today. I think it will be very useful to us in trying to deal with the other testimony today. Thank you.

Mr. HANSEN. Thank you. The gentleman from Nevada.

Mr. GIBBONS. Thank you, Mr. Chairman. I did have some issues with regard to Mr. Pritchard's comments about the hydrologic studies under the State of Nevada. However, in view of the time and the effort of us to move this hearing along, I am going to defer that and possibly personally talk to him later, but I will yield back my time on this to you, Mr. Chairman.

Mr. HANSEN. Thank you. Let me point out that we are halfway through the testimony and we are more than halfway through the time. Let me just ask Paul Pritchard one quick one if I may, a quick answer. Do you believe that the research function should be returned to the National Park Service or do you think it ought to be left with USGS?

Mr. PRITCHARD. Returned to the Park Service, sir.

Mr. HANSEN. Thank you. I like good short answers and appreciate that very much. And thank you panel for being with us. It is very kind of all three of you to be here. We will excuse you and ask the next panel to come up.

Mr. PRITCHARD. Thank you, Mr. Chairman.

Mr. HANSEN. Dr. Mark Boyce, Professor, University of Wisconsin; Dr. Charles Kay, Utah State University; Dr. Richard B. Keigley, United State Geological Survey; and Dr. Frederic H. Wagner, Utah State University. If you would come forward. I am going to take you in the order that I called your name, is that all right. So first is Dr. Boyce, then Dr. Kay, Dr. Keigley, and Dr. Wagner.

OK, you all know the rules. There is the thing in front of you there. I would appreciate it if you would follow it. Dr. Boyce, are you ready to go?

STATEMENT OF MARK BOYCE, PROFESSOR, UNIVERSITY OF WISCONSIN

Mr. BOYCE. Mr. Chairman, members of the committee, thank you for inviting me to comment on the important issue of——

Mr. HANSEN. For some reason we do not hear that mike as well as others. Can you pull that up a little closer? It is like if you used to be a pilot. They used to tell you to kiss the microphone.

Mr. BOYCE. Is this better? Mr. Chairman, members of the committee, thank you for inviting me to comment on the important issue of science in our national parks. My name is Mark Boyce. I have been conducting ecological research on large mammals in the greater Yellowstone area for 20 years.

I am currently editor-in-chief of the Journal of Wildlife Management, and I am on the faculty of the University of Wisconsin, Steven's Point. I have had experience working for the Park Service as well as independently in the greater Yellowstone area.

For four years I was Director of the University of Wyoming-National Park Service Research Center where I was responsible for administering competitive research contracts in the Rocky Mountain region. We solicited proposals from scientists for topics selected by park resource managers. I am an advocate for science in our national parks. I am glad to support the objective of this hearing for a new science initiative in the National Park Service.

At the same time I would not want my comments to detract from the Biological Resources Division of USGS. Reducing redundancy and increasing efficiency through the establishment of the Biological Resources Division really made sense, and the BRD needs your support.

I like Mark Schaefer's idea of a system of ecosystem science centers. I like the idea of a National Park Service research mandate. If such direction were given by Congress I would encourage the use of a peer reviewed competition to insure good science. Prioritizing projects for research should involve park management, and I believe most scientists would agree that the National Science Foundation model for funding research insures rigor and solid methods.

Yellowstone is not bankrupt. The northern range is not overgrazed. I do not know if there are too many elk in Yellowstone National Park but I would prefer to let the wolves determine if there are too many elk in Yellowstone National Park. Park research is not bankrupt. As evidence I would cite the vast body of scientific peer-reviewed literature that has appeared in the last five years, largely funded by congressionally mandated studies on overgrazing, fire research, and in anticipation of wolf recovery.

I generally support the National Park Service resource management policy which I call ecological-process management allowing natural ecological processes of predation, fire, herbivory, nutrient cycling, births and deaths to function with minimal human intervention. I believe that the National Park Service needs good science for solid management but perhaps even more importantly science needs parks.

Let me reinforce this last point. Good science is paramount to insuring sound management in our national parks but the opposite is true as well. How our parks are managed influences the ecologist's ability to do good science. Scientists need parks as controls

to perform the basis for evaluating what we do with the rest of the world. We should encourage the National Park Service to continue with its policy of managing to minimize the influence of humans on ecological process and function.

Thank you, Mr. Chairman, and members of the committee for the opportunity to share my views on science in the National Park Service. I will be happy to answer any questions.

[Statement of Dr. Mark S. Boyce may be found at end of hearing.]

Mr. HANSEN. Thank you very much. Dr. Kay.

STATEMENT OF CHARLES E. KAY, ADJUNCT ASSISTANT PROFESSOR, UTAH STATE UNIVERSITY

Mr. KAY. Yes, I will need approximately seven minutes. Steve Hodapp wanted me to include some additional material in my oral testimony. First, I would like to thank the Chairman and the committee for inviting me to testify today. I will only summarize what I have already presented in my written testimony.

Mr. HANSEN. We will give you seven minutes.

Mr. KAY. OK. I have a Ph.D. in wildlife ecology and I am presently an Adjunct Assistant Professor in the Department of Political Science at Utah State University. I am the only independent, independently funded scientist to have conducted a detailed evaluation of Yellowstone's "natural regulation" management program. I have also conducted extensive ecological research in the southern Canadian Rockies for Parks Canada.

As you know, Yellowstone is presently managed under what is termed "natural regulation." This, though, is more than simply letting nature take its course for it entails a specific view of how nature operates. According to the Park Service, ungulate populations will self regulate without overgrazing the range. Predation is not important.

The Park Service is fond of saying that it has $3 million of research that supports "natural regulation." Unfortunately, most of those studies have not directly tested "natural regulation" and have largely been a waste of taxpayer's money. Furthermore, the Park Service has refused to fund research that may prove "natural regulation" wrong and they have generally awarded contracts only to people who produce results that support agency management.

In the rare circumstance where a contractor has produced a report critical of park management, he has never received additional funding and his credibility has been personally attacked by the agency. In the equally rare circumstance where a Park Service employee has dared challenge established agency dogma, they have been reassigned, force-transferred, or suffered disciplinary action. The next witness will address this latter point.

Having admitted to spending at least $3 million of taxpayer's money on research in Yellowstone, you would think the Park Service would have a detailed study plan of how all that work was designed to formally test "natural regulation." That, though, turns out not to be the case.

In 1989, for instance, the Department of Interior's Inspector General conducted an audit of research in Yellowstone and three other national parks. The Inspector General found that Yellowstone Na-

tional Park did not have study plans for 23 of 41 research studies performed by its research staff. In addition, the study plans that existed for the other 18 research studies were generally deficient with respect to content.

The only time the Park Service has told the public exactly what is meant by "natural regulation," and laid out a detailed plan for its study was 1971, and the agency subsequently never followed its own study plan.

Riparian management has recently been a hot political topic in the West, with environmentalists blaming ranchers for overgrazing these critical habitats. So, as an example of what "natural regulation" means on the ground, let us look at the condition and trend of willow communities on Yellowstone's northern range. Now if "natural regulation" management represents the epitome of land management, as claimed by the Park Service and various environmental groups, then surely Yellowstone's riparian areas should be in excellent condition.

But based on 44 repeat photosets of riparian areas on the northern range that I have made, tall willows have declined by more than 95 percent since Yellowstone Park was established in 1872. In 28 repeat photosets that I made outside the park, tall willows have not declined, but, if anything, have increased, despite yearly grazing by either sheep or cattle.

That these differences are due to excessive browsing by Yellowstone's burgeoning, naturally-regulated elk population, not other environmental factors, as postulated by the Park Service, is shown at the park's exclosures. On permanent plots outside exclosures, willows averaged only 13 inches tall, had only 14 percent canopy cover, and produced no seeds.

In contrast, protected willows averaged nearly nine feet tall, had 95 percent canopy cover, and produced over 300,000 seeds per square meter. Not only are Yellowstone's willow communities severely overgrazed, they are among the most overgrazed in the entire West. Also, aspen has declined by more than 95 percent since the park was established due to overbrowsing, and beaver are now ecologically extinct on the northern range for the same reason. This has also had a dramatic impact on songbirds and other species that are associated with those habitats.

The roots of willows, aspen, and cottonwoods are also critical in maintaining streambank stability, and as elk have eliminated these woody species, this has produced major hydrologic changes. Dr. David Rosgen, one of North America's leading hydrologists, for instance, reported 100 times more bank erosion on Yellowstone's denuded streams than on the same willow-lined streams outside the park.

Last summer, I took Dr. William Platts, one of the West's leading riparian experts, and Dr. Robert Beschta, a hydrologist at Oregon State University, on a three-day field tour of sites inside and outside Yellowstone Park. What they saw shocked them. And this is a quote from Dr. Beschta. "I couldn't believe the Lamar," Beschta said. "I've seen plenty of examples of streams degraded by domestic livestock but this is among the worst. It boggles my mind. It's changing the entire riparian flood-plain system. It could take cen-

turies to repair. I left Yellowstone feeling terrible depressed. I could not believe that this is happening in a national park."

What Beschta and Platts saw is the type of resource damage occurring under "natural regulation" management. I submit that not only must "natural regulation" management be rejected, but that what has happened in Yellowstone Park is a clear violation of the park's Organic Act, the Endangered Species Act, and other Federal legislation.

Thus, I respectfully offer the following recommendations for Congress' consideration. Congress should mandate an independent park science program. This is the same conclusion that has been reached by every panel that has ever reviewed park management, as the previous witnesses have testified to. Since the Park Service has never followed any of those recommendations, I submit that Congress must legislate the needed changes, for the agency has repeatedly demonstrated its refusal to comply with anything less.

Because of the politics in Yellowstone, I also suggest that Congress appoint an independent panel of eminent scientists to set priorities for park research and to review/approve competitive research proposals for funding.

In addition, I suggest that Congress appoint an independent commission to review "natural regulation" management and park science in Yellowstone, similar to what has just happened in Canada. What I am asking is for a fair impartial hearing of the available evidence. If we cannot straighten out Yellowstone, Mr. Chairman, there is little hope for the rest of our national parks.

Furthermore, I suggest that if you want independent scientists to critically evaluate various aspects of park management, then Congress must establish a mechanism to directly fund that research. This need not come from new appropriations but from a reapportionment of existing funds. Without adequate funding there will be no independent evaluation of park management.

And finally, Mr. Chairman, I invite you and other members of the committee, especially the representatives from Montana, Idaho, and Wyoming, who are most concerned about the problem, to personally tour Yellowstone with me this coming summer. It is quite an educational experience to be standing on a site and to be handed a photograph of how that area looked back in 1871. I wager, Mr. Chairman, that you will never view park management in the same light again.

Thank you for your time and consideration.

[Statement of Mr. Kay and attachments may be found at end of hearing.]

Mr. HANSEN. Thank you, Dr. Kay.

Mrs. CUBIN. Mr. Chairman, I regret that I have to be leaving. I would like to ask you——

Mr. HANSEN. You want to go out of order and you just got a question you have to——

Mrs. CUBIN. No, I just want to submit a statement for the record.

[Statement of Mrs. Cubin follows:]

STATEMENT OF HON. BARBARA CUBIN, A U.S. REPRESENTATIVE FROM WYOMING

Thank you, Mr. Chairman. As we discussed earlier, there is currently a considerable problem with bison leaving Yellowstone National Park.

Dr. Kay stated in his testimony that Yellowstone National Park is currently being managed under what is termed "natural regulation." I am concerned with this type of management practice because I believe it directly lends itself to what we are currently witnessing in Yellowstone with mass exodus of bison.

My educational training, Mr. Chairman, is in chemistry; not biology or ecology, but I know enough to figure out when wildlife are starving because of a lack of forage they will probably migrate out of that area to look for food.

Bison are leaving Yellowstone Park in huge numbers. The threat of brucellosis looms large because of this mass migration into States like Montana—Wyoming has not largely been affected by this migration.

As a result, many have been slaughtered to keep the threat of brucellosis from spreading into neighboring States that are currently brucellosis free; Wyoming being one of those States that currently enjoys its brucellosis free status. Bison don't happen to be a problem in Wyoming—the overpopulation of elk in the northwest part of my State is the biggest threat to our brucellosis free status.

Mr. HANSEN. Oh, fine, without objection. If you want to, we would be happy to have you to talk to—is there anything additional?

Mrs. CUBIN. Thank you, Mr. Chairman. I will just make it very brief because my Subcommittee is going to always start on time, right? Dr. Kay, does your research show or is there evidence that suggest that there is an overpopulation of elk and bison in Yellowstone National Park, and, if so, how does the natural regulation management practice contribute to that overpopulation?

Mr. KAY. "Natural regulation" management created the problem. Basically what you have is a view of nature which suggests that ungulate populations will self regulate before they will have a significant impact on the vegetation. This is what the park terms ecological carrying capacity and the Park Service has said, I believe, that bison are already at ecological carrying capacity and probably elk are too, which means by definition, if you understand the ecological lingo that the agency uses, that the animals are short of forage.

And also according to natural regulation, the Park Service views the main limiting factor on the bison population as starvation. According to the Park Service, thousands of bison starving to death during winter and thousands of elk starving to death is natural.

It was very interesting to hear Mark Boyce's comments about wolves because this runs contrary to everything that has been done as far on wolf recovery because the agency has adamantly denied that we need wolves in Yellowstone to control elk. And as a matter of fact, one of the contentions of the "natural regulation" hypothesis is that predation is a non-essential adjunct to the regulation of ungulates by food limitation.

According to the "natural regulation" view of the world, if wolves are present they only take the elk and bison slated by naturer to die by other causes, primarily starvation, and thus wolves will not lower the ungulate populations. I am sure you have read the wolf recovery plan and wolf EIS. They adamantly deny that wolves are going to have any significant impact on the park and especially on the ungulates outside the park in the States of Montana, Wyoming, and Idaho.

Mrs. CUBIN. Just this one last—I am going to make two statements and if you will just agree or not just, you know, in deference to time. Number one, would you say it is accurate for me to state that overpopulation does cause reduced forage in the park? And, number two, would it be correct for me to say that typically herds

that normally stay in a certain area when they are starving to death will migrate out of that area and feel compelled to find forage in other places?

Mr. KAY. Sometimes they will migrate, sometimes they will not. Sometimes they will sit there and starve to death.

Mrs. CUBIN. Thank you very much.

Mr. HANSEN. Thank you. Dr. Keigley, you are recognized for five minutes.

STATEMENT OF RICHARD B. KEIGLEY, UNITED STATES GEOLOGICAL SURVEY

Mr. KEIGLEY. In 1991 I was assigned to investigate the effect of elk on riparian ecosystems in Yellowstone. In my position description, I was given the responsibility for defining the research problem and I was called upon to exercise independent and original thinking. But from 1992 to 1994, I experienced a great deal of interference with my ability to address the research issue.

In fact, by 1995 Yellowstone even refused to issue me a research permit to conduct research in the park. Now this was research that I was assigned to conduct under my NBS performance evaluation standard. In my opinion, the reason that I was removed from Yellowstone's research program was that I came up with scientific evidence that would not support Yellowstone's resource management policies.

Now I would like to ask the question: Why was this research done? Yellowstone's resource management plan makes management by natural regulation contingent upon there not being a deteriorating ecosystem. My research was aimed at investigating that possibility. What did I find? Well, I found that in general, as far as I know, no cottonwoods are regenerating on the northern range.

Young cottonwoods are trimmed off to a height of about a foot. Slightly larger ones are being killed back to the ground. And in my opinion, cottonwoods will be locally eliminated from the northern range within a period of some decades. Now my research found this does not correspond with a change in climate. Cottonwoods grew in the '30's.

What would I likely have documented had I been allowed to conduct the research? Well, I think I could have documented that virtually every species of woody plant is in decline, and of particular interest are the conifers because these are taken as a last resort. These only grow to be about a foot tall, the very youngest of the conifers.

What is the significance of this? Well, in the early '70's it was said that the reason for the decline in woody plants was due to fire suppression. That these were decadent communities that needed fire. Well, we had fire in 1988 and aspen still does not grow. It has also been suggested that climate change is responsible.

What my research would have documented is that species that are widely different in physiology: conifers, aspen, willow, birch, alder, are all in decline; it is very unlikely that each of these species would have been affected similarly by climate. Yellowstone is losing, in my opinion, much of its component of woody plants.

Now it has been said that Yellowstone is not overgrazed. I ask the question: In a national park should we really be comfortable

with this proposition? And I think we can examine that by asking ourselves if we would be willing to let BLM and U.S. Forest Service grazing allotments look like the northern range. I suggest that most of us would not be.

Now my research has, I think, an impact on the management of Yellowstone in that I do not think we are allowed or have been allowed to really aggressively look at the effect of natural regulation. But this kind of influence also has an impact on the credibility of all science and I think that is unfortunate. In my prepared statement that I have not had time to present here, I included five recommendations that I believe need to be followed.

And I think regardless of what research organization ultimately follows out of this, those five points that I raise there are going to be necessary for any successful science with respect to national parks and the surrounding areas. Thank you.

[Statement of Mr. Keigley may be found at end of hearing.]

Mr. HANSEN. Thank you, Dr. Keigley. Dr. Wagner.

STATEMENT OF FREDERIC H. WAGNER, ASSOCIATE DEAN, UTAH STATE UNIVERSITY

Mr. WAGNER. Thank you, Mr. Chairman. I have four points in the time that you have allotted me in this discussion on science and resource management in the national parks. At least two of them have been made previously so I will just hurry past them. The first has been said, is obvious to the committee, and I think need not be dwelt upon, and that is that sound research is essential to effective resource management.

The second point is that the Park Service, as has also been stated here today, has not had a strong science tradition. It has been repeatedly advised, as we have heard, to develop a large and credible research program, but has not done so. There has been no formal policy or structure for science in the Park Service. What research has been done has been administratively disparate. In some cases it has been administered out of regional offices. In other cases it has been administered by park superintendents. So it has been a small program developed at the grass roots and not by a matter of policy from the top.

My third point is that this weak commitment to science has resulted in spotty research and management. There has been good science done in some of the parks. A recent book by Halvorson and Davis has outlined 12 case studies where solid science has been done and capable management programs based on it. The Beard Research Center in the Everglades has turned out excellent science for the tough management problems there.

But there has been bad science and bad management decisions, as a result. I think the natural regulation science in the first place and the policy that was based on it are prime examples. And additionally, I think that what the weak science mandate has produced is in some cases a climate for administrators to ignore contrary evidence that was not convenient for policy.

There have been cases that we have already heard about where researchers have been threatened who turned up evidence from their science that was contrary to policy or inconvenient for managers. And some people have been threatened with their jobs, some

transferred. As we have heard, the scientist sitting on my left has been denied access to one of the parks which is of course public property, so there has been that problem.

So my fourth point is central to these hearings: what is the best structure for science in the National Park System? I think there are three points that bear on that question.

One is that in my opinion research is a service to management in a management agency, and therefore the research needs to be relevant to management problems. That argues for administrative proximity. I think it is important that the researchers understand the management problems and commit their efforts to the solution of those problems. So that argues for proximity.

Secondly, the managers have to trust the researchers and I think that too is a function of administrative proximity. The managers have to see that the researchers understand their problems and are addressing their efforts to assist in the solution of those problems.

But thirdly, a matter that argues for distance between research and management is that research has to be free of political, bureaucratic, and policy pressures to turn out unvarnished truth, wherever the chips may fall. And so that then argues, I think, for administrative distance. I think it is a very bad idea to have the people who are administering management also administer science.

So where should it then go? We are talking about some kind of a compromise between these two considerations. When my colleagues and I started writing our book on wildlife policies in the national parks, we were prepared to recommend that a division of research be established in the Park Service with its own associate director, its own discreet budget lines, and its own administrative lines free of management, but nevertheless in the agency. But before we could finish our book, the National Biological Survey was formed and so everyone knows where that has ended up with the research now in the Biological Resources Division.

That does meet the distance aspect. If it is decided by this committee and the Congress that research should go back to the national parks, I absolutely recommend that it not go back in the structure which existed prior to the formation of the National Biological Survey. It did not fare well there and I do not think it will again. So I think that is something to be avoided.

As far as leaving it in BRD, we know that it has been a political football for three or four years now. It has been kicked around from one place to another. That can't contribute to productivity and high morale in the organization. We know that it has a new director who is setting up operating procedures for the division, so that is surely something to consider. So that argues for leaving where it is.

If it is left in BRD, I think two things are needed. One is some very strong liaison between BRD and the higher-level administrators in the Park Service so that this can insure that Park Service higher administrators can direct down to park management that research evidence be accepted into the management programs of those parks.

And I absolutely think there ought to be a prohibition against forbidding biologists from BRD to do research on national parks which are public property, doing research which they were as-

signed to do by their superiors. I find that absolutely reprehensible. Thanks, that is the end of my comments.

[Statement of Mr. Wagner may be found at end of hearing.]

[Book review of "Science and Ecosystem Management in the National Parks" may be found at end of hearing.]

Mr. HANSEN. Thank you. I appreciate the testimony of all of you gentlemen. Dr. Keigley, you did not finish your time. What are these recommendations that you wanted to give us?

Mr. KEIGLEY. The first one is to ask the question how success should be measured. At the present time we have client satisfaction as a principal measure of success for each of our performance evaluations. I believe that what this does is that it prohibits us from giving the bad news, which may be necessary in some cases, to park managers.

Instead, what I propose is that scientists and managers or research administrators be measured on one simple question: What were the potential or actual impacts of their science on resource management? This would let us cover the good along with the bad. The second point is research funding. I believe that we need to find a new procedure where we can: A, identify cases where there are legitimate opposing points of view, and, B, if there are, equitably allocate fiscal resources to opposing sides.

My third point is that scientists should have a formal role in preparing resource management plans because the park actually does not have the expertise, or lost much of the expertise to do that. And, secondly, park preparation may restrict the point of view that is presented in the resource management plan and I will touch on that in just a moment.

My fourth point is we need some procedure, a formal procedure, for resolving conflicts. I have been involved in a conflict for four years and I would rather not be. And if we had some procedure that would allow us to mitigate these or mediate these early on, we can avoid the kinds of crises that we find ourselves in today.

My final point recommendation deals with a different kind of bias and that is that national parks have impacts that extend beyond the park borders, and yet the resource management plan typically only addresses impacts that occur within the park borders. I believe we need to expand this formal document to include participation by State fish and game agencies, Forest Service, BLM, and private ranchers as well so that they can have their input into this formal document and if necessary, present different separate points of view, to put it all in one place so the public can look at it and evaluate it, and I think from that we will have a much more balanced science program.

Mr. HANSEN. Do the other three of you have any heartburn with Dr. Keigley's suggestion?

Mr. WAGNER. Not at all.

Mr. KAY. No, sir.

Mr. HANSEN. Dr. Boyce, do you have any comment on that?

Mr. BOYCE. No. I think that there are a number of possible models for a way in which science could be administered and structured. In the context of Dr. Keigley's last comment regarding ecosystem management and the fact that various populations cross

park boundaries and the influences of park management go outside the park; the opposite is true as well and I certainly support his view that some sort of ecosystem management administration be used to foster interactions among these various agencies.

There are actually some fledgling structures of this sort. For example, there is the interagency grizzly bear committee for managing grizzly bears in the greater Yellowstone ecosystem. There is also the interagency Jackson Hole elk herd management that involves representatives from each of the agencies and I think these have been very useful and very powerful structures for reducing conflicts amongst the various agencies and insuring that priorities are balanced amongst the various agencies.

Mr. HANSEN. Thank you, sir. The gentleman from American Samoa, you are recognized for five minutes.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. I certainly commend the scientific community from the State of Utah in your presence here and in trying to give us a better understanding of the serious problems not only with Yellowstone but various issues affecting the National Park System.

Perhaps our scientific communities from the University of Wyoming and the University of Montana could also be helpful in this regard. A couple of questions to Dr. Kay and Dr. Wagner. If you believe there are too many bison and elk in Yellowstone Park, how do you propose to reduce the size of the herd in the park? I believe the NPS system was to let the wolves do the regulating. Is this my understanding in reading your testimony, Dr. Kay?

Mr. KAY. My understanding was that it was not the Park Service's intention to have the wolves regulate the bison. In fact, they adamantly denied that the wolves will control bison numbers. Now as to what you do with this, that is a different policy question, which we were not asked to address today.

And I personally believe, if you want my opinion on this, that we need a new park Organic Act because there is a conflict between use, public use, and preservation. And I would suggest that we look to our northern borders for a model on how we might resolve this. Canada has the strongest environmental protection act in the world.

In 1988, the Canadian Parliament passed an amendment to their park Organic Act that said ecological integrity will be given first priority in all management decisions. Parks Canada has been in the process since 1988 of trying to define ecological integrity. Now part of the problem I have with the request by others on the panel for additional funding to do all this monitoring, is monitoring of what, for what?

Unless you have a model of how the ecosystem is structured and functions, and how it was structured and functioned at various points in the past, you have no idea what to monitor or what the monitoring data means. Now Parks Canada is in the process of developing those models. I have submitted reports to Parks Canada and they have independently tested my work.

Mr. FALEOMAVAEGA. Dr. Kay, because of my time. I am trying to get back to my basic question. If there are too many bison and elk in Yellowstone Park, how do you propose to reduce if it is over-

population? If there is overpopulation, how do you propose to reduce the——

Mr. KAY. You would have to eliminate the animals.

Mr. FALEOMAVAEGA. How do you propose——

Mr. KAY. The Park Service did it in the past. You have to understand at one point in the past the Park Service believed that Yellowstone was horribly overgrazed and they controlled the animals by trapping the bison and they actually shot bison in the park.

Mr. FALEOMAVAEGA. My point is do you support killing the elk and the bison in the park?

Mr. KAY. If the objective is to maintain the vegetation in the condition that existed prior to the park being established then the bison have to be reduced. I have no problem with shooting bison in the park, sir.

Mr. FALEOMAVAEGA. OK, Dr. Wagner.

Mr. WAGNER. Again, whether there are too many elk depends on the purpose of the park and a number of authors have pointed out that the goals and the reasons-for-being of the national parks are not clearly enough articulated to know what their goals are. Whether or not we should have more bison or elk or fewer, or whether these should be controlled are arguments over means rather than ends.

But one way of looking at this, up until 1967 the park held the bison numbers at 400 in Yellowstone. Natural regulation went into place in 1967 and the herd has simply increased steadily, steadily up to the present to where at the beginning of this winter there were somewhere in the neighborhood of 4,000.

But, again, it is not clear what the goal for managing bison should have been. Now if it should have been something on the order of what has been suggested, and that is preserving the parks in roughly the condition that prevailed prior to European contact, then Dr. Kay's research is very convincing that large mammal populations were held at very low densities in pre-Columbian times, probably by a combination of predation and aboriginal hunting. And if that is the goal, then indeed there are too many elk and bison in the park.

Mr. FALEOMAVAEGA. Dr. Kay, when you conducted this independent research and study of the park, was this in cooperation with the National Park Service or was this on your own or was this from a foundation?

Mr. KAY. My research in Yellowstone was part of my dissertation research at Utah State University and my research in the park was funded by the Wilder Wildlife Foundation, which is a private foundation out of Sinton, Texas. But my research was certainly conducted under a park permit. The park knew what I was doing all the time. I participated in annual research meetings and I certainly kept the park staff updated on what I was doing.

Mr. FALEOMAVAEGA. And the Park Service cooperated with you in your research?

Mr. KAY. Yes, they let me do the research in the park.

Mr. FALEOMAVAEGA. Dr. Keigley, you claim that you were barred from research in Yellowstone two years ago. Could you explain how that allegedly happened?

Mr. KEIGLEY. What happened is that I filled out with my supervisor a proposed research direction and this was documented in the performance evaluation for 1995 and that is a formal agreement between me and my supervisor and the NPS as to what I am to do, and I was supposed to be able to study conifers on the northern range.

That request which you have to have is a formal research proposal or permit to conduct research within the park. That was submitted to the chief of research at the Center for Yellowstone Resources. And he refused to put it on the table for the resource committee to consider and so as a result it never came up for approval and it was agreed between my supervisor and I that it probably would not be and so I was obviously not permitted to work in Yellowstone, and furthermore I am not even permitted to work adjacent to Yellowstone.

Mr. FALEOMAVAEGA. Sir, you are a gentleman with a scientific background of more than 25 years in doing this type of work which you were just simply iced out simply because of a disagreement in your scientific opinion with your supervisors or those who were your managers, is this basically what happened?

Mr. KEIGLEY. The disagreement was not with my supervisor. The disagreement was between myself and the Yellowstone Center for Resources, and, yes, that is true.

Mr. FALEOMAVAEGA. My time is up.

Mr. HANSEN. The gentleman from Montana.

Mr. RICK HILL. Thank you, Mr. Chairman. Dr. Kay, in your view is the brucellosis problem compounded or complicated by the overpopulation problem in the park?

Mr. KAY. It certainly is. When the bison herd in the past, as Dr. Wagner mentioned, was held at 400 animals, and the elk herd was also held at lower numbers, these animals did not leave the park. And if the animals remained in the park, then there would not be any conflict with domestic livestock.

Mr. RICK HILL. Some people are arguing that if we just expand the range of the bison that we can solve the problem of overpopulation. Could you address that?

Mr. KAY. Yes, that is not true. Under natural regulation management, the bison population will simply increase until it again uses the available range. For instance, sir, if you drew the boundary halfway down the Paradise Valley, that might temporarily solve the bison problem for five or ten years but then at some point in time instead of having 1,000 bison come out you might have 5,000 that were coming out heading for Great Falls.

Mr. RICK HILL. So the concept of natural regulation is that the animals will eventually starve to death and that is how they are going to be regulated.

Mr. KAY. That is right, and they will do that without having major impacts on the vegetation. That was the Park Service's original definition of "natural regulation."

Mr. RICK HILL. And is that supported by your research?

Mr. KAY. No, it is not, sir.

Mr. RICK HILL. Could you explain that?

Mr. KAY. As I explained in my dissertation, you first have to understand what is meant by "natural regulation." In 1971 the Park

Service produced a document by one of its research biologists, Doug Houston, where he laid out what the definitions of "natural regulation" were. And basically those were the species I looked at, aspen and the willows.

That is to say, I measured aspen and willows to test the Park Service's "natural regulation" hypothesis. Now the Park Service has admitted that aspen has declined and willows have declined, but they claim the elk were not primarily responsible. Instead the decline was due to fire suppression, climate change, and a whole host of other factors postulated by the Park Service, but not primarily elk.

Dr. Houston said if the decline in aspen and willows was due primarily to elk, then that would disprove "natural regulation." It would prove that the Park Service's hypothesis was not working. And that is basically what my research showed. I not only did that, I reviewed all the first-person historical accounts, I looked at all the archaeological data, and I basically looked at what you would call long-term ecosystem states and processes.

There never were large numbers of bison in the park, sir. For instance, I have analyzed 20 historical journals, first-person historical accounts, because they are the most reliable. Between 1835 and 1876, there were 20 different expeditions in Yellowstone. They spent 765 days in the ecosystem on foot or horseback. Yet they saw bison three times, none of which were within the present confines of Yellowstone Park.

In addition, they only saw elk 42 times. There are now over 100,000 elk and reading Dr. Boyce's testimony he had it up to 120,000 elk in the ecosystem. Yet early explorers only saw elk once every 18 days.

Mr. RICK HILL. One of the arguments out here is whether what we are seeing happen now is bison migrating because of overgrazing, lack of feed, or are these traditional migration routes. What is your view on that? Are these traditional migration routes we are seeing?

Mr. KAY. Well, it depends on who you listen to at what point in time. For instance, take the park's bison expert, Dr. Meagher. In 1973 she produced a report on the ecology of bison and she made predictions on what would happen to the bison population under "natural regulation." She had a map in that report that showed the historical bison migration routes in Yellowstone.

According to that 1973 Park Service document, there were no historical migration routes near West Yellowstone and there were none near Gardner, two places where bison are coming out of the park today. To the best of my knowledge, the Park Service has not uncovered any additional historical data that would support their reinterpretation of historical migration routes in those particular directions.

It certainly seems ecologically feasible that if there were some bison in the park that they may have migrated out in those directions, but there is no evidence in the condition of the vegetation in the earliest historical photos, there is no evidence in the first-person historical accounts, and there is no evidence in archaeological data that there have been large numbers of food-limited animals in Yellowstone at any time during the last 10,000 years or more.

Mr. RICK HILL. Dr. Kay, I just want to tell you that I for one would welcome the opportunity to visit the park with you next summer and I am looking forward to that opportunity. Thank you, Mr. Chairman.

Mr. HANSEN. The gentleman from Minnesota.

Mr. VENTO. Thanks, Mr. Chairman. Obviously, Dr. Boyce and Dr. Linn, I apologize, I was reading your testimony across and I had you in Wisconsin, Dr. Linn, where I should have had Dr. Boyce. At least we have another Wisconsin alumni here though in Dr. Wagner, at least 30 years ago.

I am from Minnesota actually and I want to make that clear although everyone seems to be associating with the Christian-Green Bay phenomena. Dr. Keigley, you stated that the park and what happened in the park has trans-boundary effects in things outside the park. But things outside the park also affect things in it, don't they?

Mr. KEIGLEY. That is correct.

Mr. VENTO. I mean so it is a two-way street. You say correct, so it is a two-way street. If they are doing research out there maybe they want to join in. I try to play to the collaboration aspect rather than the isolation of the Federal Government. I do not think anyone has enough money to do all of the research that needs to be done here.

One of the things that is sort of disturbing to all of us is that you are suggesting that you are unwilling to accommodate a manager. We think that scientists ought to pursue the information and get objective data. You do a lot of review before you start on a project. You review all the documentation and papers. That is the way it works, I guess.

You must have reviewed all of the papers that Dr. Boyce is talking about in his statement. You said that because you did not accommodate the manager, that the Biological Resources Division had no alternative but to withdraw the scientists from the research program. In other words, was there peer review of your work?

Mr. KEIGLEY. My research proposal was peer reviewed at Montana State University by two faculty.

Mr. VENTO. Was this part of the described design as described as rigorous, excellent and the approach ingenious? Those are quotes from the memoranda that I got and the letters. Was it reviewed by others within the Biological Resources Division within the Department? They must have come to this conclusion somehow.

Mr. KEIGLEY. It was circulated through the Yellowstone Center for Resources for quite a while and sent down to Fort Collins. I never got any adverse comments back from either the Yellowstone Center for Resources or Fort Collins on my research design for 1995.

Mr. VENTO. So they peer reviewed. Do you have any evidence that backs up your statement that because you are unwilling to accommodate the manager that there was no alternative but to withdraw you from this?

Mr. KEIGLEY. I am just describing what happened.

Mr. VENTO. So it could have been a lot of things. It could have been an allocation of resources question. Did they have more money than they needed up there?

Mr. KEIGLEY. No, sir. I did nothing that summer and that is documented in my——

Mr. VENTO. You did not do anything that summer?

Mr. KEIGLEY. A scientist works from field season to field season and to prepare for a field season to do research means that you have to invest some effort in planning before that. This came down to about June when Yellowstone refused to give me permission to work within the park and then subsequently I was denied permission to even work adjacent to the park. And so I really did nothing in 1995, no field research.

Mr. VENTO. You did nothing? You did not do any field research? Is that what you mean?

Mr. KEIGLEY. Well, I mean nothing. A scientist does field research during the summer. You feel like you are doing nothing.

Mr. VENTO. OK. They had something for you to do, I guess. They did not send you on vacation, I guess.

Mr. KEIGLEY. I was not on vacation, no.

Mr. VENTO. Dr. Boyce, your question here. To your knowledge, is national parks research peer reviewed?

Mr. BOYCE. The National Park Service——

Mr. VENTO. Research or the research from the Bureau of Resource Management or department——

Mr. BOYCE. The National Park Service does not really do research at the moment in view of the fact that the BRD was off——

Mr. VENTO. Well, that is just on the biological side. Actually they have half the scientists still over there. I guess they may be doing something. But those you are familiar with do not do the biological research is what you are saying, but is that research peer reviewed?

Mr. BOYCE. Certainly there has been a large amount of research done in the national parks through the National Park Service with funds provided through Congress, for example, the overgrazing studies, the fire research studies, and most recently the wolf recovery efforts, and those studies have resulted in a large number of publications that certainly have been published in top-flight peer-reviewed periodicals.

Mr. VENTO. Could you explain what it means to have it published? Is not something that is published receiving general agreement in terms of the scientific community? That is not controlled by the Park Service, is it?

Mr. BOYCE. No, not at all. In fact, it means that the papers are submitted to other scientists working in the same area for review and there has to be critique by peer reviewers before a peer-reviewed periodical will publish a paper.

Mr. VENTO. I see Dr. Kay was shaking his head. Have you had anything published lately, Dr. Kay? Maybe you have not, I am talking about publication, you know.

Mr. KAY. Basically what peer review is is to get two other people to agree with your point of view because that is all peer review is.

Mr. VENTO. No, I was talking about publication, I think——

Mr. KAY. That is what I am saying. What I am saying is that the Park Service has been able to censor peer review. In two cases that I can prove with written documentation, when I submitted

manuscripts to scientific journals, they sent those manuscripts to the Park Service for peer review, which I think is unethical.

Mr. VENTO. So they are controlled by the Park Service, is that what you are saying, that the National Science Foundation or the——

Mr. KAY. I am not saying—this was not the National Science Foundation. This was two specific scientific journals.

Mr. VENTO. And so these specific scientific journals were controlled by the Park Service?

Mr. KAY. I am not saying they were controlled by the Park Service, all I am saying is what they did and what happened to me in those particular instances.

Mr. VENTO. You are obviously putting fault with the Park Service because someone did not publish your papers.

Mr. KAY. What I am saying is the peer review process is not independent in all cases of review by the Park Service.

Mr. VENTO. So are you talking about a major fundamental flaw with the entire scientific process that we have in this country?

Mr. KAY. Yes, I think so.

Mr. BOYCE. But it is the best we have got.

Mr. KAY. No, it is not. And, in fact, may I comment on that?

Mr. VENTO. My time is what it is.

Mr. KAY. May I comment on that, Mr. Chairman? There is an alternative——

Mr. HANSEN. I think we should give you a chance.

Mr. KAY. This has been tried in the social sciences because there are various social hypotheses that are very controversial and there have been several papers on the biases of the peer review process, in some cases actual corruption. I can provide that documentation for the committee.

So what some journals like "Current Anthropology" do once they decide there is a potential conflict is that interested scientists can write whatever they like on that particular subject and then that manuscript is sent out for open peer review. Anybody who is interested, can then write a review and those reviews are published right in the journal. No more long knives in the dark. Then the original authors get to rebut their critics and this all is published together so that anyone can read both sides of the issue. But unfortunately, science journals do not follow this format, and I think if they followed that format especially for controversial subjects, then at least both sides of an issue would be given a fair hearing.

Mr. HANSEN. Thank you.

Mr. FALEOMAVAEGA. Will the gentleman yield?

Mr. HANSEN. How much time do you need?

Mr. FALEOMAVAEGA. Just one sentence. I just want the Chairman of the committee to know that the next anthropologist I catch coming to my island, I am going to shoot him.

Mr. KAY. Well, there are anthropologists, sir, and there are anthropologists.

Mr. HANSEN. The gentlelady from Idaho, I recognize you for five minutes.

Mrs. CHENOWETH. Mr. Chairman, I would like to pursue this with Dr. Kay. This is critically important to us. There we are a Congress poised to anoint science to throw a lot of money at sci-

entific programs and if we see the interruption of the process of even publicizing I would like to know more about it. And, Dr. Kay, you indicated that you would get the committee documents.

Mr. KAY. If you want that, I have this all in writing.

Mrs. CHENOWETH. I personally would. Mr. Hodapp, I would very much appreciate a follow through on that. I think that is a critically important piece of testimony for this hearing. And I do believe that we can do better than that. We must do better than that. We breached the trust if we cannot have open scientific discussions and dialog without political interruption. Thank you very much.

Mr. KAY. I agree.

Mrs. CHENOWETH. I want to ask you, Doctor. I am fascinated with your testimony, as well as all four of you, but have you done much work in Yellowstone on the grizzly bear?

Mr. KAY. Yes, I have.

Mrs. CHENOWETH. Would you be willing to say that the grizzly bear is reaching a population where we may be able to delist the grizzly bear from the endangered species?

Mr. KAY. Unfortunately, Councilwoman, I would not.

Mrs. CHENOWETH. OK.

Mr. KAY. Because it is very difficult to try to estimate what the grizzly bear population is. Also, I have an entirely different opinion as far as what is happening with the grizzly bear than that held by park and the U.S. Fish and Wildlife Service.

Mrs. CHENOWETH. Could you go over that?

Mr. KAY. Yes, I believe that the elk are having a severe negative impact on the bears. The bears are primarily vegetarians and basically the elk and the bison are out competing the bears for food. This forces the bears outside the park where they are then being killed, but they are really dying of "natural regulation" management.

For instance, Congresswoman, you know bears eat berries, bears love berries. What you might not know is that the bears in the Yellowstone ecosystem don't eat berries. Now, the people who do the bear research have postulated that this is because Yellowstone is naturally poor habitat for berry-producing shrubs.

But, if you read the first-person historical journals, there are accounts of Native Americans in the 1860's, excuse me, 1869 and 1870, who were collecting choke cherries by the bushel basket full just outside Yellowstone Park. And as part of our research which is attached as Appendix B, I actually measured the berry production inside and outside long-term exclosures, these are fenced plots where the ungulates have been excluded.

And at one exclosure, if my memory serves me correctly, that is called West-Lamar in Yellowstone National Park, 100 serviceberry plants outside where the elk graze produced no berries. While inside the exclosure, 100 plants produced over 111,000 berries. Chokecherries per 100 plants outside the exclosure none, while inside the exclosure 100 plants produced 212,000 berries. The elk have also had a severe negative impact on other foods bears prefer such as cow parsnip and other species.

Plus riparian areas, riparian areas are critical for grizzly bears. When you read the Grizzly Bear Recovery Plan and other governments documents, they all note that riparian areas are critical for

grizzlies. But those areas have been destroyed by the elk in Yellowstone National Park.

Mr. BOYCE. Grizzly bears also eat elk and the grizzly bear population in the greater Yellowstone ecosystem has never been higher according to all current scientific information both based upon counts of unduplicated females with cubs of the year, as well as the demographic data on grizzly bears in the greater Yellowstone ecosystem. I have spent the last three years analyzing those data and we have never had a more viable population of grizzly bears in the greater Yellowstone ecosystem in recorded history.

Unfortunately, I would agree with Dr. Kay that it is not time to delist the bears. We need to insure that the population is large enough to persist for long periods of time and expanding the range is probably a very important thing to do, for example, into the Wind River range of Wyoming.

Mrs. CHENOWETH. Dr. Boyce, I noticed you did not mention Idaho and I really appreciate that because I—we're very proud of Idaho. And I appreciate your comments. I do want to add, Dr. Keigley, you said that you were barred from doing further research in Yellowstone. I want to know specifically by whom were you barred.

Mr. KEIGLEY. I think I explained a moment ago that the mechanism by which it happened——

Mrs. CHENOWETH. Well, let me ask you this to make it easier. Was it the superintendent who barred you?

Mr. KEIGLEY. Let us say he failed to take steps——

Mrs. CHENOWETH. To issue the permit.

Mr. KEIGLEY. To cause the permit to be issued.

Mrs. CHENOWETH. And everything else was in place for you to do the study that you were mandated to do, right?

Mr. KEIGLEY. That is correct. I could have done it.

Mrs. CHENOWETH. In other words, the park superintendent has total control over who does what research and ultimately who publishes what regarding the park, is that what you gentlemen are telling me?

Mr. KEIGLEY. Well, the permit had to be—the proposal had to be given to the resource committee. Another individual opted not to do that. That person is under the authority of the superintendent and it could have been turned around but it was not.

Mrs. CHENOWETH. Thank you. And I see the yellow light on, Mr. Chairman. I am going to have to leave though and I do just want to say, Mr. Chairman, that what I am learning and what I am seeing in the media disappoints me so much about how the bison are starving in Yellowstone.

Of course, Idaho borders the park and being from Utah I know, Mr. Chairman, you can identify with my concern because what would happen if our cattlemen allowed their cattle to starve like this. What would the public outcry be if cattle were starving and what if a puppy or a dog were starving? This just cries against the Americans' human nature. Thank you.

Mr. HANSEN. Thank you. Dr. Wagner and Dr. Kay both alluded to what the Yellowstone Park can hold as far as bison or elk and there seems to be no question that they are well overgrazed and there are too many there. What figure would you come up with?

I mean that is kind of a tough question, I guess. Give me an approximate, would you?

Mr. WAGNER. It is hard for the whole park but the focus has been on the northern range which is the big herd that winters inside the park. Most of the other major herds move outside the park in winter. In the northern range right now there are something over 20,000 elk.

At one point that herd had been taken down to less than 5,000, possibly as low as somewhere between 3,000 and 4,000. At that point in time there was evidence of recovery of the vegetation of some of the animals, and at that point in time the biologists then in the park believed that the proper number of elk from the northern range was on the order of 5,000.

Now, again, that depends on what the goal of the park is. If the goal of the park is to reconstruct or to try to maintain the conditions that prevailed at the time of the European contact, Dr. Kay's evidence suggests that there were probably fewer than 5,000. Dr. Keigley and I currently have a manuscript in press where we are projecting something on the order of 5,000 or fewer elk in the northern range at the time the park was formed, and we believe those animals migrated out of the park during the winter down to the Yellowstone Valley. So we do not even think that they wintered in the park even when they were down at those low numbers.

Mr. HANSEN. It amazes me that, let us see, we have about 40 units that we allow hunting in. I guess that would be just like spitting on the flag in the eyes of some folks to allow hunting in that area, but I am sure it would be a great hunt. You know, Deseret Land and Livestock in my home State of Utah, if you want to shoot an elk it costs you $5,000 to go up there and shoot one.

Mr. WAGNER. $9,000 for a bull.

Mr. KAY. $5,000, Congressman, for their management hunts, which are the smaller bulls. Their larger bulls are $9,000.

Mr. HANSEN. I just checked four or five years ago and I was totally determined I could not afford it.

Mr. WAGNER. Well, this is inflation.

Mr. HANSEN. And they make money on that place and they tell me, I do not know if this is right, but they tell me people are standing in line to get those permits to go up into that Deseret Land and Livestock, to the benefit of the committee, which is a huge ranch in northern Utah, privately owned.

Now if that is the case and the Park Service did the same thing that would be quite a shot in the arm for you to get $9,000 a bull in that area especially when they do it in the fall when there are not too many folks around there. They could do the same thing with bison. Obviously, we are overstocked with bison in the same area.

I know some people just stand aghast, especially the animal folks and some of the anti-hunters and anti-gun people, but it seems to me kind of a reasonable idea. I just threw that out because I want to get some criticism from the press. But let me just say this. On the wolf, we have put a lot of money in trying to put the wolf back in our area.

I went out and looked at the pens and everything and I am not taking on the theory but it just seemed to me that if you really

wanted to introduce that species that the 10 or 12 or 14 that are up there, there would have to be a whole lot more than that to come up to balance and make the thing really work. This is just almost like having a canine area. You have to spoon feed each one of them constantly.

And, Dr. Kay, I understand you had some thoughts on that. Kind of give us an opinion how many would have to be established in there to make this thing all work out.

Mr. KAY. Well, I do not know how many we would have to establish there to make it all work out, Congressman. What I looked at in my publications is whether the wolf recovery goals meet the requirements of the Endangered Species Act because, as you know, the recovery goals are for 100 wolves in Yellowstone, and 100 in Idaho, and 100 in Montana, and then if all three areas reach that number at the same time, the wolf would be delisted.

However, I do not think those goals are realistic. I mean, if 100 wolves is enough, Congressman, why can't we live with just 100 spotted owls. There is a thing called minimum viable population size. So in my analysis of the wolf recovery program, I suggest that if the government tries to delist at these low figures, then they are going to be sued by environmentalists and the government is going to lose in court.

Based on the best available scientific evidence, mainly from research in Canada and Alaska, a population of between 1,500 and 2,000 interbreeding wolves is needed to meet requirements of the minimum viable population size under the Endangered Species Act.

And if you recall, grizzly bears were part of a recent lawsuit, which I believe was just been settled out of court. In that case, environmentalists asked for about 1,600 or 1,800 grizzlies as one interbreeding population.

Mr. HANSEN. Well, wait a minute, did everybody hear that, 1,500 to 2,000?

Mr. KAY. Yes.

Mr. HANSEN. Is the statement you made?

Mr. KAY. Yes.

Mr. BOYCE. And of course the expectation is that there will be linkages with other populations of other wolves further north eventually and that as the wolves coming down from Canada expand further south that eventually the link between the Yellowstone wolves and the Northern Continental Divide wolves will be there sufficient to provide genetic exchange that would be sufficient to alter those figures so that the number of wolves occupying Yellowstone National Park could be substantially lower than that figure, of course.

Mr. KAY. Spotted owls fly around a lot, Congressman, and the Judge ruled you had to have 2,180 pairs of spotted owls to meet the requirements of the Endangered Species Act.

Mr. HANSEN. Gentlemen, this has been a very lively and interesting discussion. We sure appreciate you being here. It is very kind of you. We have got 17 minutes for our last panel so we will excuse you and thank you so much for being with us.

Mr. KAY. Thank you very much, sir.

Mr. HANSEN. Mr. Roger Kennedy, Director of the National Park Service, Dr. Mark Schaefer, Deputy Assistant Secretary for Water

and Science, Department of the Interior. Will you gentlemen come up? Mr. Kennedy, what a privilege to see you, sir.

Mr. KENNEDY. It is always a joy to come before this committee, Mr. Chairman.

Mr. HANSEN. Mr. Kennedy has been the outstanding Director of the National Park Service, a joy to work with, and a man that has been in some really tough positions in the last few years. We appreciate you and want you to know that.

STATEMENT OF ROGER G. KENNEDY, DIRECTOR, NATIONAL PARK SERVICE; ACCOMPANIED BY DR. SOUKUP

Mr. KENNEDY. Thank you very much, Mr. Chairman. Actually I do enjoy coming before this committee. It is a smart bunch of Congressmen and they ask good questions. I think the best thing I can do with the limited time I have got is try to get a few facts on the table, just some numbers that may be useful.

I would rejoice in entering into a policy discussion on science but I am incompetent to do that so I am going to turn to Dr. Schaefer and to Dr. Soukup and I think Dr. Fenn is behind me. These are a lot of folks that are scientists. Let me, if I can, just respond to the call of the meeting which said we are going to talk about the relationship of previous reports on what you ought to do about science in the parks and what the recommendations of those were and what has been done about it.

Let me, if I may, at the outset, however, deal with just a couple of possible misapprehensions that may be circulating around here. The capacity to do science, and particularly we are talking about biological sciences here, the National Park Service has not been gutted. There are 499 people classified in biological series in the NPS.

There are 367 with advanced degrees in the biological sciences are working for the National Park Service. There are 312 doing work, research in the parks for the National Park Service, and there are 215 who are doing research for the National Park Service that are not necessarily Park Service folks. I am just trying to deal with the question did they take all the science out. They did not.

Second, with respect to inventory and monitoring, the fact is that through our applications for this year, we have asked for 15.21 million bucks to do this stuff, to do inventory and monitoring to know what it is we have got that we are being berated for not knowing enough about. We got $8.46. I am including $2 million we are asking for this year.

We have been pretty consistent in asking for the dough to do this work and, as is the case always in the Congress and in any administration, we have to claw our way through the administrative process and then get past you folks to get the dough we need. Third, with respect to this marvelous multiplication of Park Service budget that we have been hearing some again about today and which I occasionally get asked about on television, it just is not true. It just is not true.

Here is a graph which I want to enter into this record, if I may, which shows the National Park Service budget in constant 1983 dollars from 1983 on and anybody can see what it looks like. There is no big multiple increase in Park Service funding, and in fact if

you look at it in constant purchasing power dollars from '91 through '97 it is down. If you look at it from '83 through '97 it is down. So let us be done with that business.

Now, if I may, let us turn to this question about funding support for resource management. Now that breaks into three categories. They are law enforcement. Law enforcement, it costs us money, 37 million bucks a year to see to it that people do not do bad things in the parks to the resources that we are charged with protecting. We take care of things.

A little reference was made earlier to degradation of archaeological sites. That is a hugely important subject and I can tell you that in the State of Utah and in other western States the destruction of the fundamental American heritage that arises because there is not adequate law enforcement to protect those resources is a national disgrace. It is true in the park system, it is true out of the park system. It ought to stop. We are losing the American heritage because people are ripping it off.

Second, in the big numbers that you have heard, there are 80 million bucks for what is called cultural resource management and that includes a huge amount of stuff that you do not just naturally think about. We have more objects in the park system that we take care of, I mean physical museum-type objects than there are in the Smithsonian.

We have 22,000 historic buildings. We've got to take care of those places. We take care of the Native American Graves Protection and Repatriation Act activities. That is expensive, necessary, and absolutely a part of our obligation to this country. We are protecting what we have, both culturally and naturally.

Now most of our discussion today properly has been about natural resource protection. How are we doing? How are we doing in knowing what we are doing, and how are we doing in acting on the basis of what we know? I think those are probably the two questions that are before us. Now our intention was—the big report, the report that everybody says ought to have set the pattern for the Park Service, we agree with it, was the National Resource Council, the American Academy of Sciences, in 1992.

Let us sort of look at it, if we can, in a real hurry what they said because we agree with them and we ought to do some more things to get on with this and help things. First, there ought to be an explicit legislative mandate for research in the National Park Service. Sure, there should.

Now lots of questions about what do you do when you are trying to manage a park and you just had a flood? What are you going to do you do when you have a park and the road is rubbed out or in the Grand Canyon the water line has run out, are you going to spend on long-term research at that moment? You are not. And somebody has got to make those decisions on the ground.

I am absolutely for a diversified system of management responsibility in which superintendents have a lot of responsibility. Now it is also true as you heard earlier that it is a good darn thing that the government performance and whatever it is act, the GPRA act says you better have better accountability for those decisions made. Amen. Good thing. But for goodness sake, let us not have the Con-

gress set up a lot of mini categories that deny the possibility of intelligent management of the parks.

Now it said we need an independent budget for research. And guess what? We got something called the Biological Resource Division, the U.S. Geological Survey. You are looking at it on my left. It and a whole lot of scientists. That is about as independent budget for research as you are going to get. An increased budget for research, that is what they recommended before we got a 30 percent cut.

An independent research program where all scientists are supervised by scientists, you bet, as long as one of the other panelists—if he did. By golly, the question is: what are you going to do with it, who are you reporting to? I thought Dr. Wagner's four points, and I know I am running longer and I will try to run this fast, Dr. Wagner's four points made exquisite sense.

He said there is a tension between proximities so you know what you are doing on the ground and long distance which means that you have got to have a little freedom and somebody has got to protect you so that you can get independent work done. Of course he is right. Of course he is right.

And while I am not the initiator of the National Biological Service, I am here to tell you that there is a strong prospect that as a consequence of its creation, contrary to a whole lot of orthodoxy that I hear, there is a stronger possibility that there is going to be a generic capacity to do strategic science because people who are doing it are scientists and have a strong capacity to do technical science on the ground at the same time.

That is a tension, it is a tension anywhere running anything. How does the R&D function relate to the production function? This is tough. And, of course, finally, there is the problem what do you do about Yellowstone, is it overgrazed, isn't it overgrazed, what is the appropriate level of population? I do just want to enter two more final facts and I am done, and thank you for your tolerance on the time.

There are fewer bison today in Yellowstone National Park than there were in 1988. Second, we had a lot of talk about how many elk, when was the vignette, when was the pre-Columbian, I do not know, and I have tried to get data as far back as I could out of these fellows to tell me what is the history of the populations here. The fact is nobody really knows.

I was handed before I came up here because I just thought it was interesting a report, 1921, from the Government Printing Office that says the following: 30,000 elk, for instance, live in the park. I do not know whether that is true. I do not know whether somebody was right that in 1492 there were 5,000 elk in this park. I do not think he does.

Mr. Chairman, I would be delighted to try to respond to any questions you have got.

[Statement of Mr. Kennedy may be found at end of hearing.]

[NPS Budget in 1983 dollars may be found at end of hearing.]

Mr. HANSEN. You know, I really see some value in making you wait till the last. His testimony wouldn't have been anywhere near as good if you had just given your testimony and walked out. We got that great response from what was said. We are going to do

that with all of them, we will make all the Administration people listen to other people and then we will get some good testimony.

Mr. KENNEDY. I do not know if I would want to wish that on my colleagues, Mr. Chairman.

Mr. HANSEN. Dr. Schaefer, do you have some comments you wanted to give us or are you a support actor today?

STATEMENT OF MARK SCHAEFER, DEPUTY ASSISTANT SECRETARY FOR WATER AND SCIENCE, DEPARTMENT OF THE INTERIOR

Mr. SCHAEFER. Well, I am partly support. I guess I will make some very, very brief comments. I know you have some questions, Mr. Chairman. If you do not mind, I will ask that my entire testimony be put into the record.

Mr. HANSEN. Without objection.

Mr. KENNEDY. I should have said that too. Will you file my formal testimony, please, Mr. Chairman? Thank you, sir.

Mr. SCHAEFER. Secretary Babbitt and the Department have made outstanding science our highest priority and we are doing everything we can to make our programs as efficient and as effective as is possible. Consistent with Congressional direction we took the National Biological Service, put it into the U.S. Geological Survey, and made it the Biological Resources Division.

They are now there with three other divisions and we think this multidisciplinary approach that we have available to us now to do research will pay off big time in the long run for us and we hope that you will give us a chance to show that we can make this arrangement work.

One reason the Secretary built the National Biological Service originally was to provide more independence to our scientists. They have that now in the Biological Resources Division and we think it is going to pay off for us in the long run. Besides the multidisciplinary research activities, I wanted to point out that we are making a special effort to connect these research programs with the needs of managers, whether they are in the parks or the refuges, Bureau of Land Management—wherever they are.

We have gone through a very careful process to develop what we call a needs assessment activity or needs assessment process. It is done on an annual basis. We identify priority needs of managers and we go down the line and take the money we have available and dedicate it to those high priority needs.

Since it is done on an annual basis, there is a lot of opportunity to make changes over time if the managers feel like we have to redirect resources. We are also making a special effort to connect our programs to the needs of the States and the tribes. We have done pretty good at that in the Geological Survey generally over the years and BRD is going to make a special effort to meet the needs of people in the States.

Also, we are making a special effort to try to leverage the resources in the nation's universities. People have talked about this earlier today. We agree there are excellent minds throughout the country and we have to find a way of tapping these people. We are trying to find ways of placing more of our own scientists in the university setting so that we can leverage those resources.

And, finally, we very much support the scientific and technical activities that take place in the park—those near-term activities that are directed to monitoring and inventory-type work. We want to see those go forward. We think we have got a good, solid program here that we can make work. We would like to work with you. If you identify weaknesses, we will take them seriously, we will go back and we will try to make it better, but I think we have an excellent program in place. Thank you.

[Statement of Mr. Schaefer may be found at end of hearing.]

Mr. HANSEN. Thank you, Dr. Schaefer. The gentleman from American Samoa is recognized.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. I certainly would like to offer my sense of appreciation to the Director of the National Park Service for he certainly, I would say, has a mark of distinction in the service that he has rendered to our country as Director of this very important agency and I also sense a real sense of appreciation for your patience in allowing the members of our community to testify before you.

As you know, the protocol that generally we allow the highest officials of the Administration to testify first but I am sure you gentlemen can get a sense of appreciation of what are some of the things that we go through and hopefully that you might be able to respond. And I do appreciate your candid response, Mr. Kennedy, to some of the allegations and statements that have been made earlier by members of the scientific community.

I wanted to ask Dr. Schaefer as well as Mr. Kennedy, for fiscal year 1996 and 1997, has the Congress given you basically what you have asked for as far as the biological research program is concerned with the Department of Interior? Have we been responsive or have we just not given you sufficient resources to do your work?

Mr. SCHAEFER. Well, last year we had a problem. We got a $30 million hit in our budget and I mentioned our needs assessment process earlier. Those are the priorities that we try to meet for the parks and for the refuges, and because of that cut, which we vigorously opposed but did not prevail, we had to cut off some of our work related to the parks.

So we would like to work with you to push a little bit harder for some additional solid funding. In FY '98 the Administration proposes additional money for the Biological Resources Division to support science in the parks and other public lands.

Mr. FALEOMAVAEGA. So what you are basically saying is if you want us to do our work, give us the money to do it with.

Mr. SCHAEFER. Yes.

Mr. FALEOMAVAEGA. Mr. Kennedy, I think you probably may have heard Dr. Kay's earlier statement that Park Service research program is slanted and is a waste of taxpayers' money. Can you respond to that?

Mr. KENNEDY. Baloney. Baloney. There are first-rate scientists, as the other scientists testified, who do work for the National Park Service. This is not a university. We are not sitting around doing abstract research. We are doing work on the ground that serves the superintendents and the public through those superintendents.

The hard part, and it is a hard part, every one of the responsible scientists that testified before you pointed it out, the hard part is

connecting what you want to learn about and what its consequences are to the management of the place. We do first-rate science. We have a lot of people doing first-rate science. We would like to do better science. Is it perfect? Not a bit. But that it is no good at all is bunk.

Mr. FALEOMAVAEGA. I would like your precise statement in response. Mr. Kennedy, and I think not only in fairness to Mr. Keigley but as well as to the Park Service, and I do not want to put you in a position if there is any sensitivity involved with the employment of Dr. Keigley previously with the National Park Service.

Would you prefer that we submit the question in writing or can you respond orally to some of the allegations stated earlier by Dr. Keigley?

Mr. KENNEDY. I appreciate your sensitivity and I would prefer not to comment on the particular personnel action or an action vis-a-vis of a person who does not currently work for the National Park Service, works for somebody else, and therefore I—in the first place I have tried to naturally enough as anybody else who is going to come testify before you fellows, I tried to find out what happened here.

And I have tried to do that and yet at the end of the day I am not this man's boss so I am not going to comment on the matter.

Mr. FALEOMAVAEGA. Dr. Schaefer, I think Mr. Kennedy may have stated earlier, but I think it would be helpful to the committee to submit for the record but say it orally, how many biological scientists do we currently have with the National Park Service or part of the Biological Research Division. Can you give us a breakdown? Do we also have political scientists that serve with the National Park Service?

Mr. KENNEDY. Yes. We have a social science program as well.

Mr. FALEOMAVAEGA. Do they study the politics and——

Mr. KENNEDY. Well, politics in the sense that we try to find out what the folks, our customers, the American people, we try scientifically to study what they want us to do and the degree to which we are providing the services they want or not. That is not political science exactly. That is sociology but it is a social science.

Mr. FALEOMAVAEGA. All right.

Mr. SCHAEFER. Do you want a response to the first part of your question?

Mr. FALEOMAVAEGA. Yes, please.

Mr. SCHAEFER. You got to kind of keep it straight because there are the Park Service employees that are doing more of the short-term-type work that is monitoring and inventoring in focus, and then there is the Biological Resources Division that is responsible for the longer term research activities.

But to answer your question, we have about 1,700 full-time equivalents dedicated to Biological Research Division work. That is about 600 research grade scientists.

Mr. FALEOMAVAEGA. Do you have a breakdown in PhD's, Masters?

Mr. SCHAEFER. Yes, we will submit that for the record.

Mr. FALEOMAVAEGA. Please.

[The following was submitted for the record:]

BIOLOGICAL RESOURCES DIVISION SCIENTISTS

The Biological Resources Division of the U.S. Geological Survey has 519 employees in research positions with a bachelor's degree or higher level of education. Of the 519 employees, 66 have at least a bachelor's degree but have not obtained a master's degree, 146 have at least a master's degree but have not obtained a doctorate degree and some of these individuals may have completed some post-graduate education.

In addition, BRD has 259 employees in science positions which are not research grade with at least a master's degree and 105 employees have at least a doctorate degree. These support positions are critical to the accomplishment of the mission of the Biological Resources Division, and include such activities as remote sensing, GIS technology, analytical chemistry, biological modelling, and statistics.

Mr. SCHAEFER. And we have 48 permanent biologists that work right in the parks. We have about 50 biologists that work in Cooperative Park Study Units presently. These are university located activities where Interior researchers work in cooperation with universities.

Mr. FALEOMAVAEGA. My time is up, Mr. Chairman. Thank you.

Mr. HANSEN. Thank you. The gentleman from Montana.

Mr. RICK HILL. Thank you, Mr. Chairman. Mr. Kennedy, can you tell us who makes the decision or who made the decision to not manage wildlife in Yellowstone Park or to adopt the natural regulation process in Yellowstone National Park?

Mr. KENNEDY. 30 years ago.

Mr. RICK HILL. I was asking who, but you do not know?

Mr. KENNEDY. 30 years ago because that is when that policy became the policy of the park. I am not trying to bicker with you. I just wanted to underline—obviously it has been there a while and the Leopold report which undergirded it has been in place for a long time. I think, Congressman, although I am not sure of this and I am just offering—I think that there is a discussion going on between your delegation maybe at this moment and the Secretaries of Agriculture and Interior, I think that is this afternoon.

Mr. RICK HILL. You are correct.

Mr. KENNEDY. I think so, and I think that I probably should not walk all over that discussion by saying much more about what they are going to be talking about. I hope it is responsive. I believe it is responsive to your question but I do not want to gum it up by stating something that is not in the light of that conversation.

Mr. RICK HILL. Well, I would just like to kind of clarify how the process works just for my own education.

Mr. KENNEDY. Sure.

Mr. RICK HILL. Who then today makes this decision? Is this a decision that is made by the park superintendent, is it made by you, is it made by the Secretary? Who makes this decision today?

Mr. KENNEDY. Well, there is not a single decision. There is a process in every park in which questions arise as to do we need exotic species in or do you work to get rid of them. What is an exotic species? Brucellosis bacteria is an exotic species. It happens. But who decides what ought to be permitted to proliferate and what should not. These are lots and lots of species in all these places.

Mr. RICK HILL. But somebody, Mr. Kennedy, had to make this decision. Are you telling me that nobody makes this decision?

Mr. KENNEDY. No, not at all. It is a—there are a multitude of decisions. There is not a single.

Mr. RICK HILL. All right, let me be more specific. With regard to the question of bison——

Mr. KENNEDY. Yes, sir.

Mr. RICK HILL. And the decision to not manage the herd, who made that decision and who makes that decision today?

Mr. KENNEDY. There is not a decision not to manage that herd. There is not such a decision. It is not made by anybody.

Mr. RICK HILL. Are you saying that there is not a decision to manage the herd through what we commonly refer to as a natural management?

Mr. KENNEDY. There is in effect management of that herd right now in many ways including the parks being opened in the winter. That is a management decision about the behavior of that herd.

Mr. RICK HILL. Mr. Kennedy, let me be more specific. With regard to the size of the bison herd and the decision to manage its size, is there anyone that you can identify for me who has made that decision or will make the decision with regard to how it will manage to a size or whether it will manage at all the size of the herd?

Mr. KENNEDY. OK. The question that you are putting to me, and I am not trying to bicker with you, I am just——

Mr. RICK HILL. I am trying to get you to not evade me. What I want to know is there a person——

Mr. KENNEDY. Who makes the decision as to whether there is or is not a prescribed number or not.

Mr. RICK HILL. Or a decision to manage to that number.

Mr. KENNEDY. OK.

Mr. RICK HILL. Is there a person? I just want to know is there a name, is there a position?

Mr. KENNEDY. Oh, sure there is but what I want to be sure of is that the answer to your question is responsive in this way. If that implies is there a number——

Mr. RICK HILL. No, I am asking for the name or the title of a person.

Mr. KENNEDY. Me. I am the Director of the National Park Service.

Mr. RICK HILL. What do you think about the fact that there have been nearly 1,000 bison destroyed?

Mr. KENNEDY. It depends obviously depending who you are talking to today, whether you like to shoot them or let them starve.

Mr. RICK HILL. What is your opinion about——

Mr. KENNEDY. I do not like watching animals suffer any more than anybody else does. Do I have a scientific determination as to what the carrying capacity of Yellowstone National Park is? I do not. I will turn to Dr. Soukup for his advice on that.

Mr. RICK HILL. I was not asking that question but if I could proceed. Do you feel any responsibility at all for what has occurred there?

Mr. KENNEDY. You bet. And have I been working on this with your governor and others for quite a spell? Yes, sir.

Mr. RICK HILL. OK. Dr. Kay's research, and anybody that has visited the park can see that we have seen a substantial change in the park in the last 25 or 30 years, the aspen, the grasses are

changing, the level of grazing has changed substantially. Does that trouble you at all?

Mr. KENNEDY. Sure.

Mr. RICK HILL. Are you aware of that damage to the park? Does it trouble you at all?

Mr. KENNEDY. Yes, and yes.

Mr. RICK HILL. Do you think it is associated with the decision to use natural regulation?

Mr. KENNEDY. I do not know that. I do not know that and I really do need to defer to the biological scientists who know more than I do.

Mr. RICK HILL. One last question. We have been working, trying to work, with the Park Service to get an environmental impact statement to deal with this issue of what is the carrying capacity. And, frankly, the view of many is that the Park Service has delayed purposely to not allow that statement to be released.

Can I have your assurance that you are going to do everything within your power to see that the deadline of July 31 is met to have that environmental impact statement available?

Mr. KENNEDY. Yes.

Mr. RICK HILL. Thank you. Thank you, Mr. Chairman.

Mr. HANSEN. Thank you. The gentlelady from the Virgin Islands.

Ms. CHRISTIAN-GREEN. Thank you, Mr. Chairman. I would like to take this opportunity to thank you, Mr. Kennedy, on behalf of the people of the Virgin Islands for your tenure as Director of the Park Service and for your particular interest in our concerns and our needs at home.

Mr. KENNEDY. Thank you.

Ms. CHRISTIAN-GREEN. But I want to ask you specifically about some of the recommendations that were made earlier by NPCA and seem to have been supported by many other witnesses this morning. Are you in favor of the recommendation that Congress should enact specific legislative mandate for NPS research?

Mr. KENNEDY. Yes.

Ms. CHRISTIAN-GREEN. And the independent research arm that would establish independent research?

Mr. KENNEDY. I think, ma'am, we talked about what that means really and I think we are on our way to getting now that done. I think independent but useful is what I am for. Independent so it would tell you something you can use.

Ms. CHRISTIAN-GREEN. OK, and the third one that they recommended was that Congress should establish a science advisory board.

Mr. KENNEDY. As an expiring bureaucrat I am not big on advisory boards. I got to tell you I do not know that the Administration's position is on advisory board but I will be doggone if I can see a whole lot of use for a whole panoply of specific advisory boards for archaeology, for history, for sociology, for anthropology or for science. A lot of our people love that stuff. I just do not. Personal view.

Ms. CHRISTIAN-GREEN. Thank you for your answers.

Mr. HANSEN. Thank you. Mr. Kennedy, is not this still the bible for wildlife management?

Mr. KENNEDY. I cannot see what you got there, Mr. Chairman. I will say yes if it is. Is it——

Mr. HANSEN. It is the Wildlife Management in the National Parks, the Leopold Report.

Mr. KENNEDY. OK. Could I ask Mr. Soukup? Is that the bible for wildlife management in the park?

Mr. SOUKUP. Yes, sir, it has been pretty much——

Mr. HANSEN. It is still the one—this lines up perfectly with what this last group of scientists just said as far as Yellowstone and the others. I was just looking at it. It amazed me. Do you still use it or is this now one of those like the Pentagon, you know.

We do studies for the Pentagon ad nauseam and there is a big huge room in the bottom of the Pentagon where they hold Congressional studies and they are never looked at at that point. I just wondered if you had a room like that at the Park Service.

Mr. KENNEDY. As I said earlier and it probably shocked my colleagues and I will be in hot water, I thought Dr. Wagner's formulation of four points made pretty good sense.

Mr. HANSEN. Mr. Kennedy, let me just say this. I want to tell you how much we appreciate you coming up here. The time that you have been Director has been a real privilege. I have an appointment at 3:30 and I do not have a Republican here so I am going to turn it over to my good friend from American Samoa.

Mr. KENNEDY. Thank you, Mr. Hansen. Thank you very much. I appreciate working with you.

Mr. FALEOMAVAEGA. [presiding] In the spirit of bipartisanship, Mr. Kennedy and Mr. Chairman, I am more than delighted to assist my friends on the majority side at this instance as I am sure that this is always the problem with committee hearings and commitments and other committees so I will continue and ask the gentleman from Massachusetts if he has any questions.

Mr. DELAHUNT. No, I do not have any questions, Mr. Kennedy, but simply a statement of the well wishes to an expiring bureaucrat who really does not sound like a bureaucrat, by the way.

Mr. KENNEDY. Thank you, sir. It is a pleasure working with you.

Mr. DELAHUNT. And, you know, during your tenure you have clearly shepherded so well the National Seashore park on Cape Cod, and we are eternally in your debt for your assistance and help in terms of the initiative with the Boston Harbor Islands and you have a proud legacy. Thank you very much.

Mr. KENNEDY. Thank you, sir. Thank you very much.

Mr. FALEOMAVAEGA. The gentleman from Minnesota.

Mr. VENTO. Let me give my kudos to the Director. I think that he has finally got us trained after four years. I think that your statement today in terms of trying to summarize and address and anticipate the questions was exactly what we need. I do not know, having to sit here all day you do not get paychecks.

I think probably having to do with shorter panels or different panels on different days so obviously the goal to get done in the timeframe is easily eclipsed. But we do appreciate your service of the last four years. It has been a very bumpy one but as I said you have done as well as anyone could have in terms of trying to keep it together.

Mr. KENNEDY. Thank you, sir.

Mr. VENTO. We are grateful for that.

Mr. KENNEDY. It is my training in the fourth district of Minnesota, Mr. Vento.

Mr. VENTO. But a couple of the questions, just briefly, that came to mind when you were talking about environmental impact statement. The general plan for Yellowstone or any park is a general management plan, which requires DIS, doesn't it?

Mr. KENNEDY. Yes.

Mr. VENTO. And so there is a lot of participation by everyone in the process and then a specific resource management plan for a specific process in the Park Service for the implementation of the general——

Mr. KENNEDY. Oh, yeah, this is going to be a hard thing to do. All I said was I will do my best. I will, but this is going to be a hard thing to get out in time because there are very, very, as you may have observed today, strong points of view that bear upon this question.

Mr. VENTO. One of the things, Dr. Schaefer, is there any projection for individuals in the Biological Resources Division when there is a question about the advocacy of their work for their proposals? Do they have a basis for if they have a proposal to put forth in this particular matter to another agency and it is not in fact accepted. There is the suggestion of the thought, of the notion, that management is trying to influence the science.

What type of projection, what type of remedy is in place to prevent that type of issue so that the science remains inviable? Do you have any comment on that?

Mr. SCHAEFER. As I said earlier, one reason that the Biological Resources Division wwas formed, and the National Biological Service prior to when it was formed, was to provide more independence for the Department of Interior's scientists. In a situation in which a particular scientist feels that they have not gotten a fair shake in terms of research direction that they would like to go in and one of the Bureau's desires to have that research done, what you do is you start with your supervisor and you talk with him or her about the nature of the problem.

And then you push it up through the system if you are not satisfied with the supervisor's response. But we are absolutely committed to independent research. We encourage our scientists to publish in the peer review literature. We want competition. We want competition for funding and we want competition for publication as well. That is why we emphasize peer review.

We will look into the concerns that Dr. Keigley——

Mr. VENTO. I guess that is a specific case. But there are remedies is what you are saying. You are saying that there are remedies that are in place. They work.

Mr. SCHAEFER. I believe they work but it is my understanding that—well, I think I would like to do what Director Kennedy has done and not engage in specific testimony on this issue.

Mr. VENTO. No, I do not want you to. The other issue is there was some suggestion that you are familiar with the scientific journals and other publications and the peer review process. Do you think it is fundamentally flawed?

Mr. SCHAEFER. Absolutely not. We are looked to worldwide for the quality of our peer review system in this country. It could always be better but it is the very best—

Mr. VENTO. Post-graduate work that are Nobel prizes or——

Mr. SCHAEFER. Well, that is a good sign. That is often pointed to as one of the reasons that we are so competitive internationally.

Mr. VENTO. Director Kennedy, do you have any comments generally about this? Do you have a remedy in terms of these sorts of problems that might occur where there are differences? There is competition in these areas.

Mr. KENNEDY. Yeah, sure, I do. Unfairness exists in the world and when it exists it needs to be looked into by Congress or by the Administration to be sure that things are done fairly. With respect to peer review, of course I believe in it. I have written eight books that have been peer reviewed and I bought 412 peer-reviewed pieces in the course of 50 years of writing.

I do not mind submitting my stuff for somebody else who knows more than I do to read it over and tell me whether it is any good or not. That sounds like a pretty good system to me and it works in science and it does in history.

Mr. VENTO. So it may not be perfect but it is the best we have got.

Mr. KENNEDY. Darn right.

Mr. VENTO. I was really pleased that you, Director Kennedy, mentioned the social sciences, the work that is done there. So often the decisions we make in the committee with regards to increase in park fees and the permitting systems and the whole panoply of decisions that are made in public policy are not backed up, for instance, by what the effect would be by doing something like simply raising a fee will be in terms of park visitation. I mean we cannot answer some of those fundamental questions.

Mr. KENNEDY. No. We need to know what we are doing.

Mr. VENTO. Pardon?

Mr. KENNEDY. We need to know what we are doing.

Mr. VENTO. We need to know, yeah. And so I think that it is not just the biological sciences that may get the attention because the issue of bison, I note that some of the speculation on the bison issue is that they referred to the interaction, for instance, with snowmobiles.

In fact, they packed down snow. The bison can find a pathway out of the park that way. If they were not able to do that, they probably failed and nobody noticed because there was not as much participation and utilization of the park. I do not know that. That is conjecture.

We would like to get more answers about that. Maybe that is an issue that has to be accepted with regards to how we are going to use the park in the winter. Certainly I hope it does not prevent it or limit it in any way. After all, it is an important activity economically and other ways in that area.

But, in any event, I do very much appreciate your testimony. The time has expired. I appreciate Mr. Hansen permitting the hearing to go forward with his absence.

Mr. FALEOMAVAEGA. Thank you. Mr. Kennedy, there are a couple of issues that I would like to clear up for the record because I think

there seems to be a lot of misunderstandings about the shooting of the bison in Yellowstone National Park. And I want to clear this for the record, the National Park Service is not the one that is shooting the bison.

Mr. KENNEDY. That is correct, sir.

Mr. FALEOMAVAEGA. All right. Because of your policy of natural regulation, when a bison leaves the internal boundaries of the territories of the National Park System, that animal, whether it is a bison, elk, or bear, what then happens? Is it still under the responsibility of the National Park Service?

Mr. KENNEDY. In the instances that most people are thinking about which is the northside of Yellowstone, it is the State of Montana that has been on the west side of that portion that has been shooting the bison.

Mr. FALEOMAVAEGA. Right. And the purpose of this is the fear by the State government officials of the State of Montana that the bison, when it goes outside of the boundary of the Yellowstone Park, might have problems with brucellosis?

Mr. KENNEDY. Yes.

Mr. FALEOMAVAEGA. Now is there any scientific, Dr. Schaefer, any scientific study or evidence to verify whether or not bison does have brucellosis?

Mr. SCHAEFER. There are bison——

Mr. FALEOMAVAEGA. Or transmitted?

Mr. SCHAEFER. OK, transmission. There is no documented case of transmission of brucellosis from wild, free-ranging bison to cattle, no documented case.

Mr. FALEOMAVAEGA. And is it my understanding that the National Park Service, as far as you are concerned, there is not an overpopulation of bison currently within the Yellowstone National Park?

Mr. SCHAEFER. No, sir, I do not believe there is an overpopulation of bison in the park.

Mr. FALEOMAVAEGA. So for the record what you are saying is that this 1,000 bison that were shot were shot not because they were starving to death but because of fear that they might have brucellosis, is that——

Mr. SCHAEFER. Not all 1,000 were shot. Some of those were actually sent to slaughter but——

Mr. KENNEDY. They are dead.

Mr. SCHAEFER. Yes, we have lost 1,000 bison for dubious reasons.

Mr. FALEOMAVAEGA. Dubious reasons, what were those reasons, Dr. Schaefer?

Mr. SCHAEFER. Well, the belief that there is a genuine high risk of transmission of brucellosis from the bison to the cattle. The risk simply has not been well documented scientifically.

Mr. FALEOMAVAEGA. Not only that, is not brucellosis really not an inherent disease that comes out of bison, it is really more from cattle, isn't it?

Mr. SCHAEFER. Well, in fact, the Yellowstone bison herd was actually originally infected by cattle.

Mr. FALEOMAVAEGA. So as far as the National Park Service is concerned, there is no scientific evidence whatsoever to show that

even the fact that this 1,000 bison that were shot, there was no evidence, clear evidence, of brucellosis, the presence of brucellosis?

Mr. SCHAEFER. A significant proportion of the bison in Yellowstone are infected and test positive for brucellosis. There is no strong scientific evidence of transmission of the disease from Yellowstone bison to cattle. There has not been a single documented case of transmission of brucellosis from wild bison in Yellowstone to cattle.

Mr. FALEOMAVAEGA. Am I correct that the National Park Service does keep a very clear tab on the number of bison within the Yellowstone National Park system? In other words, you regulate it very closely or do you watch it very closely?

Mr. KENNEDY. We observe it and count it as accurately as we can. These are wild critters that move around but we do our best. We fly over, for instance, and count them.

Mr. FALEOMAVAEGA. OK, now I just want to make sure that we are clear for this record on this. Did you have something you wanted to add, Dr. Schaefer?

Mr. SCHAEFER. No. I was just debating whether or not to say something. Someone was pressing Director Kennedy earlier to indicate who was controlling herd size.

Mr. FALEOMAVAEGA. Yes, please respond to that.

Mr. SCHAEFER. Under natural regulation it is the man upstairs that controls herd size.

Mr. SOUKUP. Or the woman.

Mr. FALEOMAVAEGA. The man upstairs.

Mr. KENNEDY. After all, under natural circumstances all of the combinations of enough food and enough predators and birth rates and death rates.

Mr. FALEOMAVAEGA. I understand that some of the members of the native American community expressed concern and I was just curious if the National Park Service has been in consultation with them because some of the families would have loved to have not because necessarily they are hungry but I think for purposes of their high respect, the cultural aspects of the bison. Has the National Park Service closely worked with some of these native American families who requested that this be done?

Mr. KENNEDY. Yes.

Mr. FALEOMAVAEGA. Are we going to continue to kill the bison or is this——

Mr. KENNEDY. We are not killing the bison. Somebody else is killing the bison.

Mr. FALEOMAVAEGA. Is it just the bison or does this include the elk as well?

Mr. KENNEDY. There is a hunting operation with respect to elk in the State of Wyoming. I am nervous about testifying at this particular moment today on this subject when I think the Secretary of the Interior and the Secretary or Agriculture are meeting with the Montana delegation as we speak, and I think I probably better subside at this point while these great ones make their policy.

Mr. FALEOMAVAEGA. Well, I sincerely hope that they will come out with a resolution——

Mr. KENNEDY. I hope so too.

Mr. FALEOMAVAEGA. [continuing]—to this serious problem because I am sure that in the sense of the American people it just kind of goes against the conscience of every American to see that animals are starving; it is very, very against our sense of conscience with what we do with animals, but I do appreciate your response.

Mr. KENNEDY. Thank you, sir.

Mr. DELAHUNT. Mr. Chairman, could I have one question?

Mr. FALEOMAVAEGA. The gentleman from Massachusetts.

Mr. DELAHUNT. Yes. Earlier in the day another panel, one of our colleagues, I forget whom, made the statement that there is a quarantine in one State, I do not know if it was Montana, of Montana's cattle. And the inference that I drew—and I just think that this needs to be clarified—is that the quarantine resulted from brucellosis that was transmitted by bison from the park so that is no relationship?

Mr. KENNEDY. No, I do not believe that is what the question meant to say.

Mr. DELAHUNT. OK, maybe I am misrepresenting.

Mr. KENNEDY. I just want to say one more thing if I may. I think this is a very, very tough situation in which there are people with legitimately powerfully different views about how many bison or elk there should be in this system. There is no agreement on this subject. It is not an easy one, nor is it easy for there to be a park which is not a zoo next to places where people are running cattle. That is a very, very tough set of problems for the nation.

I guess the only thing that I have resented throughout this entire afternoon, if I may speak for myself, was any inference that this was an easy, slam-dunk decision for any rational, decent person to make. It is very tough and we are doing the best we can with it. Thank you, sir.

Mr. DELAHUNT. Thank you.

Mr. VENTO. Mr. Chairman, I would just point out that these constant contacts between wild populations—whether it be mountain sheep or in this case buffalo and cattle—I mean very often it is the other way, it is from the outside that these things are coming in and affecting the park.

Mr. KENNEDY. Yes.

Mr. VENTO. And while the transmission problem, the brucellosis from cattle to buffalo or bison are possible or maybe the other, maybe, we do not know, but in these instances it is possible to keep them off these grounds but they are using these grazing allotments right up to the boundary of the park and so there is the suggestion that the species or other process might possibly be contaminated.

But the same thing could be said with regard to the elk. Although they may share a different range, they also carry brucellosis and they are not shooting them. They are going out there wandering because they are game species, and so there is not perhaps the same ground share and other factors that enter into it because also I think some cultural values that affect why they are not shot in those instances.

So it is important to understand. This is a problem in terms of population, quite candidly, in all the parks. We have a frankly

much more acute, I would say, in some of the eastern parks like Camp David.

Mr. KENNEDY. Or Gettysburg.

Mr. VENTO. You do not want gunshot around for other reasons, you know. There is a population there of whitetail deer that look pretty scrawny. Of course, then again it may not be a natural species in some areas but I think it is in that area frankly. Dr. Schaefer, did you have any comments?

Mr. SCHAEFER. I just wanted to mention that we very much support additional research to understand the transmission issue better. As you pointed out, a significant number of the elk are infected with the bacterium that causes brucellosis and we need to understand whether there is transmission between elk and bison, and whether there is transmission in the reverse direction.

There are other mammals in the ecosystem that can be infected as well. It is something that we do not know a lot about. The other point is that the key to solving the problem may be developing a vaccine that is safe and effective in bison. We would like to put more money, time, and effort into the development of that particular vaccine.

Mr. KENNEDY. I think the problem is, of course, this brings us right back full circle in terms of suggesting that the Park Service has to be at the cutting edge. I am sure that that would be interesting or the Biological Resources Division will be at the cutting edge in terms of doing primary research on things like antigen and antibody reactions.

And I think that Dr. Fuchi at the National Institute of Health might have wherever he went to these days in terms of dealing with retro viruses and other factors might have something to add to this in a qualitative way. So I mean I think we are just saying we get the whole issue of science here that we would have to advance and it is not as though brucellosis has not received a lot of research dollars.

Across the country we deal with it in fact and so I mean it goes without saying. I do not know what the problem is incidentally with the Montana beef versus Alabama but if the price of beef was a little higher maybe the problem would not be so bad, I do not know.

Mr. VENTO. Mr. Chairman, I think the only positive forward motion that I can suggest on this particular point is that it would be a good thing for the appropriators, I know this is not an appropriations hearing, to listen carefully when the Department of Agriculture discusses the necessity for precise research on the question of vaccines that might work for bison as distinguished from vaccines that might work for cattle.

That is a thing that might actually help if we paid attention to that. The Department of Agriculture is the appropriate body probably for that subject but it is important.

Mr. FALEOMAVAEGA. I would just like to say that there certainly is a sense of unfairness that directing our attention to shooting bison for fear of brucellosis and yet the same is not done for elk, and I think not only is there a contradiction but certainly a very, very serious problem. And then using the name of starvation and then accusing the National Park Service for being responsible when

in fact this is not the case and that is what I call irresponsible media coverage of really the real story with the bison in Yellowstone.

Mr. Kennedy, thank you again, and Dr. Schaefer, and members of your office. Thank you, the panelists who were here previously. I know the Chairman would have stated the same thing in expressing his appreciation for your being here this afternoon and also the members of the committee. The hearing is adjourned.

[Whereupon, at 3:33 p.m., the Subcommittee was adjourned; and the following was submitted for the record:]

STATEMENT OF BARRY T. HILL, ASSOCIATE DIRECTOR, ENERGY, RESOURCES, AND SCIENCE ISSUES, RESOURCES, COMMUNITY, AND ECONOMIC DEVELOPMENT DIVISION, GAO

Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss our views on the National Park Service's knowledge of the condition of the resources that the agency is entrusted to protect within our National Park System. As you know, the Park Service is the caretaker of many of this nation's most precious natural and cultural resources. The agency's mission, as mandated by the Congress, is to provide for the public's enjoyment of these resources while, at the same time, preserving and protecting these great treasures so they will be unimpaired for the enjoyment of future generations. The 374 units that now make up the National Park System cover over 80 million acres of land and include an increasingly diverse mix of sites ranging from natural areas such as Yellowstone and Yosemite National Parks to urban areas such as Gateway National Recreation Area in Brooklyn, New York, to national battlefields, national historic sites, national monuments, and national preserves.

Over the years, in response to a variety of concerns raised by this Subcommittee and other congressional committees, we have reported on several aspects of resource management within the National Park Service. My testimony today is based primarily on the findings of three recent reports, [1] which generally focused on what the Park Service knows about the condition of the resources entrusted to it.

In brief, Mr. Chairman, our work has shown that although the National Park Service acknowledges, and its policies emphasize, the importance of managing parks on the basis of sound scientific information about resources, today such information is seriously deficient. Frequently, baseline information about natural and cultural resources is incomplete or nonexistent, making it difficult for park managers to have a clear knowledge about what condition the resources are in and whether the condition of those resources is deteriorating, improving, or staying the same. At the same time, many of these park resources face significant threats, ranging from air pollution, to vandalism, to the development of nearby land. However, even when these threats are known, the Park Service has limited scientific knowledge about the severity of them and their impact on affected resources. These concerns are not new to the Park Service, and, in fact, the agency has taken steps to improve the situation. However, because of limited funds and other competing needs that must be completed, the Park Service has made relatively limited progress to correct this deficiency of information. There is no doubt that it will cost money to make more substantial progress in improving the scientific knowledge base about park resources. Dealing with this challenge will require the Park Service, the administration, and the Congress to make difficult choices involving how parks are funded and managed. However, without such an improvement, the Park Service will be hindered in its ability to make good management decisions aimed at preserving and protecting the resources entrusted to it.

INFORMATION ABOUT PARK RESOURCES IS ESSENTIAL FOR EFFECTIVE MANAGEMENT

The National Park System is one of the most visible symbols of who we are as a land and a people. As the manager of this system, the National Park Service is caretaker of many of the nation's most precious natural and cultural resources,

[1] National Park Service: Activities Outside Park Borders Have Caused Damage to Resources and Will Likely Cause More (GAO/RCED-94-59, Jan. 3, 1994), National Parks: Difficult Choices Need to Be Made About the Future of the Parks (GAO/RCED-95-238, Aug. 30, 1995), and National Park Service: Activities Within Park Borders Have Caused Damage to Resources (GAO/RCED-96-202, Aug. 23, 1996).

ranging from the fragile ecosystems of Arches National Park in Utah to the historic structures of Philadelphia's Independence Hall and the granite faces of Mount Rushmore in South Dakota.

Over the past 30 years, more than a dozen major studies of the National Park System by independent experts as well as the Park Service itself have pointed out the importance of guiding resource management through the systematic collection of data-sound scientific knowledge. The recurring theme in these studies has been that to manage parks effectively, managers need information that allows for the detection and mitigation of threats and damaging changes to resources. Scientific data can inform managers, in objective and measurable terms, of the current condition and trends of park resources. Furthermore, the data allow managers to make resource management decisions based on measurable indicators rather than relying on judgment or general impressions.

Managing with scientific data involves both collecting baseline data about resources and monitoring their condition over time. Park Service policy calls for managing parks on this basis, and park officials have told us that without such information, damage to key resources may go undetected until it is so obvious that correcting the problem is extremely expensive—or worse yet, impossible. Without sufficient information depicting the condition and trends of park resources, the Park Service cannot adequately perform its mission of preserving and protecting these resources.

INFORMATION ON THE CONDITION OF MANY PARK RESOURCES IS INSUFFICIENT

While acknowledging the importance of obtaining information on the condition of park resources, the Park Service has made only limited progress in developing it. Our reviews have found that information about many cultural and natural resources is insufficient or absent altogether. This was particularly true for park units that feature natural resources, such as Yosemite and Glacier National Parks. I would like to talk about a few examples of the actual impact of not having information on the condition of park resources, as presented in our 1995 reports. [2]

CULTURAL RESOURCES

Generally, managers at culturally oriented parks, such as Antietam National Battlefield in Maryland or Hopewell Furnace National Historic Site in Pennsylvania, have a greater knowledge of their resources than managers of parks that feature natural resources. Nonetheless, the location and status of many cultural resources especially archaeological resources-were largely unknown. For example, at Hopewell Furnace National Historic Site, an 850-acre park that depicts a portion of the nation's early industrial development, the Park Service has never conducted a complete archaeological survey, though the site has been in the park system since 1938. A park official said that without comprehensive inventory and monitoring information, it is difficult to determine whether the best management decisions about resources are being made.

The situation was the same at large parks established primarily for their scenic beauty, which often have cultural resources as well. For example, at Shenandoah National Park in Virginia, managers reported that the condition of more than 90 percent of the identified sites with cultural resources was unknown. Cultural resources in this park include buildings and industrial artifacts that existed prior to the formation of the park. In our work, we found that many of these sites and structures have already been damaged, and many of the remaining structures have deteriorated into the surrounding landscape.

The tragedy of not having sufficient information about the condition and trends of park resources is that when cultural resources, like those at Hopewell Furnace and Shenandoah National Park, are permanently damaged, they are lost to the nation forever. Under these circumstances, the Park Service's mission of preserving these resources for the enjoyment of future generations is seriously impaired.

NATURAL RESOURCES

Compared with the situation for cultural resources, at the parks we visited that showcase natural resources, even less was known about the condition and trends that are occurring to natural resources over time. For example:

---

[2] Appendix I lists the 12 park units we visited while conducting this review. These units represent a cross section of the units within the park system. However, because they are not a randomly drawn sample of all park units, they may not be representative of the system as a whole.

—At California's Yosemite National Park, officials told us that virtually nothing was known about the types or numbers of species inhabiting the park, including fish, birds, and such mammals as badgers, river otters, wolverines, and red foxes.

—At Montana's Glacier National Park, officials said most wildlife-monitoring efforts were limited to four species protected under the Endangered Species Act.

—At Padre Island National Seashore in Texas, officials said Hey lacked detailed data about such categories of wildlife as reptiles and amphibians as well as mammals such as deer and bobcats. Park managers told us that-except for certain endangered species, such as sea turtles-they had inadequate knowledge about whether the condition of wildlife was improving, declining, or staying the same.

This lack of inventory and monitoring information affects not only what is known about park resources, but also the ability to assess the effect of management decisions. After 70 years of stocking nonnative fish in various lakes and waterways in Yosemite, for example, park officials realized that more harm than good had resulted. Nonnative fish outnumber native rainbow trout by a 4-to-1 margin, and the stocking reduced the numbers of at least one federally protected species (the mountain yellow-legged frog).

INFORMATION ON THREATS TO PARK RESOURCES IS AISO LIMITED

The Park Service's lack of information on the condition of the vast array of resources it must manage becomes even more significant when one considers the fact that many known threats exist that can adversely affect these resources. Since at least 1980, the Park Service has begun to identify threats to its resources, such as air and water pollution or vandalism, and to develop approaches for dealing with them. [3] However, our recent reviews have found that sound scientific information on the extent and severity of these threats is limited. Yet preventing or mitigating these threats and their impact is at the core of the agency's mission to preserve and protect the parks' resources.

We have conducted two recent reviews of threats to the parks, examining external threats in 1994 and internal threats in 1996. Threats that originate outside of a park are termed external and include such things as off-site pollution, the sound of airplanes flying overhead, and the sight of urban encroachment. Protecting park resources from the damage resulting from external threats is difficult because these threats are, by their nature, beyond the direct control of the Park Service. Threats that originate within a park are termed internal and include such activities as heavy visitation, the impact of private inholdings within park grounds, and vandalism. In our nationwide survey of park managers, they identified more than 600 external threats, and in a narrower review at just eight park units, managers identified more than 100 internal threats. [4] A dominant theme in both reports was that managers did not have adequate information to determine the impact of these threats and correctly identify their source. For the most part, park managers said they relied on judgment, coupled with limited scientific data, to make these determinations.

For some types of damage, such as the defacement of archaeological sites, observation and judgment may provide ample information to substantiate the extent of the damage. But for many other types of damage, Park Service officials agree that observation and judgment are not enough. Scientific research will generally provide better evidence about the types and severity of damage occurring and any trends in the seventy of the threats. Scientific research also generally provides a more reliable guide for mitigating threats.

Two examples will help illustrate this point. In California's Redwood National Park, scientific information about resource damage is helping mitigation efforts. Scientists used research data that had been collected over a period of time to determine the extent to which damage occurring to trees, fish, and other resources could be attributed to erosion from logging and related road-building activities. On the basis of this research, the park's management is now in a position to begin reducing the threat by advising adjacent landowners on better logging and road-building techniques that will reduce erosion.

The second example, from Crater Lake National Park in Oregon, shows the disadvantage of not having such information. The park did not have access to wildlife biologists or forest ecologists to conduct scientific research identifying the extent of damage occurring from logging and its related activities. For example, damage from logging, as recorded by park staff using observation and a comparison of conditions

[3] State of the Parks - 1980: A Report to the Congress, U.S. Department of the Interior, National Park Service (May 1980).

[4] Appendix II lists the eight park units we studied during this review.

in logged and untagged areas, has included the loss of habitat and migration corridors for wildlife. However, without scientific research, park managers are not in a sound position to negotiate with the Forest Service and the logging community to reduce the threat.

ENHANCING KNOWLEDGE ABOUT RESOURCES WILL INVOLVE DIFFICULT CHOICES

The information that I have presented to you today is not new to the National Park Service. Park Service managers have long acknowledged that to improve management of the National Park System, more sound scientific information on the condition of resources and threats to those resources is needed. The Park Service has taken steps to correct the situation. For example, automated systems are in place to track illegal activities such as looting, poaching, and vandalism, and an automated system is being developed to collect data on deficiencies in preserving, collecting, and documenting cultural and natural resource museum collections. For the most part, however, relatively limited progress has been made in gathering information on the condition of resources. When asked why more progress is not being made, Park Service officials generally told us that funds are limited and competing needs must be addressed.

Our 1995 study found that funding increases for the Park Service have mainly been used to accommodate upgraded compensation for park rangers and deal with additional park operating requirements, such as safety and environmental regulations. In many cases, adequate funds are not made available to the parks to cover the cost of complying with additional operating requirements, so park managers have to divert personnel and/or dollars from other activities such as resource management to meet these needs. In addition, we found that, to some extent, these funds were used to cope with a higher number of park visitors.

Making more substantial progress in improving the scientific knowledge base about resources in the park system will cost money. At a time when federal agencies face tight budgets, the park system continues to grow as new units are added—37 since 1985, and the Park Service faces such pressures as higher visitation rates and an estimated $4 billion backlog of costs related to just maintaining existing park infrastructures such as roads, trails, and visitor facilities. Dealing with these challenges calls for the Park Service, the administration, and the Congress to make difficult choices involving how national parks are funded and managed. Given today's tight fiscal climate and the unlikelihood of substantially increased federal appropriations, our work has shown that the choices for addressing these conditions involve (1) increasing the amount of financial resources made available to the parks by increasing opportunities for parks to generate more revenue, (2) limiting or reducing the number of units in the park system, and (3) reducing the level of visitor services. Regardless of which, if any, of these choices is made, without an improvement in the Park Service's ability to collect the scientific data needed to properly inventory park resources and monitor their condition over time, the agency cannot adequately perform its mission of preserving and protecting the resources entrusted to it.

This concludes my statement, Mr. Chairman. I would be happy to respond to any questions you or other Members of the Subcommittee may have.

TESTIMONY OF PAUL C. PRITCHARD, PRESIDENT, NATIONAL PARKS AND CONSERVATION ASSOCIATION

Introduction:

Good afternoon Mr. Chairman and members of the Subcommittee. My name is Paul C. Pritchard and I am the President of the National Parks and Conservation Association (NPCA). NPCA is America's only private, nonprofit citizen organization dedicated solely to protecting, preserving and enhancing the National Park System. An association of "Citizens Protecting America's Parks," NPCA was founded in 1919, and today has more than 500,000 members.

On behalf of our association, I commend the subcommittee for holding this hearing today. Effective research and resource management are essential to the future of our national parks and I am encouraged by the Committee's recognition of this important connection. Since its founding in 1919, NPCA has advocated understanding and protecting the national parks through science? based management. In fact, one of the principal goals of our founders was, "to thoroughly study the National Parks and make past as well as future results available for public use."

I am pleased to offer testimony today on the effectiveness of the National Park Service's scientific research program in carrying out the agency's resource protection

mission. I also appreciate the Chairman's invitation to comment on previous reviews of that program.

Twice in the past ten years, NPCA has commissioned significant studies of park research. The purpose of these studies was to improve park protection through better research and resource management. A summary of our recommendations is appended to my testimony as Appendix 1 and I would appreciate its inclusion in the hearing record.

I hope that the Appendix will be helpful and I would like to take this opportunity to strongly urge the committee to draft a bill that will mandate the following:

1. A comprehensive program of scientific research in the parks;
2. That the scientific basis for all management decisions be fully documented;
3.That every effort be made to utilize the scientific talent and wealth of knowledge of our nation's universities and that such cooperation be inclusive rather than exclusive;
4. That no research occur in the parks unless it is authorized by the National Park Service;
5. That all findings be made know to the National Park Service and the public and be made available on the World Wide Web;
6. That research priorities be set according to management needs, not solely on the basis of each researcher's personal or institutional interests; and
7. That non-profit 501(c)(3) organizations be given incentives to provide financial support for research in the parks.

Legislative Authority.

The necessity for science-based management of the national parks is not a new idea. Although there is no specific statutory mandate for such research, at least 11 existing laws require some kind of research in the parks They are:

—Lacey Act (1900);
—Historic Sites Act (1935);
—Wilderness Act (1964);
—Concessions Policy Act (1965);
—National Historic Preservation Act (1966);
—National Environmental Policy Act (1969);
—Endangered Species Act (1973);
—Clean Air Act (1973);
—National Parks and Recreation Act (1978);
—Archeological Resources Protection Act (1979);
—Native American Graves Protection and Repatriation Act (1990) [1]

Commissions and Reports.

Over the last 35 years, at least 15 reports or commissions have dealt with science in the National Park System. These include:

—The Government Accounting Office's report on NPS visitor services (1995);
—"A Biological Survey for the Nation." The National Research Council's plan for establishing a National Biological Survey (1993);
—The National Park Service's report entitled "Science and the National Parks II" (1993);
—The Ecological Society of America's report on ecological science in the parks (1992).
—The National Research Council's report entitled "Science and the National Parks" (1992).
—The National Park Service's "Vail Agenda" report (1992).
—The National Park Service's "Report of a Workshop for a National Park Service Ecological Research Program" (1992).
—The National Parks and Conservation Association's Commission on Research and Resource Management Policy in the National Park System (1988).
—The National Parks and Conservation Association's "National Park System Plan: A Blueprint for Tomorrow" (1988).
—A. Starker Leopold's and Durward Allen's report entitled "A Review and Recommendations Relative to the NPS Science Program" (1977).
—"National Parks for the Future" The Conservation Foundation's report on problems facing the National Park System (1972).
—The National Research Council's publication entitled "A Report by the Advisory Committee to the National Park Service on Research" (1963).
—A. Starker Leopold's report entitled "Wildlife Management in the National Parks" (1963).

---

[1] National Park Service. Usable Knowledge: A Plan for Furthering Social Science and the National Parks. 7 February 1996.

NPCA's National Park System Plan: In 1988, the National Parks and Conservation Association released a nine volume plan for the national parks. Volume two of this plan, entitled "Research in the Parks: An Assessment of Needs," was devoted entirely to the status of research in the parks and the shortcomings of the research program at that time. This plan contained 38 recommendations for improving the status of research in the parks.

Our recommendations are still relevant. Among other things, we concluded that:

1. Congress should enact a specific legislative mandate for NPS research which clearly defines the role of research in resource management and decision making and requires the completion of standardized Service-wide inventories of natural and cultural resources, and implementation of permanent monitoring programs.

2. The National Park Service should establish an independent research arm, distinct from management and operations, to assure long-term continuity and objectivity in the NPS research program. This arm should integrate natural, cultural and social science divisions under an Associate Director for Research. Regional Chiefs of Research should report directly to the respective division chiefs at WASO. All park researchers should report to the respective Regional Chief of Research.

3. Congress should establish a Science Advisory Board of demonstrably qualified experts to provide independent, balanced and expert assessment of NPS natural, cultural, and social science needs and programs. Regional and park-specific adhoc science advisory boards should also be established.

4. The NPS should include in its annual budget request, and Congress should appropriate, a separate line item for research equivalent to 10% of the total operating budget of the National Park Service. Congress should specify that the funds be used to establish a servicewide projects fund; increased park and regional base funding for research, inventory and monitoring; and a contingency fund for emergency needs.

5. NPS should establish additional Cooperative Park Studies Units and cooperative agreements focusing on the social sciences, historical and archaeological research. To ensure that the best available expertise is obtained, CPSU cooperative agreements should require that the CPSU administrator solicit proposals from private sector scientists with geographic and subject matter expertise in the parks under study.

6. Each NPS region should be required to prepare an annual report, outlining all inhouse, contract, and CPSU research that has been completed that year, is still in progress, or is in need of initiation.

7. The NPS should develop and implement a standardized, yet flexible, technique for measuring visitation and visitor needs in the parks. This should include the establishing of "indicator" parks that would be surveyed periodically to provide baseline information, and show comparisons between parks. The results of these studies should be disseminated to concessioners and the tourism industry.

8. Funding should be provided to enable the NPS History Division to conduct the historic theme studies which are used to identify potential additions to the national park system, the national historic landmarks system, and the National Register of Historic Places. A shipwrecks theme study should be conducted and appropriate National Register nominations prepared. Where appropriate, national historic landmarks should be designated.

9. The NPS should conduct a survey assessment of the historical research function throughout the service; consider a more stable funding source for historic resource studies for natural and recreational areas as well as administrative histories that analyze policy issues; and establish base funding for cultural resource studies whose principle purpose is to provide data for interpretation.

1a The NPS should provide additional funds for the Submerged Cultural Resources Unit and the Maritime History Project so that underwater archaeologists can continue to inventory and document shipwrecks before treasure hunters strip them of their research potential.

11. Parks with significant natural resources should develop or expand a Geographic Information System, a computerized mapping system that organizes data spatially, enabling park managers to make timely, effective management decisions.

12. The development and implementation of a comprehensive NPS natural resources inventory and monitoring program should be a high priority. The I&M program should be conducted in cooperation with adjacent landowners, state and federal agencies, non-governmental organizations, and the governments of other countries.

13. The NPS should establish technical research centers for each major biome, using existing Cooperative Park Study Units if possible. Topic-oriented or biome-oriented centers should be multi-organizational to foster cooperation with other agencies experiencing similar resource problems, and should be staged with interdiscipli-

nary science teams that could travel to individual parks to assist with special research problems. The centers could also serve as training and continuing education centers for researchers, resource management specialists and park managers.

The Gordon Commission In 1989, NPCA funded, in cooperation with the National Park Service, the Commission on Research and Resource Management Policy in the National Park System, a "blue ribbon" panel whose mission was to assess the roles of research and resource management in the future of the national parks. Also known as the "Gordon Commission," after its chairman, John C. Gordon, Dean of Yale University's School of Forestry and Environmental Studies, the Commission made numerous recommendations for improving science and management in the parks. The Gordon Report contains a series of recommendations, including several that NPCA had already made in the 1988 System Plan.

In 1991, the National Park Service followed NPCA's lead by requesting that the National Research Council (NRC) of the National Academy of Sciences review the status of science-based management in the national parks. In 1992, the NRC concurred with the Gordon Commission and reported that science-based management of the parks was woefully inadequate.

The NRC made 16 major recommendations for improving park research. A recent analysis of the NRC recommendations and those made by NPCA in 1988 and 1989 indicates that each of the NRC's 16 recommendations was a restatement of a Gordon Commission recommendation.

One recommendation that appeared in all three reports was the call for a research mandate for the NPS. In December 1993, and again in late 1996, members of the NPS Directorate (now National Leadership Council) circulated a draft bill that would "provide for a program of research in the units of the National Park System," [2] but, no bill was introduced.

National Biological Survey: Impact on the National Park Service Consistent with the plans set forth in the 1994 report entitled "A Biological Survey for the Nation," the National Park Service lost many of its researchers during the time the research mandate bill was being circulated in draft form. These former NPS researchers joined scientists from the Cooperative Research Units of the U.S. Fish and Wildlife Service and several other federal agencies to form the National Biological Survey. [3] The result, according to a survey of NPS managers and former researchers, was the collapse of already inadequate science-based management of the national parks.

The results of a survey conducted in early 1996 by the office of the Associate Director for Natural Resource Stewardship and Science are recorded in a report entitled "Working Relationships Between The National Biological Service and the National Park Service: A Survey of Managers and Scientists." The Service described the survey results as "...representing the opinions of selected NPS managers and illustrating the range and diversity of view among NPS partners within the NBS." [4]

This survey revealed the impact the establishment of the NBS had done on NPS research capacity and the application of research findings to park resources management. Survey results included the following:

1. Before the transfer of NPS scientists to the NBS, 49% of the NPS respondents reported that they had received scientific assistance "regularly;"
2. Since the transfer of NPS scientists to the NBS, only 19% of the respondents reported receiving assistance from the transferred NPS scientists "regularly;"
3. Since the transfer of NPS scientists to the NBS, the percentage of respondents "never" receiving scientific guidance had nearly tripled, from 11% to 32%; and
4. Respondents were asked whether they received research and technical assistance from National Biological Service scientists who were not previously with the NPS. 5% reported receiving such assistance "regularly," 24% "occasionally," and 71% reported none.

The Park Service drew the following conclusions from the survey results:

1. "The perceived level of research and technical assistance regularly provided by former NPS scientists has declined;"
2. "The proportion of managers receiving no assistance has increased;"

---

[2] Memorandum from Acting Director, NPS to Deputy Director, Legislative and Intergovernmental Affairs through Assistant Secretary for Fish and Wildlife and Parks. 14 December 1993.

[3] For an exhaustive description of the National Biological Survey, its structure and purpose, see: *A Biological Survey for the Nation.* National Research Council. National Academy Press. 1993.

[4] United States. Natural Resource Stewardship and Science Directorate, National Park Service. *Working Relationships Between The National Biological Service and the National Park Service: A Survey Managers and Scientists.* Washington, D.C. 17 April 1996.

3. One-fifth of the scientists who were transferred from NPS to the National Biological Service were either "not encouraged or actively discouraged" from assisting NPS managers after the transfer;

4. Over 50% of the scientists who were transferred from NPS to the National Biological Service "felt that their support from NPS parks had declined." [5]

This status of research in the parks reached a new low on October 2, 1996 when the U.S. Geological Survey (USGS) announced the creation of its Biological Resources Division (BRD) and the appointment of Dennis B. Fenn, a former National Park Service soil scientist, as its first chief biologist. This announcement marked the transfer of NBS scientists from the National Biological Service (formerly Surly) to the USGS. It meant that former park scientists, already far removed from park managers by the bureaucracy of the NBS, had become employees of the USGS. [6]

The BRD claims that it has "...a strong commitment to supporting the scientific needs of the other bureaus within the Interior Department," according to a USGS press release. However, based on the results of the NBS experiment, there is no reason to believe that this will be the case.

This is particularly unfortunate, because, as the DOI Science Board wrote in a September 9, 1996, service-wide proposal for science-based management,

...management of the nation's lands and waters requires skillful public service supported by sound science. The challenges of the 21st century—and the choices they will shape for the American people—will demand even more skill and science. [7]

NPCA strongly agrees with this statement.

Importance of Research-based Resource Management:

There are many reasons why we must work to improve research and resource management in the parks. First of all, until Congress funds research and resource management adequately, we will continue to deal with the unresolved problems this committee has faced in recent years. Until we base management decisions on the best possible scientific evidence, we will continue to be engaged in arguments based on perception and assumption, rather than on fact.

Another important reason for encouraging science-based management is to better protect our parks for the benefit of the American people. The National Park Service's Organic Act mandate requires the agency to "...conserve the scenery and the natural and historic objects and the wild life therein..." in perpetuity. We cannot achieve that goal without research because we cannot protect what we do not understand.

There are many examples of how a little research, linked to competent management, can benefit the parks.

Some examples:

1. Enhancing Visitor Experience and Resource Protection. After NPCA developed the Visitor Impact Management framework, a tool land managers can use to protect park resources from over crowding and ensure visitor enjoyment of the parks, the National Park Service began implementing a derivation of this process as the Visitor Experience and Resource Protection program. This is an example of how research can inform managers and produce benefits for parks and people.

2. Protecting Air Quality. The air quality information that has been developed through monitoring and experimentation at Shenandoah National Park and Great Smokies National Park has enabled the National Park Service to show that air pollution generated miles away can and does harm plants and trees in the parks. This information has allowed citizens to better understand how their development decisions and pollution control activities affect our national parks.

4. Protecting Park Ecology. Researchers from the University of Washington have conducted studies that are helping the park service protect the park's beautiful subalpine meadows.

5. Utilizing Partners. NPS has a cooperative agreement with the Organization of American Historians (OAH), the largest American History organization. In November 1995, OAH established a National Park Committee. As a result of this cooperation, five members of OAH spent three days at Antietam reviewing Civil War scholarship and ways it could be integrated into the National Park Service's resource management and interpretation programs there. [8]

---

[5] Ibid.

[6] "'New' U.S. Geological Survey Names First Chief Biologist." PRNewswire, America on-line News Profiles Service. 2 October 1996.

[7] United States. Department of the Interior Science Board. Science fore Management in the 21st Century: A Network of Cooperative Ecosystem Studies Units. 9 September 1996. pg. 1.

[8] Pitcaithley, Dwight. Personal Interview. 18 July 1996.

6. Studying Visitor Needs. The Visitor Service's Project Database (VSP) provides a record of visitor characteristics and needs. It is available to the public and is maintained by the NPS Visitor Services Project at the University of Idaho. It contains data collected in more than 80 units of the National Park System since 1982. The data represent snapshots in individual parks and there is no monitoring of these parks over time, but the VSP is at least a step in the right direction.

While these successes are important, they need to be multiplied many fold. There is still so much we need to know. Until we have an adequate level of research, park resources will remain at risk.

Failures and Shortcomings of NPS Research and Resource Management While there have been many successes as a result of cooperation between researchers and resource managers, there have also been many failures. In many instances, even the most basic resource knowledge, in the hands of well-trained managers, could have prevented the irreversible loss of park resources.

Some examples:

1. Everglades. The recent crisis in the Florida Everglades has arisen in part because of a lack of basic knowledge about the ecosystem of south Florida. Had the Park Service and other agencies better understood the dynamics and hydrology of that system before its alteration began, we would not need to be devoting hundreds of millions of dollars to restoring the system.

2. Cultural Resources in the Southwest. For decades, the National Park Service has lacked the information needed to care for prehistoric ruins in the southwestern United States. As a result of this information gap, the Park Service has damaged many irreplaceable structures and ruined others. A recent initiative, announced in the FY 98 budget and known as "Vanishing Treasures," is an attempt to begin research-based management to these cultural treasures.

3. Transportation. The dramatic increases in visitation the parks have experienced since the l950s has been met with a decades old response: building more roads for single passenger vehicles. Access to our parks will be one of the most controversial issues in our future if we do not begin to seek and apply knowledge to this management challenge. This presents an opportunity to correct our course and gain adequate knowledge before building new roads, or monorails, or funding unknown transportation strategies.

4. Water in Death Valley. During a recent visit to Death Valley, I learned that development of lands adjacent to the park could dramatically drop the area's water table and dry up already rare springs. But park managers aren't sure how development will affect the park's few oases, because the basic research on the area's hydrology has not been done. If landowners and park lovers are at odds over the allocation of water in the area, there is little we can do to resolve conflict until we have baseline data regarding the region's hydrology.

5. Global Climate Change. An additional and equally daunting challenge facing our parks is global warming. A recent, informal review conducted by NPCA has shown that 49 of our 54 national parks could lose their most significant features to global climate change. This much we think we know, but we have taken little action to counter this threat. This breakdown between knowledge and action is an additional threat to the parks.

6. Yellowstone National Park's Buffalo Management. A final, but especially timely, example of how current research, science, and information are inadequate to manage park resources is the case of the buffalo herd in Yellowstone National Park. This winter, over 1,000 American buffalo have been slaughtered in and around Yellowstone. This amounts to one-third of the park's buffalo population.

Park personnel have participated in the slaughter under the guise of "disease prevention." Federal and state bureaucrats have claimed that because the buffalo may be infected with brucellosis, they must not be allowed to commingle with domestic cattle. Nor must they be allowed to use their historic wintering grounds, on public or private lands, because they allegedly pose a threat to domestic cattle.

But the trouble is, there is no scientific evidence that documents the transmission of brucellosis from buffalo to domestic cattle in the wild. None.

One-third of Yellowstone National Park's buffalo have been sacrificed because the National Park Service, the U.S. Department of Agriculture, and the state of Montana refuse to base management on facts. This lack of facts can only lead us into conflict. This is unacceptable and it must not continue.

No one wants to put domestic cattle at risk. My family has cow-calf and dairy operations. I come from a cattle farming family.

I implore the members of the committee to steer us out of these troubled waters of management by supposition and innuendo and toward a more reasonable management informed by research results.

Conclusion.

In closing, I offer a few general recommendations for improving park protection through research based resource management.

1. Before investing $5 billion or more in capital improvements for the parks, Congress should invest in intellectual capital for the parks—the scientists and the resource managers—that will make sure that every one of those dollars is wisely spent. Adequate research will help us avoid conflict and ensure that we "...conserve the scenery and the natural and historic objects and the wild life..." in perpetuity.

2. Park research should depend upon reliable links to the academic community through programs such as the Department of Interior Science Board's proposed "Cooperative Ecosystem Studies Units."

APPENDIX 1: Summary of Recommendations, National Parks and Conservation Association: 1988, 1989, National Research Council: 1992

TESTIMONY OF PAUL C. PRITCHARD, PRESIDENT, NATIONAL PARKS AND CONSERVATION ASSOCIATION

In 1991, the National Park Service responded to the research-related recommendations the National Parks and Conservation Association (NPCA) made in its 1988 National Park System Plan as follows:

In general terms, the Service supports much of the thrust of this volume as it advocates more research funding and personnel, better inventory and monitoring programs, enhanced professional standards and capabilities, etc. However, the Service maintains that it has the full authority to do whatever research is needed and disagrees that there is a need for additional legislative authority for research, though some legislative clarifications be helpful.

Regarding the structure of the science/research programs of the National Park Service, since investigation and formulation of the NPCA recommendations on park research, the Service has entered into an agreement with the National Academy of Sciences and they are now conducting a comprehensive review of the NPS science programs. Thus, pending the outcome of that review, the Service will not comment on NPCA's recommendations regarding the structure of the science programs. [1]

In 1992, National Academy Press published the results of this "comprehensive review of the NPS science" programs as a book entitled "Science and the National Parks." NAS planned to conduct a Service-wide peer review of research but "soon determined that the crucial problems in the NPS research program are not at the level of individual projects. Instead, they are more fundamental, rooted in the culture of the NPS and in the structure and support it gives to research. Thus, the committee concluded that the real need was for an assessment more broadly focused on the research program and its place within the agency (emphasis added)." [2]

This report was a restatement, four years after the fact, of NPCA's assessments of NPS science in the 1988 *National Park System Plan* and the Gordon Report. The National Academy of Sciences included the following laundry list of recommendations for improving the NPS science program:

1. To eliminate once and for all any ambiguity in the scientific responsibilities of the Park Service, legislation should be enacted to establish the explicit authority, mission and objectives of the national park science program.

Status: No Action.

As shown below, NPCA already had made this recommendation in the 1988 *National Park System Plan* and again in its 1989 report entitled *National Parks: From Vignettes to a Global View* (The Gordon Report).

"Congress should enact a specific legislative mandate for NPS research which clearly defines the role of research in resource management and decision making and requires the completion of standardized Servicewide inventories of natural and cultural resources, and implementation of permanent monitoring programs." [3]

On at least two occasions, the Park Service has drafted such legislation, most recently at the request of Sen. Jeffords in 1996, but no bill has been introduced.

---

[1] "'NPS Review Comments on the National Parks and Conservation Association's National Park System Plan—*Investing in Park Futures - The National Park System: A Blueprint for Tomorrow.*" Memorandum from Acting NPS Director to Directorate, Field Directorate, WASO Division and Office Chiefs. 18 April 1991.

[2] National Resource Council *Science and the National Parks.* Washington: National Academy Press, 1992, pg. 9.

[3] *The National Park System Plan Volume Two: Research in the Parks.* Washington: National Parks and Conservation Association, 1988, pp. 107-111.

2. The National Park Service should establish a strong, coherent research program, including elements to characterize and gain understanding of park resources and to aid in the development of effective management practices.

Status: Some Improvement.

As shown below, NPCA already had made this recommendation in the 1988 *National Park System Plan.*

"Park managers should be selected on the basis of their knowledge of resource management practices, their ability to manage and use science programs, and their ability to apply that knowledge when formulating budget requests. Managers should be held accountable, through performance standards, for utilizing applicable research findings in decision making.

1Researchers should be held accountable, through performance standards and contract stipulations. for working closely with management and presentation of research results in formats useful to managers, including executive summaries with management alternatives and implications. Contracts should provide for follow up to assist with the application of management recommendations. Incentives and rewards should be provided. [4]

NPS has recognized this need and clearly stated its commitment to the professionalization of the rangers assigned to research and resource management duties. According to a 1995 NPS report, "the ranger of the future will be required to have academic training in the cultural or natural resource fields." [5] This move toward professionalization is also evident in the "Careers" program, NPS Restructuring, and the new NPS training program entitled "Employee Training and Development Strategy."

3. To provide a scientific basis for protecting and managing the resources entrusted to it, the Park Service should establish and expand where it already exists, a basic resource information system, and it should establish inventories and monitoring in designate park units.

Status: Some Improvement.

NPCA had made this recommendation in the 1988 National Park System Plan.

"Congress should enact a specific legislative mandate for NPS research which clearly defines the role of research in resource management and decision making and requires the completion of standardized Servicewide inventories of natural and cultural resources, and implementation of permanent monitoring programs. [6]

"Parks with significant natural resources should develop or expand a Geographic Information System, a computerized mapping system that organizes data spatially, enabling park managers to make timely, effective management decisions."Congress should specify that...funds be used to establish...increased park and regional base funding for research, inventory and monitoring....

"The NPS should provide for effective data management by increasing the quality and use of the COMMON data base, including developing a standardized, systemwide inventory methodology for the ecological modules. Cultural resource data bases, particularly the Cultural Sites Inventory, and the List of Classified Structures should be fully implemented. Funding should be provided to complete the descriptive cataloging of artifacts in the Service's museum collections.

"The development and implementation of a comprehensive NPS natural resources inventory and monitoring program should be a high priority. The I&M program should be conducted in cooperation with adjacent landowners, state and federal agencies, non-governmental organizations, and the governments of other countries." [7]

COMMON no longer exists, but several new databases have been established since 1988 and others have expanded. NPS maintains the List of Classified Structures (LCS) database, the Automated National Catalog System (ANCS), the Cultural Landscapes Initiative (CLI) database, the Cultural Sites Inventory (CSI), the National Catalog of Museum Objects (NCMO), and the Inventory Condition Assessment Program (ICAP). These are described below and in the Cultural Resources Database Appendix. CSI, CLI, and ICAP are in the development stages.

4. This [basic resource information] should be obtained and stored in ways that are comparable between park units, thereby facilitating access, exchange, integration, and analysis throughout the park system and with other interested research institutions.

Status: No Action Taken.

---

[4] Ibid.

[5] United States. National Park Service Natural Resources Strategic Plan Team II. The Natural Resource Management Challenge: The NR-NL4P Report Washington: NPS, 3 March 1995.

[6] Ibid.

[7] Ibid.

As shown below, NPCA already had made this recommendation in the 1988 *National Park System Plan*.

"Congress should enact a specific legislative mandate for NPS research which clearly defines the role of research in resource management and decision making and requires the completion of standardized Servicewide inventories of natural and cultural resources, and implementation of permanent monitoring programs." [8]

Congress has not enacted such legislation. NPS has refrained from seeking such legislation. In several fiscal years, Congress deleted requested funds for the NPS Inventory & Monitoring program to free up funds for unrequested construction. [9]

5. The NPS should support and develop intensive long-term, ecosystem-level research projects patterned after (and possibly integrated with) the National Science Foundation's Long-Term Ecological Research Program and related activities of other Federal agencies.

Status: Action taken. but situation has worsened.

NPCA had made an essentially identical recommendation in the 1988 National Park System Plan.

The NPS should establish technical research centers for each major biome, using existing Cooperative Park Study Units if possible. Topic-oriented or biome-oriented centers should be multiorganizational to foster cooperation with other agencies.... [10]

NPCA repeated this recommendation in the 1989 "Gordon Report" and the Natural Research Council repeated it in the 1992 "Science and the National Parks." The Gordon Commission also made many detailed recommendations regarding ecosystem-level research. But NPS lost most of its scientists to the National Biological Service (NBS) which was established by the Clinton Administration. Rather than creating an "independent research arm," whose function was to establish continuity and objectivity in NPS research, the NBS has done great damage to NPS efforts to integrate science and management.

According to a report entitled Working Relationships Between The National Biological Service and the National Park Service: A Survey of Managers and Scientists, the NBS has robbed the Park Service of scientific guidance. The National Park Service calls the survey results "...useful as representing the opinions of selected NPS managers and illustrating the range and diversity of view among NPS partners within the NBS." [11]

Survey results include the following:

—Before the transfer of NPS scientists to the NBS, 49 % of the respondents received scientific assistance "regularly."

—Since the transfer of NPS scientists to the NBS, only 19% of the respondents report receiving assistance from the transferred NPS scientists "regularly."

—Since the transfer of NPS scientists to the NBS, the % of respondents "never" receiving scientific guidance nearly tripled, from 11% to 32%.

—Respondents were asked whether they received research and technical assistance from National Biological Service scientists who were not previously with the NPS. 5% reported receiving such assistance "regularly," 24% "occasionally," and 71% reported none.

The Park Service drew the following conclusions from the survey results:

—"The perceived level of research and technical assistance regularly provided by former NPS scientists has declined."

—"The proportion of managers receiving no assistance has increased."

—One-fifth of the scientists who were transferred from NPS to the National Biological Service were either "not encouraged or actively discouraged" from assisting NPS managers after the transfer.

—Over 50% of the scientists who were transferred from NPS to the National Biological Service "felt that their support from NPS parks had declined." [12]

The National Park Service has stated that it needs research to be connected in some way with management to ensure that the research remains focused on the application needs. The creation of NBS removed NPS research from the direct influence of park management, but also made the research less relevant to management needs. The ADNRSS (Associate Director, Natural Resource Stewardship and Science) has responsibility for natural and social science concerns and works closely

---

[8] Ibid.

[9] Dennis, John. Personal Interview. 8 May 1996.

[10] Ibid.

[11] United States. Natural Resource Stewardship and Science Directorate, National Park Service. Working Relationships Between The National Biological Service and the National Park Service: A Survey of Managers and Scientists. Washington, D.C. 17 April 1996.

[12] Ibid.

with the Associate Director for Cultural Resource Stewardship and Partnership regarding cultural research. Regional chiefs of research are gone. Park researchers are gone. [13]

When the National Biological Service was created, "...access for park managers to clear and broad avenues of science support...declined and/or [became] more difficult," according to a recent NPS report. [14]

6. The ways resources are used and appreciated by people should be documented.

Status, Some Improvement

As shown below, NPCA already had made several much more substantive recommendations which called for improved documentation of visitor use of parks and of visitor impacts on park resources.

The NPS should develop and implement a standardized, yet flexible. technique for measuring visitation and visitor needs in the parks. This should include the establishing of "indicator" parks that would be surveyed periodically to provide baseline information, and show comparisons between parks. The results of these studies should be disseminated to concessioners and the tourism industry.

The development of a comprehensive social science program within the NPS should be a high priority. Social science should be integrated with natural and cultural research to facilitate multidisciplinary problem solving and to provide a better understanding of the relationship between visitors and resources as well as the interrelationships of the park and its region. A Regional Social Scientist position should be established in each NPS region. [15]

The Visitor Service's Project Database (VSP) provides a record of visitor characteristics and needs. It is available to the public and is maintained by the NPS Visitor Services Project at the University of Idaho CPSU. It contains data collected in more than 80 units of the National Park System since 1982. The data represent snapshots in individual parks, but there is no monitoring of these parks over time.

On February 7, 1996 NPS released a plan, entitled Usable Knowledge: A Plan for Furthering Social Science and the National Parks, which describes a "cost-effective plan for improving the social science capability of the National Park Service." In it, NPS recognizes that social science is a necessary element of a successful Service and that as of early 1996, "the NPS has a minimal infrastructure for conducting social science." The Plan includes 11 "key recommendations for improving social science in the national parks" along with an implementation plan and a budget for FY 96-FY 99.

7. National Park Service researchers should have more input into the development of resource management plans. Effective interaction between research results and resource management plans cannot take place without both a strong science program and a strong resource management program.

Status: No Action Taken.

NPCA made this same recommendation in the 1988 *National Park System Plan.*

"Researchers and resource management specialists should participate on multidisciplinary review teams to provide peer review of the technical quality of resource management plans.

"Resource management specialists should serve as a key liaison between researchers, managers and other park staff to facilitate the integration of research results into all park operations.

"To facilitate the integration of research into other park functions, researchers should hold briefings and seminars on current park research and provide periodic updates of references and reading lists. Presentations should highlight the interdependence of all staff functions in resource protection.

"Managers should be held accountable, through performance standards. for utilizing applicable research findings in decision making." [16]

8. The National Park Service should also establish and encourage a strong "parks for science" program that addresses major scientific research questions, particularly within those parks that encompass large undisturbed natural areas and wilderness. This effort should include NPS scientists and other scientists in independent and cooperative activities.

Status: No Action Taken.

---

[13] Dennis, John. Personal Interview. 8 May 1996.

[14] United States. National Park Service Natural Resource Stewardship and Science Office of Research. *A Conceptual Proposal For Restructuring the CPSU Network.* Washington, D.C. 7 May 1996.

[15] Ibid.

[16] Ibid.

NPCA had already described a need for more wilderness-oriented research in the 1988 *National Park System Plan.* [17]

"In National Park Service areas with proposed, recommended and/or designated wilderness, the Service should monitor backcountry use and impacts, and regulate visitation so as to preserve backcountry resources and wilderness values such as solitude." [18]

9. The National Park Service should revise its organizational structure to elevate and give substantial organizational and budgetary autonomy to the science program, which should include both the planning of research and the resources required to conduct a comprehensive program of natural and social science research.

Status: No Action Taken.

As shown below, NPCA already had made this recommendation in the 1988 National Park System Plan. [19]

The NPS should include in its annual budget request, and Congress should appropriate, a separate line item for research equivalent to ten percent of the total operating budget of the National Park Service. Congress should specify that the funds be used to establish a Servicewide projects fund; increased park and regional base funding for research, inventory and monitoring; and a contingency fund for emergency needs. [20]

The National Park Service should establish an independent research arm, distinct from management and operations to assure long-term continuity and objectivity in the NPS research program. This arm should integrate natural, cultural and social science divisions under an Associate Director for Research. Regional Chiefs of Research should report directly to the respective division chiefs at WASO. All park researchers should report to the respective Regional Chief of Research. [21]

10. The science program should be led by a person with a commitment to its objectives and a thorough understanding of the scientific process and research procedures.

Status: No Action Taken.

NPCA had called for the creation of an Associate Director for Research position and for managers to be held so some standard of scientific literacy in the 1988 National Park System Plan. [22]

The National Park Service should establish an independent research arm, distinct from management and operations to assure long-term continuity and objectivity in the NPS research program. This arm should integrate natural. cultural and social science divisions under an Associate Director for Research. Regional Chiefs of Research should report directly to the respective division chiefs at WASO. All park researchers should report to the respective Regional Chief of Research. [23]

"Park managers should be selected on the basis of their knowledge of resource management practices, their ability to manage and use science programs, and their ability to apply that knowledge when formulating budget requests. Managers should be held accountable. through performance standards. for utilizing applicable research findings in decision making." [24]

11. The National Park Service science program should receive its funds through an explicit, separate (line-item) budget.

Status: No Action Taken.

As shown below, NPCA made this recommendation in the 1988 National Park System Plan. [25]

"The NPS should include in its annual budget request, and Congress should appropriate, a separate line item for research equivalent to ten percent of the total operating budget of the National Park Service. Congress should specify that the funds be used to establish a Servicewide projects fund; increased park and regional base funding for research, inventory and monitoring; and a contingency fund for emergency needs." [26]

12. A strategic increase in funding is needed, especially to create and support the needed long-term inventories and the monitoring of park resources.

---

[17] Ibid.

[18] The *National Park System Plan Volume One: To Preserve Unimpaired.* Washington: National Parks and Conservation Association, 1988, pp. 183c-e.

[19] The National Park System Plan Volume Two: Research in the Parks. Washington: National Parks and Conservation Association, 1988, pp. 107-111. 20 Ibid.

[20] Ibid.

[21] Ibid.

[22] Ibid.

[23] Ibid.

[24] Ibid.

[25] Ibid.

[26] Ibid.

Status. No Action Taken.

As shown above, NPCA made this recommendation in the 1988 *National Park System Plan.* [27]

13. To provide leadership and direction, the NPS should elevate and reinvigorate the position of chief scientist, who must be a person of high stature in the scientific community and have as his or her sole responsibilities advocacy for and administration of the science program. The chief scientist would work from the Washington office and report to the Director of the NPS, provide technical direction to the science and resource management staff at the regions and in the parks, and foster interactions with the other research agencies and nongovernment organizations.

Status: No Action Taken.

NPCA had called for the creation of an Associate Director for Research and Regional Research Chiefs in the 1988 National Park System Plan. [28]

The National Park Service should establish an independent research arm, distinct from management and operations to assure long-term continuity and objectivity in the NPS research program. This arm should integrate natural. cultural and social science divisions under an Associate Director for Research. Regional Chiefs of Research should report directly to the respective division chiefs at WASO. All park researchers should report to the respective Regional Chief of Research.29

14. In addition, the chief scientist should establish a credible program of peer review for NPS science, reaching from the development of research plans through publication of results. [29]

Status: No Action Taken.

As shown below, NPCA had made this recommendation in the 1988 National Park System Plan. [30]

The NPS should encourage and support more active publication in peer-reviewed, scientific and scholarly journals by NPS researchers. [31]

15. The Park Service, in cooperation with other agencies, should establish a competitive grants program to encourage more external scientists to conduct research in the national parks.

Status: No Action Taken.

NPCA had made a nearly identical recommendation in the 1988 *National Park System Plan,* by focusing on improvements of the existing Cooperative Park Study Units. [32]

"NPS should establish additional Cooperative Park Studies Units and cooperative agreements focusing on the social sciences, historical and archaeological research. To ensure that the best available expertise is obtained, CPSU cooperative agreements should require that the CPSU administrator solicit proposals from private sector scientists with geographic and subject matter expertise in the parks under study."

16. The Park Service must give the science program immediate and aggressive attention.

Status: No Action Taken.

This was the intent of NPCA's 1988 recommendations.

TESTIMONY OF DR. DAVID POLICANSKY, ASSOCIATE DIRECTOR, BOARD ON ENVIRONMENTAL STUDIES AND TOXICOLOGY, NATIONAL RESEARCH COUNCIL

Chairman Hansen, and Members of the Subcommittee: I am David Policansky, associate director of the National Research Council's Board on Environmental Studies and Toxicology (BEST). The National Research Council (NRC) is the operating arm of the National Academies of Sciences and Engineering and the Institute of Medicine. I am pleased to testify before you today on the findings of the National Research Council report, Science and the National Parks, published in 1992. Copies of the report have been made available to the subcommittee's staff. In my capacity as a member of the staff of BEST, I was involved in the project from its inception to its conclusion, working with a distinguished committee of experts and other NRC staff. My testimony today, being based on the NRC report, deals with NPS and its research as they were in the early 1990s. That was before the establishment of the

[27] Ibid.
[28] Ibid.
[29] Ibid.
[30] Ibid.
[31] Ibid.
[32] Ibid.

NBS, after which most of the NPS research capability was moved into NBS, now the Biological Resources Division of the USGS.

In 1990, James M. Ridenour, then director of the National Park Service (NPS), stated his intention to strengthen the research program and the role of science in park management, and he asked the NRC for assistance. In response, the NRC's Board on Environmental Studies and Toxicology convened the Committee on Improving the Science and Technology Programs of the National Park Service, which prepared the report.

The NRC committee found that many reviews over many years had been prepared of NPS science. In 1963, one of them, also by a committee of the NRC, said Research by the National Park Service has lacked continuity, coordination, and depth. It has been marked by expediency rather than long-term considerations. Other reports found that NPS science lacked funding, staffing, and influence. Another review of NPS concluded in 1989 that NPS needed a new vision, based on sound research and on the principles of ecosystem management, to meet the environmental challenges of the 21st century.

At the time of its review, the NRC committee reported that in NPS's view, the main objective of its science program was to provide information in support of park planning, development, management, and visitor education and enjoyment. The disciplines needed in the research programs, determined by NPS's responsibilities, ran the gamut of the biological, geophysical and social sciences. NPS itself, in its 1980 Report to Congress, estimated that 75% of the 4,34S threats to the parks were inadequately documented by research. Indeed, the NRC committee did not find any significant part of NPS's research program that should be eliminated and found much to admire and praise. But a more coherent vision and longer-term commitment was needed.

The organization of NPS in 1992 considered research as part of resource management. As a result, scientific research did not have its own budget. In addition, most research was planned and conducted by the 10 regional offices, so in effect there were 10 separate science programs in the NPS, "each different in form, function, and effectiveness." NPS's research staff was smaller than those in most other land-management agencies, about 2-3% of its staff. By comparison, the U.S. Fish and Wildlife Service then had about 8-10% of its staff in research.

The NRC committee concluded that the lack of a dearly defined science program hampered research planning, tracking of expenditures, and accountability for results. The lack of formal structure and clear NPS leadership also made assessing the program difficult and it often was not possible to separate resource management from law enforcement and various other activities of park rangers. The committee concluded that the NPS science program was unnecessarily fragmented and lacked "a coherent sense of direction, purpose, and utility. As the trustee for irreplaceable samples of the nation's natural and cultural heritage, the NPS should be among the most forward looking and progressive resource management agencies in the federal government, and research should be an essential element in its mandate."

The NRC committee spent much time deliberating on appropriate recommendations. One long-standing question was controversial: whether the leadership of NPS's science program should be centralized or decentralized. The committee came down on the side of more centralization, because the decentralized approach is often inefficient and because many scientific challenges have a broader scope than individual parks or even NPS regions.

Many of the committee's findings echoed those of earlier studies, in particular its finding that problems in NPS's research programs were not problems of individual research projects, but instead were more fundamental and had their base in NPS's culture and the support it gave to research. Thus, the important matter was the research program itself and its place in the NPS. It conclude that additional funding alone would not solve the problem, and "called instead for a fundamental metamorphosis that would stress the importance of science in the park system and guarantee long-term financial, administrative, and intellectual support. It recommended three key elements of this new structure.

—An explicit legislative mandate for an NPS research mission is needed. The committee made this recommendation to "eliminate for once and for all any ambiguity in the scientific responsibilities of the Park Service." The report provided many examples of the importance of such research; one example concerned NPS holdings in and near Prince William Sound, Alaska. Because there was relatively little information on the distribution and abundance of many animal and plant species in the region, assessing the effects of the *Exxon Valdez* oil spill in 1989 was very difficult. Similar difficulties have arisen in other, less-celebrated instances throughout NPS holdings. In addition, the national parks, because of their relative lack of human disturbances and long-term protection, provide excellent opportunities for scientific

research. Thus the committee recommended an approach that included what it called "science for the parks and the parks for science," i.e. an approach that uses science to benefit NPS and the parks as well as using the parks as scientific research areas and laboratories.

—The science program should have separate funding and reporting autonomy. NPS should elevate and give substantial budgetary autonomy to its science program. This should include both research planning and the resources needed to conduct a comprehensive program of natural and social science research. The program should be led by a person committed to its objectives and who understands the processes and procedures of scientific research. The science program should receive funds through an explicit, separate budget. Some increase in funding was recommended, especially to create and support needed long-term inventories and monitoring of park resources.

—The credibility and quality control of the science program need enhancement. To achieve this, the committee recommended that NPS elevate and reinvigorate the position of chief scientist. The incumbent should be a scientist of high stature in the scientific community and the sole responsibility of the position should be the administration and leadership of the science program. The committee also recommended that the NPS, in cooperation with other agencies, establish a competitive grants program to encourage more external (i.e., non-NPS) scientists to do research in national parks. Finally, the committee recommended that the NPS establish a "high-level scientific advisor board to provide long-term guidance in planning, evaluating, and setting policy for the science program.

Mr. Chairman and Members of the Subcommittee, the parks are national treasures. As the NRC report pointed out, the pressures on the parks are increasing rapidly, and events since 1992 have borne out the truth of that statement. It is important to protect these treasures by developing and maintaining a strong science program. And, as the NRC committee also emphasized, it would be a waste of a unique resource not to use the parks—with the proper safeguards—to help understand and address the scientific challenges faced throughout the biosphere.

On behalf of the National Research Council, I thank you for your attention and would be pleased to take questions.

STATEMENT OF ROBERT M. LINN, EXECUTIVE DIRECTOR, THE GEORGE WRIGHT SOCIETY

The Importance of Research in the National Parks.

In the late 1920s, George Wright, the man whose name our Society carries, created and personally funded the National Park Service Office of Wildlife Biology. In the early 1930s the National Park Service assumed financial support of this office—about 30 biologists were hired, and some landmark research took place, resulting in a series of seminal publications outlining management actions needing implementation in the parks, the "Fauna of the National Parks of the United States" series. More importantly, park managers were beginning to be able to acquire sound information about park resources, enabling them to make better-informed management decisions and form better, more accurate interpretive programs. Wright was the motive force behind these efforts. Unfortunately, after his death in an auto accident in 1936, momentum for science within NPS waned. By 1940 most of the fledgling NPS science program had been transferred to the Bureau of Biological Survey (now the US Fish and Wildlife Service).

With the advent of World War II science in the parks languished. Beginning in the 1960s, and continuing with slowly increasing momentum, and with many ups-and-downs, in the 1970s through the 1990s, the National Park Service worked to rebuild its scientific capacity. These efforts were spurred by at least 12 reports produced internally and externally, including the most recent review by the National Academy of Sciences, Science and the National Parks, published in 1992. These reports have unanimously recommended a stronger role for science in park management through strengthening NPS's internal scientific capacity. In 1977—twenty years ago—a report on the NPS science program by the eminent scientists A. Starker Leopold and Durward L. Allen stated:

"The National Park Service has reached a time in its history, and in the history of the nation, when science and research should be given a much greater and clearly recognized responsibility in policy-making, planning, and operation. Seat-of-the-pants guesses in resource preservation and management are open to challenge and do not stand up well in court or in the forum of public opinion."

Values intrinsic in the park lands far exceed that of tourism and having a fun vacation. Park lands include the vast array of cultural and social histories of this

nation and the natural heritage of our planet. They are one of the greatest hands-on educational tools we have. One thing we need in this nation is a greater sense of who we are and how life support systems in our biosphere work—a broadening of scope toward understanding and appreciation of life.

During the 1950s through the 1970s, research by Drs. Richard Hartesvelt, H. Thomas Harvey, Howard S. Shellhammer and Ronald Stecker of San Jose State University, and Dr. Bruce M. Kilgore of the National Park Service, proved that naturally-occurring fire was responsible and necessary for the continued existence of the Giant Sequoias of the Sierra Nevada. Without fire occurrence, White Fir and other species would succeed the Sequoia and could become a source of crown fires, forest floor litter would become an impediment to the germination of Sequoia seed, and the eventual disappearance of the Giant Sequoia would occur.

At Carlsbad Caverns National Park, it became evident that formations in the caverns were becoming discolored and that pools of water, which harbored unique cave life forms, were drying up. It was discovered that a large parking lot, paved with asphalt, had been built above the caverns, thus preventing water from percolating naturally into the caverns and the water that did percolate through carried the discolorization from the asphalt. Also, the visitor center in this hot? summer area was being cooled by drawing the cool air from the caverns below as an inexpensive cooling devise, and the elevator shafts into the caverns were actually acting as giant chimneys, evacuating air from the caverns, thus drying and heating the cavern air. This has since been corrected, but only because research into causes of the problems was carried out during the 1950s through 1960s and 1970s.

There are many more examples of research projects that have helped to save and/or understand valuable national park area values—Atlantic coast barrier island dynamics, Isle Royalewolf-moose ecology, the Bighorn Sheep of Death Valley and other western areas, the Bison of Yellowstone, and on and on. The problem is that there are so many other problems needing attention.

One thing is certain: the national parks need more reliable scientific research capability if these priceless heritage lands are to be managed properly in perpetuity. The National Academy of Sciences report, Science and the National Parks, in its "Recommendations," says it very pointedly:

"In conducting this study of science in the national parks, the National Research Council's Committee on Improving the Science and Technology Programs of the National Park Service originally set out to evaluate the scope and organization of current NPS natural and social science by performing a peer review of NPS research activities. However, the committee soon determined that the crucial problems in the NPS research program are not at the level of individual projects. Instead, they are more fundamental, rooted in the culture of the NPS and in the structure and support it gives to the research. Thus, the committee concluded that the real need was for an assessment more broadly focused on the research program and its place within the agency.

"The call for change made in this report is not new. But given the lack of response to so many previous calls for change, how can the present report succeed in inspiring action? The members of the committee believe that increased funding or incremental changes alone will not suffice, and they call instead for a fundamental metamorphosis. It is time to move toward a new structure—indeed, toward a new culture—that stresses science in the national park system and guarantees long-term financial, intellectual, and administrative support. There are three key elements:

"There must be an explicit legislative mandate for a research mission of the National Park Service.

"Separate funding and reporting autonomy should be assigned to the science program.

"There must be efforts to enhance the credibility and quality control of the science program. This will require a chief scientist of appropriate stature to provide leadership, cooperation with external researchers, and the formation of an external science advisory board to provide continuing independent oversight."

The National Park Service has come a long way since this report in the "metamorphosis" that the report calls for. Now what is needed is congressional support for at least the following objectives:

(1) Providing resource managers with high quality science, technical assistance and education;

(2) Ensuring that research and technical assistance is delivered in a timely fashion and relevant to resource managers' needs;

(3) Ensuring the independence and objectivity of research;

(4) Creating effective partnerships between the National Park Service and other Department of the Interior bureaus;

(5) Taking full advantage of university resources while benefiting faculty and students;

(6) Encouraging professional development of National Park Service employees; and

(7) Managing federal science resources efficiently.

I sincerely recommend:

(1) An explicit legislative mandate for the National Park Service to perform (or obtain) necessary research to carry out its organic act mandate of preservation in perpetuity;

(2) Supplying the National Park Service with sufficient funds to carry out, or contract for, required research.

(3) Supporting the USGS Biological Resources Division in its important mission of strategic research, and cooperative activities with the National Park Service.

TESTIMONY OF DR. MARK S. BOYCE, VALLIER CHAIR OF ECOLOGY AND WISCONSIN DISTINGUISHED PROFESSOR, UNIVERSITY OF WISCONSIN-STEVENS POINT

Mr. Chairman and members of the Subcommittee, I am honored to have the opportunity to present my thoughts on the importance of science in shaping management decisions in our national parks. My name is Mark S. Boyce. I hold the position of Vallier Chair of Ecology and Wisconsin Distinguished Professor in the College of Natural Resources at the University of Wisconsin-Stevens Point in the largest undergraduate wildlife program in the United States. I am currently editor-in-chief for the *Journal of Wildlife Management* which is The Wildlife Society's research periodical. During 1989-1993 I was Director of the University of Wyoming-National Park Service Research Center where I was responsible for managing a peer-reviewed competitive research contracts program for the National Park Service.

I have published about 150 scientific papers and six books including *Ecosystem Management: Applications for Sustainable Forest and Wildlife Resources* (1997, Yale University Press), *The Greater Yellowstone Ecosystem: Redefining America's Wilderness Heritage* (1991, Yale University Press), and *The Jackson Elk Herd: Intensive Wildlife Management in North America* (1989, Cambridge University Press). I have conducted research in the Greater Yellowstone Ecosystem (GYE) since 1977 when I began studies on elk populations. My subsequent studies in the GYE have involved bison, grizzly bears, and wolf recovery.

I wish to speak in favor of a renewed science initiative for our national parks. I believe that scientifically gained knowledge is fundamental to sound management in our parks, and I believe that the scientific research conducted in our parks has greatly benefited their management. Science is the basis for ecosystem management, a new discipline of applied ecology that attempts a comprehensive approach to natural resource management. Ecosystems are exceedingly complex and we do not know how to manage ecosystems well. National parks afford a key link in the development of sound ecosystem management by serving as ecological baselines, i.e., controls. Only with such baseline areas can we have a basis for evaluating environmental change in other areas.

Controversy continues over the link that should exist between science and management.

On one extreme, sound scientific information might not be obtained when all researchers are in the Park Superintendent's hip pocket, i.e., at the disposal of management for solving management problems. At the other extreme, a research team that is not linked to management is likely to pursue basic research that may not meet the resource management needs for the parks. One approach to resolve such potential conflicts is to fund contracts or grants on park-identified needs to university scientists, e.g., as facilitated by the Cooperative Park Studies Unit (CPSU) system. Or even better, NPS could support research funding that is awarded competitively to university scientists using a process of peer review such as that used by the National Science Foundation. Such a competitive peer-review process ensures that the quality of science is of utmost priority while also permitting rigorous review of funding levels.

I do not wish my comments in support of increased science in the NPS to be misconstrued as a criticism of the Biological Resources Division (BRD) of the US Geological Survey. I believe that the BRD hosts many competent scientists, and with the recent announcement that BRD will not charge overhead to parent Interior agencies, including the NPS, there are opportunities to enhance research in our national parks through BRD. The initial formation of the BRD (formerly NBS) seemed like an excellent way to reduce redundant efforts among branches of the Department of Interior, especially involving technology such as geographic information sys-

tems (GIS). Unfortunately, however, BRD has not seen sufficient funding from Congress to achieve the science needs for the parent organizations.

The role of science in park management is perhaps best illustrated with the extensive investigations that preceded the return of wolves to Yellowstone. Indeed, I wish to commend Congress and especially several current and former members of this Committee for their support of wolf recovery in Yellowstone. Restoring wolves to the Greater Yellowstone Ecosystem (GYE3 has given us a full complement of native fauna and offered us a fantastic opportunity to document how a complete faunal assemblage can function. One of the purported benefits of wolf reintroduction will be the reduction of ungulate numbers, but despite the return of this keystone predator some scientists continue to argue that artificial control of ungulate populations is necessary (untenable given current knowledge). I hope that the same vision that reestablished the wolf into Yellowstone will also ensure that sufficient monitoring work is funded to fully document the consequences of wolf recovery. Further, I trust that the same vision will ensure protection of the large mammal communities in Yellowstone from recent challenges largely emerging from agricultural interests.

I see no reason that protection of Yellowstone cannot be compatible with ranching operations outside the park. And I believe that the results of scientific research conducted during the past decade give us considerable insight into how to accomplish compatible juxtaposition of agriculture and ecological baseline preserves. Indeed, developing sound ecosystem science requires that we maintain areas such as Yellowstone with minimal human intervention to be able to evaluate the consequences of human activities in adjacent areas where lands are managed to meet human needs.

The successes of grizzly bear management in the GYE offer another example of the benefits to park management from research. Demographic research by the Interagency Grizzly Bear Study Team identified mortality "sinks" where excessive bear mortality occurred. This led to the closure of a campground at Fishing Bridge and transfer of sheep grazing allotments to nonconflict areas on the Targhee National Forest in Idaho and Wyoming. Together with strict management guidelines developed by the Interagency Grizzly Bear Committee, estimates of grizzly bear abundance are currently higher than ever before recorded in the GYE.

During the past five years a large number of ecological studies conducted in Yellowstone National Park have been published in peer-reviewed journals. Research in Yellowstone was stimulated by the Congressionally mandated grazing studies beginning in the mid-1980s, resulting in several publications that questioned the traditional wisdom that Yellowstone's northern range was "overgrazed." Before the grazing studies were completed, an additional Congressional appropriation was made for fire research subsequent to the 1988 fires in Yellowstone, and most recently in the series of studies funded in anticipation of wolf recovery. These studies have greatly increased our understanding of ecological processes in the Yellowstone ecosystem. A majority of the peer-reviewed research publications were conducted by university-based scientists and graduate students.

Part of the reason for my participation in this Subcommittee hearing is concern over the anticipated testimony from Frederick Wagner, Charles Kay, and Richard Keigley, all of whom have been exceedingly critical of NPS management in Yellowstone. Their position is a minority opinion based on the fact that the bulk of peer-reviewed scientific literature in contrary to their claims. The NPS has supported a number of dedicated scientists whom I believe have helped the Park Superintendent to make reasoned management decisions. I am also concerned by the alarmist positions that imply a need to cull ungulates within Yellowstone National Park because I believe that this would be a serious mistake.

This is not to imply that controversy does not exist among scientists about management policies for Yellowstone, but I do not believe that Wagner, Kay, and Keigley provide a balanced perspective on the role that science should take in establishing resource management policy in Yellowstone National Park. Shortly after Jerry Franklin became President of the Ecological Society of America a couple of years ago I asked him to consider organizing a professional society evaluation of science and management in Yellowstone. Franklin declined my suggestion recognizing that the issue was controversial among ecologists and he feared that the society would not reach a consensus. However, I am confident that ecologists would overwhelmingly support the need to maintain national parks as ecological baseline preserves allowing natural ecological processes to run their course.

I support the current NPS approach to management of our national parks which I have termed ecological-process management. This involves allowing ecological processes of nutrient cycling, plant succession, fire, flooding, decomposition, competition, predation, herbivory, symbiosis, dispersal, births and deaths to function with minimal intervention by humans. Maintaining the integrity of ecological processes does not imply that landscapes should match preconceived notions, nor does it imply

reconstruction of some past condition. Current NPS management policy is often termed natural regulation management but I believe that natural regulation engenders semantic confusion that obscures the true intent of NPS management policy.

The source of greatest controversy over this management policy is management of bison and elk on Yellowstone's northern range. During the 1960s the best available expert opinion suggested that culling of elk and bison was necessary to maintain herd sizes at levels consistent with proper range-stocking levels for cattle. Economic criteria for establishing stocking levels for cattle had little to do with the population dynamics emerging as a consequence of plant-herbivore interactions. Herd sizes have increased substantially in recent years leading agriculture interests to call for the need to reduce herds. The motivation for these proposed culling programs are (1) perception that ungulates are "damaging" the vegetation, (2) concern by livestock growers over the risk of transmission of brucellosis to cattle from bison or elk, and (3) Charles Kay's hypothesis that native Americans were incredibly effective at killing wild ungulates so that they had little influence on vegetation prior to European settlement.

Each of these attempts to justify culling of elk within the boundaries of Yellowstone National Park is unjustified. The first perception that ungulates "damage" the vegetation is inconsistent with empirical data emerging from the northern range "overgrazing" investigations. Grasses and fortes are largely dormant underground at the time that ungulates are on the winter range, so each spring we see lush regrowth of herbaceous vegetation. Certain woody plants have indeed seen heavy browsing, especially aspen and willow. But palynological evidence (from pollen in mud cores from the bottoms of lakes) interpreted by Dr. Whitlock from the University of Oregon indicates that no major changes in vegetation composition have occurred in recent years. Large numbers of ungulates will undoubtedly influence vegetation, as they have for hundreds and thousands of years. Dr. Whitlock's interpretation of her data is that ungulates probably have shaped vegetation communities in Yellowstone in the past as they do today. Range conditions may not be those that we would desire if we were managing livestock in Yellowstone, but such a frame of reference is irrelevant to management of a national park.

Brucellosis is a bacterial disease introduced to ungulates in Yellowstone from domestic livestock. The USDA's APHIS has an aggressive program attempting to eradicate the disease from the United States by 1998. But their target is completely unreasonable given the widespread occurrence of the disease among elk and bison in the Greater Yellowstone. Completely effective vaccines do not exist, and it is the professional opinion of epidemiologists that with current technology we cannot eradicate the disease without draconian measures such as total depopulation of bison and elk from the GYE, i.e., systematic slaughter of 120,000 elk and 1,900 bison. The issue is easily resolved by effective risk management. Transmission of the disease is unlikely to occur except during spring and early summer. Managing livestock to minimize contact with wildlife during this crucial period, and vaccinating cattle can ensure an exceedingly low probability of transmission of the disease. The problems are not with bison and elk management but rather the preposterous Uniform Methods and Rules of the USDA APHIS.

The third issue of native American overkill is an unsubstantiated hypothesis of Charles Kay in an attempt to justify culling of bison and elk in the Park. Even if his implausible hypothesis could be substantiated, it has no relevance to how we should manage ungulates in Yellowstone National Park. Understanding the history of exploitation of natural resources by humans is interesting, but it has no bearing on how we should manage resources in the future. Just because previous generations of humans decimated wildlife populations and altered natural ecosystems does not provide justification for doing so today. Humans are relatively recent in North America and time has been short enough that convolution between humans and faunal elements is highly unlikely. Instead, by minimizing human influence we most closely approximate the ecological processes that would have occurred in the absence of human influence. Human exploitation of natural resources is without racial context, and I believe that there is value in maintaining ecological baselines with minimal human interference whether the humans are native American or of more recent immigrant ancestry.

Choosing some arbitrary time in the past to target for ungulate management unjustified. In recent years ecologists universally have come to accept the principle that ecological processes are dynamic. Natural disturbance regimes, such as wildfire, floods, and severe winters, are fundamental to the function of places like Yellowstone. Just because a particular vegetation structure was documented in 1870 when early explorations were conducted in Yellowstone does not imply that this should constitute a target for how the vegetation should look today.

Protection and preservation of nature are what national parks are all about. We hunt elk in every western state virtually everywhere that they occur. There are few places in the United States where we can allow a population of large ungulates like elk to achieve a balance or fluctuate with their food resources and predators. Some range and wildlife managers believe that we must intervene, and somehow Nature will not get it right. Some believe that we will lose our justification for hunting if we should discover that it is not necessary to cull wildlife herds. I believe that these views are outdated and contrary to what we have learned about population ecology. I have spent my entire career studying wildlife populations attempting to understand what determines their abundance and distribution. We do not need to intervene to ensure a healthy ecosystem. Yellowstone National Park is not on the verge of ecological collapse. Indeed, to quote F. V. Hayden (1871), "Yellowstone is the greatest scientific laboratory that nature furnishes on the face of the globe."

To an ecologist, national parks are much more than recreation areas and places of scenic splendor, although we enjoy our parks for those values. But for a scientist, national parks serve an exceedingly important function as ecological baselines against which we can compare ecological processes operating in human-dominated landscapes. In addition, there is inherent interest in learning what the long-term dynamics of vegetation, ungulates, wolves and grizzly bears will be in Yellowstone. With wolf recovery, we now have reconstructed all faunal elements and have an outstanding opportunity to document the dynamics of this large mammal community. Interfering would destroy one of the grandest scale ecological experiments (albeit unduplicated) in history. We stand to gain nothing by culling ungulate populations in Yellowstone, but we would lose a great deal.

Thank you Mr. Chairman and members of the committee for the opportunity to share my views on science in the National Park Service. Good science is paramount to ensuring sound management in our national parks. But the opposite is true as well—how our parks are managed influences the ecologists' ability to do good science. Scientists need parks as controls that will form the basis for understanding what we do with the rest of the world. We should encourage the NPS to continue with its policy of managing to minimize the influence of humans on ecological process and function. I will be pleased to answer any questions.

STATEMENT RICHARD KEIGLEY, BIOLOGICAL RESOURCE DIVISION, USGS

My name is Richard Keigley. I am an ecologist employed by the Biological Resource Division of the USGS. I have been subpoenaed to appear before this subcommittee and do not represent the Department of Interior.

From March 1991 to June 1996 I was duty stationed in Yellowstone National Park. Prior to my assignment to NBS in October 1993, I had a 22 year career in the NPS.

If science is to be successfully applied to controversial issues, we must acknowledge where problems exist and correct them if possible. I will briefly describe a problem. I will then describe five ways in which I believe the research program could be improved. Those five ways involve: (1) the measurement of success, (2) the allocation of fiscal resources, (3) the link between science and management, (4) conflict resolution, and (5) relationships with park neighbors.

In 1991 I was assigned to investigate the effect of elk on riparian ecosystems in Yellowstone's northern elk winter range. In 1995 I was barred from conducting research in Yellowstone. In my opinion, I was removed because I was finding scientific evidence that did not support Yellowstone's resource management policies. My removal means that one point of view will be absent from Yellowstone's research program. This kind of bias can jeopardize the search for scientific truth.

How can the present research program be improved? One possible means of improvement would be a change in the way success is measured. At the present time, "client satisfaction" is an important measure of success. In some cases, this standard may inhibit BRD from providing objective science.

It is only natural that a park manager might prefer one research outcome over another. But a credible science program will provide the "bad news" when appropriate. Many managers can accept a less-preferred research outcome with good grace and remain a satisfied client. But some will not. In this case, if a scientist is unwilling to accommodate the manager, BRD has no alternative but to withdraw the scientist from the research program, otherwise, client satisfaction will not be attained. To protect the integrity of science, the standard of client satisfaction should be reconsidered. I believe there are alternative ways of assessing service to the client agencies.

My second point deals with how fiscal resources are allocated to individual scientists. We have seen from previous testimony that scientific research can become highly polarized. If those scientific ideas are allowed to compete on a level playing field, one point of view should come to dominate over other points of view. But if the allocation of fiscal resources is skewed to some point of view, the validity of an opposing point of view may not emerge, even though it more closely corresponds with scientific truth. BRD should develop a new procedure to: (a) identify cases where polarization exists, and (b) if it does, equitably allocate fiscal resources to opposing points of view.

BRD's service to the parks could also be improved by strengthening the link between science and management. The management of each park is guided by its Resource Management Plan. These plans describe resource issues, identify recommended management alternatives, and identify and prioritize research needs. The Resource Management Plan is a critical link between science and management.

At the present time, the responsibility for preparing Resource Management Plans lies with park management. The degree of input by BRD is a matter of park discretion. In cases of controversy, there will be a temptation to slant the preparation or interpretation of Resource Management Plan project statements. BRD must then live with this situation.

I believe BRD's research effectiveness could be improved by establishing a formal partnership in Resource Management Plan preparation and interpretation. Scientists would then have a mandated role in describing resource issues, identifying needed research, and prioritizing research implementation. This partnership is too important to be left to chance.

BRD's research program could be improved by establishing procedures for resolving unhealthy conflict. We should recognize that conflict plays an integral role in the search for scientific truth. Truth emerges when ideas are allowed to compete on a level playing field.

But we also know that conflict can take directions that inhibit productivity. I believe it would be to the Department of Interior's advantage to develop formal procedures to resolve conflicts among scientists and between scientists and managers.

We are all aware of current conflicts between the state of Montana and Yellowstone National Park. To a large degree those conflicts arise due to different resource management objectives. The reconciliation of these kinds of conflict is not a proper role for scientists.

But conflicts have also arisen over matters of science. For example, what is an appropriate size for Yellowstone's northern elk herd? Yellowstone claims that the elk herd is at a proper size and that there is no evidence of range deterioration within the park. As a result, the visitor to Yellowstone believes they see a vignette of primitive America. They especially enjoy the easy viewing of elk.

From some park neighbors' perspective the situation is different. Elk migrate out of Yellowstone during the winter. Private ranchers complain that their ranges deteriorate because of excessive elk use. State and USFS lands are also impacted. The ability to regulate the size of the northern herd when it is outside of Yellowstone is politically limited by the perceptions held by the American public. For that reason, Yellowstone's neighbors have a vested interest in the BRD science that is conducted in service to Yellowstone.

Yellowstone's Resource Management Plan limits its discussion of ungulate impacts to those that occur within the Park borders. In recognition that NPS issues extend beyond the park's borders, Resource Management Plans should incorporate those perspectives when describing resource issues. Representatives from the State and private entities should be involved in the development of the plan. BRD could coordinate the identification and prioritizing of research needs. A National Park can have an immense impact on its neighbors. Those neighbors should have a formal way to express their concerns.

I summarize my recommendations. The attainment of client satisfaction does not necessarily translate to the attainment of good science. BRD should investigate alternative methods of measuring success. In cases where scientific opinion is strongly polarized, there should a balanced allocation of fiscal resources directed at the research problem. A formal procedure should be developed to accomplish this objective. Resource Management Plans are the critical link between science and management. Their development should involve a formal partnership between BRD and NPS. DOI should develop a formal procedure to mediate unhealthy conflicts among scientists and between scientists and managers. Finally, a park's Resource Management Plan should address the impacts that park management may have on its neighbors.

STATEMENT OF FREDERIC H. WAGNER, ECOLOGY CENTER AND COLLEGE OF NATURAL RESOURCES, UTAH STATE UNIVERSITY

I am Frederic H. Wagner, Professor in the Department of Fisheries and Wildlife, Associate Dean of the College of Natural Resources, and Director of the Ecology Center, a 7-department, lateral program that coordinates research and graduate education in the science of ecology, all in Utah State University.

Before moving to Utah, I was a research biologist with the Wisconsin Department of Natural Resources. I have been at Utah State University over 30 years and have been professionally involved in a number of western-U.S., public-policy issues including a 5-year study of national parks. You may know of a book which I and 7 colleagues wrote entitled *Wildlife Policies in U.S. National Parks*, published in 1995 (Wagner et al. 1995). Two chapters in the book deal with science in the national parks and the National Park Service. Much of my research and writing in the past 10-15 years has been on the role of research in natural-resources management, the role of science in policy formation, and science ethics.

I will address four main issues in this testimony. First, science is, in my opinion, essential to effective management and protection of park resources, and to informed setting of policies that prescribe management and protection. Second, while there has been some good research in some areas of the agency, the Park Service has not overall had a strong tradition or commitment to the use of science in its operations. Third, because of this inadequate commitment, the quality of science and its use in policy have been spotty. In some cases it has been positive. But in others it has resulted in management decisions that have been detrimental to park resources. Fourth, I will comment on the pros and cons of different administrative arrangements for research in the National Park Service.

SCIENCE IS ESSENTIAL TO EFFECTIVE RESOURCE MANAGEMENT AND PROTECTION

I am sure the persons on this Committee are well aware that natural-resources systems are extremely complex, involving intricate relationships between water, soils, atmosphere, vegetation, animals, and climate. Appropriate decisions on effective management and protection depend on an understanding of that complexity that can only be provided by competent research.

A recent book by W.L. Halvorson and G.E. Davis (1996) describes the wide range of resource problems in a number of parks that could only be solved after years of research had provided a knowledge base on which to carry out effective management. Sophisticated air-quality studies showed that particulate emissions from the Navajo Power Plant in Page, Arizona were the main cause of the visibility problem in Grand Canyon. Vegetation research showed that periodic, low-intensity prescribed burns, like those set by Native Americans, rather than complete elimination of fire, is the proper management procedure to perpetuate the giant trees in Sequoia National Park. Studies on underground hydrology showed that sewage and toxic-waste pollution could be carried many miles underground to affect the water quality of surface streams in Ozark National Scenic Riverways and subsurface streams in Mammoth Cave National Park in Kentucky. And long-term research on the effects of angling on cutthroat trout in Yellowstone Lake showed that heavy fishing removal not only reduced the fish stocks, but also affected populations of osprey, white pelicans, and grizzly bears which feed on the fish. I am attaching my recent review of this book, now in press, to this statement.

Now while I believe that research is indispensable to rational policy setting and effective resource management, science does not, in my view, set policy or prescribe management goals. I consider these to be social and political processes the purpose of which is to satisfy societal values. I maintain that research in management agencies is a service to policy setting, and to the design and evaluation of management programs. It provides a knowledge base for informed policy setting and effective management. It enlightens these processes.

THE NATIONAL PARK SERVICE HAS NOT HAD A STRONG SCIENCE TRADITION

Following passage of the Park Service Organic Act in 1916, the agency has been heavily involved in carrying out its dual mission: protecting the resources "unimpaired for the enjoyment of future generations" and managing the flow of tourists who come to see these natural wonders. In the early decades of NPS history, simple protection was sufficient management of the resources, and the organization was largely staffed with landscape architects and ranger personnel who were well suited to carry out the dual mission.

But within a few decades, as the American population grew and developed economically, park resources began to be impacted from the outside by air and water

pollution; by invasion of non-native plants and animals; and by encroachment of urban, industrial, and land-use expansion. And impacts grew on the inside by heavy tourist use, and by distortion of plant and animal communities from their pristine conditions. A 1986 survey of NPS employees (Anon. 1986) produced reports of 101 categories of threats to park resources. And academic researchers have published on the many external threats to parks (cf. Coggins 1987, Freemuth 1991).

It thus became evident to many observers that mere preservation was not sufficient management to protect the resources, that active management was necessary in many cases, and that a strong research program to provide a factual basis for effective management was needed. Recommendations to this effect began appearing in the 1 930s, and have continued up to the present.

But with no tradition of science as an integral part of the agency's operations, or a significant cadre of employees with strong science training who had moved into the higher, influential administrative positions, the response to these recommendations has been weak at best. A 1992 National Research Council study (Risser et al. 1992) commented that there had been "a dozen reviews" of science in NPS since the early 1960s. All urged an expanded research program to provide a base of scientific information essential for capable management. But in the words of the NRC review, the response has been Abysmal."

In 1991-92, the research outlay was only 2 percent of the NPS budget. In 1993, when research in several Interior agencies was combined into the new National Biological Survey, the number of scientists transferred from the Fish and Wildlife Service was about 9 times the number from NPS even though both agencies manage roughly the same total area of land.

As one author pointed out (Haskell 1993), the limited research that had developed by the time it was moved to NBS was initiated at the grass roots, and not authorized from the top as a matter of policy. There had been no coherent research arm, separate budgetary line, or high-level research administrator.

THE WEAK SCIENCE COMMITMENT HAS PRODUCED SPOTTY RESEARCH AND MANAGEMENT DECISIONS

The weak commitment to research and lack of formal policy made it difficult to produce consistently high-quality research. With no central policy and administration, research on natural resources was administered under Natural Resource Management with which it competed for funds. The section on Science and Research in the chapter on Natural Resource Management in the NPS 1988 Management Policies is only four sentences long. At the field level, research was administered out of the regional offices in some regions, by park superintendents in others. Without central direction, procedures, and standards for ensuring research quality, persons involved in research varied from highly qualified scientists to individuals with lesser credentials.

As a result of this lack of coherence, research quality varied. The 12 case studies discussed in the Halvorson and Davis book are examples of good science that has contributed to effective management programs which protect the resources. Research at the Beard Research Center in Everglades provided an excellent knowledge base with which to address the daunting management problems of that park.

But research on the ecology of elk in Yellowstone produced faulty conclusions that were the basis of the ill-conceived, natural-regulation management policy to which Dr. Kay has referred. This policy is generating over populations of deer in eastern parks and elk in the West that are ravaging the other resources in those parks. And in my opinion, you can place the Yellowstone bison problem that we are reading so much about in the press these days squarely at the feet of the natural-regulation management policy. Bad science produces bad management.

The weak mandate for science in NPS also makes it possible for some administrators to ignore it or act belligerently toward it when it is inconvenient, or to use it selectively to support policy positions. If research is to serve policy and management effectively, it must be free of coercion to seek truth regardless of where the chips may fall. It must have that freedom even if at times it produces results that are contrary to policy or indicates changes that are less comfortable than maintaining the status quo.

Administrators must then decide whether to change directions, or stay the course. If they apply pressures on researchers to produce biased science that supports present policy, or if they select only those findings that support current positions and ignore contrary evidence, it basically destroys the values and credibility of science.

While I don't suggest that such misuse of science has been the norm in NPS, there have been instances of it. Yellowstone and the natural-regulation policy has

again been a case in point. That policy was greeted with skepticism in the wildlife profession from its inception in 1967. The skepticism was ignored by Park officials just as they have refused to recognize contrary evidence from recent research. And Park researchers who generated contrary evidence were threatened with their jobs, transferred elsewhere, or denied access to the Park. Dr. Keigley, who has testified today with admirable professional restraint, is one example.

So What is the Best Administrative Structure for Research in NPS

Since research in resource-management agencies is a service to policy setting, and to the design and evaluation of management programs, the question arises as to what administrative alignment with management allows it to serve most effectively. Several considerations bear on the answer, and these are a function of the personal and administrative distance between research and management:

1. Research must be relevant to management needs. Since research is a service to management, its practitioners must be close enough to management to understand the management problems and insure that their investigations are relevant to the solution of those problems. This argues for relative administrative proximity between scientists and managers.

2. Research must have the managers' trust. If managers are to accept research results and adapt their programs according to what is indicated by the latest findings, research must have the managers' trust. This is earned by the managers' recognition that the researchers understand the management problems, and are committed to helping solve them. This is another consideration arguing for personal and administrative proximity of research to management. If researchers are not known personally to managers, and/or they are situated at considerable administrative distance, it is much easier to ignore research recommendations.

3. Research must be free of political. policy. and bureaucratic pressures to seek objective truth without fear of administrative, personnel, and budgetary reprisal. There are instances where this has occurred in NPS, Dr. Keigley's example being one case in point. This consideration argues for administrative distance between management and research. Research should not be administered by the people who are making and - administering policy.

Thus, there are arguments both for keeping research and management close together, and for distancing them. The question then arises as to what is the best compromise, and more specifically what is the best arrangement for NPS. I believe this is a major purpose of these hearings.

When we began writing our book on wildlife policies in national parks, we were prepared to recommend putting NPS research in its own, newly created division, with separate budget and administrative lines, and its own associate director. This was the structure in the Fish and Wildlife Service, and is the current situation in the U.S.D.A. Forest Service. But in October 1993 before we had finished our book and as everyone here knows, NPS research was moved into the new National Biological Survey and eventually into the Biological Resources Division of U.S.G.S.

Icertainly do not think it should go back to its previous structure in NPS with the lack of a formal policy directing the use of research in management programs, and the disparate administrative status under which research operated. If it were restored to the agency, it should be in a discrete research arm with its own budget, administrative line, and administrator, and independent of park operations. And it should be expanded to provide a more adequate service to the parks than it did prior to 1993.

Its present position in U.S.G.S. now gives it the administrative distance it needs to allow it to seek objective truth without policy or bureaucratic pressures. Perhaps it should be left where it is for a while to give it a chance to work. It has been a political football for nearly 4 years, and to uproot it and reposition it once again would just prolong the agony with the violence that does to the organization's morale and productivity. It has just recruited a new director who is moving to establish procedures and relationships.

I do think that if park research remains in the Biological Resources Division of U.S.G.S., there is a real need to develop formal liaison with the Park Service to insure relevance of the research to park needs. I also think there needs to be provision at top administrative levels in NPS to direct park administrators to consider and adopt research results in their management efforts.

And I agree that park superintendents should have a major say in what research is carried out in the parks. But I think there should be provision at the top for directing research that superintendents might not want out of concern for results that would challenge policy, but would clearly be relevant to enhancing the understanding of management and policy problems. There need to be safeguards against park superintendents refusing access to federal scientists proposing to do research rel-

evant to park management problems, but for whatever reason inconvenient for the superintendents. The parks, after all, are public property.

Thank you very much for the invitation to present this information, and for your attention.

Publications Cited:

Anon. 1988. Natural resources assessment and action program. U.S. National Park Service, Office of Natural Resources, Washington: IV + 70 pp.

Coggins, G.C. 1987. Protecting the wildlife resources of national parks from external threats. Land and Water Law Review 22: 1-27.

Freemuth, J.C. 1991. Islands Under Siege: National Parks and the Politics of External Threats. University Press of Kansas, Lawrence: XIV + 186 p.

Halvorson, W.L. and G.E. Davis. 1996. Science and Ecosystem Management in the National Parks. University of Arizona Press, Tucson: XII + 364 pp.

Haskell, D.A. 1993. Is the U.S. National Park Service ready for science? The George Wright Forum 10 99-104.

Risser, P.G., A.M. Bartuska, J.W. Bright, R.J. Contor, J.F. Franklin, T.A. Heberlein, J.C. Hendee, I.L. McHarg, D.T. Patten, R.O. Peterson, R.H. Wauer, and P.S. White. 1992. Science and the national parks. National Academy Press, Washington: XIV + 122 pp.

. Wagner, F. H. , R. Foresta, R. B. Gill, D. R. McCullough, M.R. Pelton, W. F. Porter, H. Salwasser, with consultation by J.L. Sax. 1995. Wildlife Policies in the U.S. National Parks. Island Press, Washington: X + 242 pp.

STATEMENT OF CHARLES E. KAY, INSTITUTE OF POLITICAL ECONOMY, UTAH STATE UNIVERSITY

I would first like to thank the Chairman and the Committee for inviting me to testify here today. I have a B.S. in Wildlife Biology and a M.S. in Environmental Studies both from the University of Montana, and a Ph.D. in Wildlife Ecology from Utah State University. I am presently an Adjunct Assistant Professor in the Department of Political Science and a Senior Environmental Scholar at that University's Institute of Political Economy. I am the only independent, independently funded scientist to have conducted a detailed evaluation of Yellowstone National Park's Natural regulation" management program. Not only have I conducted scientific research on the elk overgrazing question, but I have also studied wolf recovery, grizzly bear management, the bison problem, and other key issues in that ecosystem. I have also traveled widely throughout the West and am familiar with similar resource management problems in other national parks. Moreover, I have conducted extensive research on long-term ecosystem states and processes in the southern Canadian Rockies for Parks Canada. This included work in Banff, Yoho, and Kootenay National Parks.

My research in Yellowstone and Canada has been widely published in books and scientific journals and I have submitted copies of those papers to the committee's staff. In addition, GAO is presently investigating the Yellowstone situation and I have submitted copies of my research to that agency as well. Moreover, I have volunteered to take GAO on a field tour of my study sites in Yellowstone next summer.

As you know, Yellowstone is presently managed under what is termed "natural regulation." This, though, is more than simply letting nature take its course for it entails a specific view of how nature operates. According to the Park Service, predation is an assisting but nonessential adjunct to the regulation of elk and bison populations. Instead, ungulates are limited by their available forage supply—termed resource or food-limited. In other words, the Park Service contends that ungulate populations will self regulate without overgrazing the range. This means that if wolves are present, they will only kill animals slated by nature to die from other causes and thus, would not lower the elk population. In the debate over wolf recovery, the Park Service has adamantly denied that wolves are needed to control elk or bison numbers in Yellowstone Park. Instead, under Natural regulation," elk and bison die from starvation, and according to the Park Service, thousands of animals starving to death is natural.

Now, the Park Service is fond of saying that it has 3 million dollars worth of research which supports "natural regulation." Unfortunately, most of those studies have not directly tested "natural regulation" and have largely been a waste of taxpayer's money. Furthermore, the Park Service has refused to fund research that may prove "natural regulation" wrong and they have generally awarded contracts only to people who produce results that support agency management. In the rare circumstance where a contractor has produced a report critical of park management, he has never received additional funding and his credibility has been attacked by

the agency. In the equally rare circumstance where Park Service employees have dared challenge established agency dogma, they have been reassigned, force transferred, or suffered disciplinary action. The next witness, Dr. Richard Keigley, can address these points in detail since he has been the subject of internal agency harassment.

There is also the question of how the Park Service has awarded contracts to non-agency, supposedly independent biologists. Information on who applied for these contracts and how they were awarded is supposed to be available to the public. But when an associate and I filed a Freedom of Information Act (FOIA) request on three specific contracts, we were told the information was not available for public review, because the agency had given that money to the University of Wyoming and then the University, not the agency, technically awarded those contracts. And as we were told by a University Vice-President, the University does not have to comply with FOIA requests. This raises the question of why the Park Service chose to follow a procedure that hid the awarding of these research contracts from public review. At least two of the biologists who received those contracts have been repeatedly funded by the Park Service, and have since produced a series of reports favorable to the agency. In my opinion, this certainly does not qualify as an independent test of "natural regulation" management.

The Park Service's data supporting Natural regulation" is suspect because it cannot be replicated. A case in point is aspen, which has declined by more than 95% since Yellowstone Park was established. The Park Service has attributed that decline to the lack of lightning-caused fires which the agency claims are necessary to regenerate aspen—fire kills the old trees but then the aspen clone's roots send up a profusion of suckers, a process termed root suckering (aspen clones have not regenerated from seed for several thousand years due to the species' demanding seed bed requirements).

According to the Park Service, Yellowstone's aspen would successfully regenerate-defined as producing new stems greater that 6 feet tall—if those stands were bumed. In fact, agency scientists have claimed for twenty years that their data proves burned aspen will regenerate in the park despite repeated elk browsing. They claimed to be stating a proven fact, not a hypothesis.

An independent test of the Park Service's claims was provided when Yellowstone's 1988 wildfires burned approximately one-third of the aspen on the park's northern range. After the fires, I established 765 permanent plots in burned aspen stands. Despite initial aspen sucker densities of over 50,000 stems per acre, I found that elk and other ungulates repeatedly browsed all those stems to within inches of the ground and prevented height growth. In fact, several clones have now been completely killed-out by repeated browsing. How then, could it be a "proven fact" for nearly twenty years that, if burned, Yellowstone's aspen would successfully regenerate despite abnormally high elk numbers? Clearly, there was something wrong with the agency's earlier "data." As it turns out, burning plus grazing are the worst things that can happen to the park's aspen.

The Park Service has not responded by rejecting "natural regulations even though it is now clear an underlying part of that hypothesis has been falsified. Instead, the agency has proposed a new hypothesis. They now claim that aspen was historically rare in the park so the decline of aspen is evidence that "natural regulation" is returning the park to its natural state.

Iand my co-workers tested this new hypothesis last summer. We used the same procedures the Park Service reported it had used to collect samples from aspen clones and we collected our samples in the same areas used by the agency. We then sent our samples to an independent laboratory for analysis in a blind test. That is, the laboratory did not know where the samples had been collected or the hypothesis being tested. Thus, this was a truly scientific test of the Park Service's new hypothesis. We were unable to confirm the Park Service's new hypothesis. In fact, our data produced results entirely different from those obtained by the agency. Simply put, we could not replicate the data reported by the agency even though we used the same methods and techniques in the same study areas.

In science, if the same experiment or test is repeated, all the various data sets must support the same conclusion or the hypothesis must be discarded. Our data suggest that the Park Service's new hypothesis is, at best, suspect and does not absolve Natural management of aspen's continued decline in the park.

The Park Service has also systematically attempted to suppress the publication of research that does not conform to the agency's "natural regulation" management of the park. After the U.S. Forest Service and other public agencies spent several hundred thousand dollars on a moose study inside and outside Yellowstone Park, the publication of that research was blocked. The official explanation is that the Forest Service does not have sufficient funds to publish the final report, but I sus-

pect the real reason is that work does not support Natural regulations management—please see Attachment B for details.

After I published an article critical of park management, representatives of the Department of Interior repeatedly called the University and asked them to fire me. They also repeatedly called Parks Canada, for whom I was conducting ecological research at the time, and asked them to fire me. Both refused. Then they called my Department Chairman and informed him that my research was endangering the lives of their people in the field because, and this is an exact quote, based on what I had written "those neo-Nazis in Montana were going to start shooting government officials." My "crime" Mr. Chairman, was to have published an independent analysis of wolf recovery in the park and other areas of the northern Rockies.

Having admitted to spending at least 3 million dollars of taxpayer's money on research in Yellowstone, you would think that the Park Service would have a detailed study plan of how all that work was designed to formally test "natural regulation" management. That, though, turns out not to be the case. In 1989, for instance, the Department of Interior's Inspector General conducted an audit of natural resource research in Yellowstone and three other national parks. The Inspector General found that "Yellowstone National Park did not have study plans for 23 of 41 research studies performed by its research staff. In addition, the study plans that existed for the other 18 research studies were generally deficient with respect to content." As the Inspector General pointed out, study plans are needed to ensure that research is conducted efficiently.. The only time the Park Service has told the public exactly what is meant by Natural regulation," and laid out a detailed plan for its study, was 1971, and the agency subsequently never followed its own study plan. Instead, I am the only scientist who has systematically tested "natural regulation" management.

Alston Chase has called "natural regulation" a scientific fraud and from my own detailed measurement of vegetation in Yellowstone Park, I can say that I have found no evidence to support the "natural regulation" paradigm. Instead, all my data indicate that Natural regulation" must be rejected as a valid scientific explanation of the natural world.

As you know, riparian management has recently been a hot political topic in the West, with environmentalists blaming ranchers for overgrazing these critical habitats. So, as an example of what "natural regulation" means on the ground, let us look at the condition and trend of willow communities on Yellowstone's northern range—please see Attachment A for additional details and references. Now if Natural regulation" management represents the epitome of land management, as claimed by the Park Service and various environmental groups, then surely Yellowstone's riparian areas should be in excellent condition.

To test this part of the "natural regulation" paradigm, I (a) measured willows inside and outside the park; (b) measured willows inside and outside long-term ungulate-proof fenced plots, called enclosures, on Yellowstone's northern range; (c) measured willow seed production inside and outside park enclosures; and (d) compiled repeat-photographs to measure long-term vegetation change.

Based on 44 repeat photosets of riparian areas on the northern range, tall willows have declined by more than 95% since Yellowstone Park was established in 1872. In 28 repeat photosets outside the park, tall willows had not declined, but, if anything, had increased. That these differences are due to excessive browsing by Yellowstone's burgeoning "naturally regulated" elk population, not other environmental factors as postulated by the Park Service, is shown at the park's enclosures.

On permanent plots outside enclosures, willows averaged only 13 inches tall, had only 14% canopy cover, and produced no seeds. In contrast, protected willows averaged nearly 9 feet tall, had 95% canopy cover, and produced over 300,000 seeds per square meter of female canopy cover—in willows there are separate male and female plants. Not only are Yellowstone's willow communities severely overgrazed, but they are among the most overgrazed in the entire West. This has had a devastating effect on riparian songbirds and other animals.

Beaver, for instance, were once common in the park but that species is now ecologically extinct on the northern range because overgrazing by an unnaturally large elk population has eliminated the aspen, willows, and cottonwoods beaver need for food and dam building materials. Without beaver in the system, park streams have down cut, which has lowered water tables and destroyed more riparian vegetation. Beaver is also a critical keystone species whose loss has seriously reduced park biodiversity.

The roots of willows, aspen, and cottonwoods are also critical in maintaining streambank stability, and as elk have eliminated these woody species, this has produced major hydrologic changes. Dr. David Rosgen, one of North America's leading

hydrologists, for instance, reported 100 times more bank erosion on Yellowstone's denuded streams than on the same willow-lined streams outside the park.

Last summer, I took Dr. William Platts, one of the West's leading riparian experts, and Dr. Robert Beschta, a hydrologist at Oregon State University on a three? day field tour of sites inside and outside Yellowstone Park. What they saw shocked them. After looking at one stream that had blown out and eroded down to Pleistocene gravels, something that has not happened in 12,000 years—all because the elk had destroyed the woody vegetation that once protected the stream banks, these experts declared that if you gave them a billion dollars they could not put the system back together again. This then is the type of resource damage that has occurred under "natural regulation" management. I submit that not only must "natural regulation" be rejected, but that what has happened in Yellowstone is a clear violation of the park's Organic Act, the Endangered Species Act (see Attachment B), and other federal legislation.

The Park Service, however, has responded by producing a series of research studies that blame these problems on factors other than Natural regulation" management. However, bad science leads to bad policy, and if you do not follow proper scientific procedures, or don't measure the correct variables, or don't have a large enough sample size, what you invariably get is junk science.

Elk-induced soil erosion has long been a concern in Yellowstone, but the agency claims recent research has proven that the park's burgeoning ungulate populations have not caused accelerated soil erosion. A careful review of the Park Service's data, however, shows that not to be true.

In their work, the Park Service used a simulated rainfall machine to measure soil erosion inside and outside Yellowstone's long-term grasslands enclosures. The rainfall simulator was set at the rate of one inch per hour and was run for 15 minutes on a 26X26 inch square plot. This automatically biased the study, though, because it is standard scientific practice to use a rate of 2.5 inches per hour for 15 minutes. A lower simulated rainfall rate automatically guarantees less soil erosion.

The Park Service then measured soil erosion on five outside plots and five inside plots per enclosure and found that there was more erosion on outside plots, which have a long history of heavy elk use, than on inside plots, but reported that difference was not statistically significant. Yellowstone's superintendent then publicly proclaimed the agency's research had proven there was no accelerated erosion in the park. That, though, is incorrect, as the Park Service grossly misrepresented the results of their research.

To statistically compare the average amount of soil eroded from inside versus outside plots, the samples' variances are used. If those variances are high, as they invariable are in soil work, and sample size is low, like say only five samples, then God himself could not generate statistical significance. So while it is true that statistically the agency's data showed no increased soil erosion on grazed plots at each enclosure, that does not mean elk have not caused widespread soil erosion in the ecosystem.

This is what mathematicians call a Type 11 error—concluding that there is no significant difference, when in fact there is. To correct for this problem, the Park Service should have measured more plots inside and outside each enclosure, but it did not—I suspect because those data would have embarrassed the agency. However, if you combine that study's original data inside and outside all the enclosures that were measured, which effectively increases sample size, then the agency's data shows significantly more soil erosion from heavily grazed sites. When it rains, I have watched mud flow off Yellowstone's hillsides and it is not uncommon to find exposed tree roots in the park.

The Park Service, however, continues to deny that Yellowstone is overgrazed, or that if it is, "natural regulation" is to blame. The agency, though, has not been receptive to independent review of its "natural regulation" program. In the early 1990s, the Society for Range Management, the Ecological Society of America, the American Fisheries Society, and the Wildlife Society asked the Park Service for approval to conduct an independent review of the Yellowstone situation, but they failed to obtain permission. More recently, a group of preeminent ecologists informed the Secretary of Interior that they would be willing to sews, without pay, on a panel to review the entire Yellowstone matter, but the Secretary declined.

Now if the Park Service has nothing to hide, and actually has the research to support its claims regarding "natural regulation," why then have they not welcomed an independent review of Yellowstone's management? If, on the other hand, as I have argued, "natural regulation" is the greatest threat to Yellowstone Park, then it is easy to see why the agency attempts to prevent Congress and the American public from knowing the truth. In my opinion "natural regulation" is also a failed environmental philosophy, which explains why environmental groups such as the Greater

Yellowstone Coalition have largely ignored the resource damage that has occurred in the park (please see Attachment A for details).

Moreover, this problem is not confined to Yellowstone but is endemic throughout our National Parks System. Dr. Carl Hess, for instance, has documented how "naturally regulated" elk have overgrazed Colorado's Rocky Mountain National Park, while Dr. William Bradley documented the negative impacts abnormally large elk populations are having on subalpine meadows in Washington's Mount Rainier National Park. Similarly, "naturally regulated" elk populations have had a dramatic impact on understory species composition and tree regeneration in Washington's Olympia National Park. While in New Mexico's Bandolier National Monument, elk-induced soil erosion is threatening that park's archaeological resources.

The simple truth is that ungulate populations will not internally self-regulate before those animal's have had a serious impact on the vegetation. Now, wildlife biologists often cite Africa's Serengeti as an example of how North America must have looked before it was despoiled by Europeans. The Park Service, in fact, has not only claimed that Yellowstone National Park is the last remnant of North America's Serengeti, but the agency has actively recruited Serengeti scientists to support "natural regulation" management. Today's Serengeti, however, is not a natural ecosystem, nor is it a vignette of Wilderness" Africa. Instead, the Serengeti is a romantic, European, racist view of how "primitive" Africa should have looked, for one of the first things that Europeans did when they created Serengeti and other African national parks was to forcefully remove all the indigenous peoples. For various reasons, colonial governments did not want black Africans in their white national parks.

Now, there have been hominoid predators in Africa for at least 3.5 million years, and our species, Homo sapiens, evolved in Africa 100,000+ years ago. Thus, I submit that there is nothing more unnatural than an African ecosystem without hominoid predators and the Serengeti, therefore, is not a "natural" ecosystem nor is it an example of how North America teemed with wildlife before the arrival of Columbus.

In all the ecological studies that have been done on the Serengeti, native people have generally not even been mentioned, or if they have, it has invariably been as "poachers," in the pejorative sense. Based on recent modeling, it has been suggested that Serengeti's wildlife populations will collapse if present levels of "poaching" increase by as little as 10%. While others may view this as "poaching," I suggest that this is a case of native people, who are simply exercising their aboriginal rights.

As I have documented elsewhere, elk and bison never historically overgrazed Yellowstone or other National Parks because native hunting kept ungulate numbers low. That is to say, hunting by Native Americans actually promoted biodiversity. Giving Yellowstone's bison additional areas to roam outside the park, for instance, will never solve the bison problem. For under "natural regulation," bison numbers will simply increase until the starving animals again move beyond whatever boundary has been set.

Thus, I respectfully offer the following recommendation for Congress' consideration:

(1) Congress should mandate an independent park science program. This is the same conclusion that has been reached by every panel that has ever reviewed Park Management. Since the Park Service has never followed any of those recommendations, I submit that Congress must legislate the needed changes, for the agency has repeatedly demonstrated its refusal to comply with anything less. Because of the politics in Yellowstone, I also suggest that Congress appoint an independent panel of eminent scientists to set priorities for park research and to review/approve competitive research proposals for funding, similar to what the Bureau of Land Management did with wild horse and burro research.

(2) In addition, I suggest that Congress appoint an independent commission to review "natural regulation" management and park science in Yellowstone. What I am asking is for a fair impartial hearing of the available evidence, which after all is the American way. If we cannot straighten out Yellowstone, Mr. Chairman, there is little hope for the rest of our national parks.

(3) Furthermore, I would suggest that if you want independent scientists to critically evaluate various aspects of park management then Congress must establish a mechanism to directly fund that research. This need not come from new appropriations but from a reapportionment of existing funds. Money, after all, may be the root of all evil, but it is also the root of all science. Without adequate funding there will be no independent evaluation of park management.

(4) And finally, I invite you Mr. Chairman and others on your committee to personally tour Yellowstone with me this coming summer. At least one U.S. Senator has already asked me to accompany him on a fact finding tour of the park's northern range. It is quite an educational experience to be standing on a site and to be

handed a photograph of how that area looked back in 1871. I wager, Mr. Chairman, that you will never view park management in the same light again.

We simply need an impartial review of the available evidence. For Mr. Chairman, if we can not agree on the science, then we surely can never reach agreement on how our National Parks should be managed to insure that they will be unimpaired for future generations of Americans.

Quite honestly, Mr. Chairman, based on what I know about "natural regulation" management, if I wanted to protect an area, the last thing I would do would be to make it a national park, and the next to last thing I would do would be to turn it into a wilderness area. I believe that our natural resources should be protected and America's heritage presented, but that management should be based on the best available science, not on romantic, often religious, views of nature.

Thank you for your time and consideration.

STATEMENT BY ROGER G. KENNEDY, DIRECTOR, NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

Mr. Chairman and members of the Subcommittee, I appreciate the opportunity to present this testimony, and we appreciate the attention you are paying to the role of research and resource management in the National Park Service by convening this hearing.

The National Park Service was established to manage some of the nation's most impressive and important natural and cultural features. The "Organic Act" of 1916 directs the National Park Service to conserve the scenery, and natural and historic objects and wild life, of National Parks for future generations. In 1916 the task was largely one of protecting spectacular examples of isolated scenery and wildlife from poaching, lumbering and mining. The accompanying task was to provide access to these resources for enjoyment in a way that left them unimpaired for all future generations of Americans.

When Congress provided this dual mission in the NPS Organic Act of 1916, no one could know then exactly what these tasks would entail in the years to come. Today the 374 units of the park system that cover 83 million-acres are often set in economically developing regions. Many are subject to the impacts of urban and suburban encroachment, which affects watersheds, airsheds, viewsheds, and plant and animal pathways. In this modern landscape most parks are like islands.

The 275 million visits from the public to parks each year also impact park resources. To meet the challenge of managing visitation and other impacts, a strong scientific effort is needed to understand the best ways to protect the resources.

Congress has recognized the fragility of our nation's natural resources by enacting over the past 30 years such important legislation as The National Environmental Policy Act, The Clean Air Act, The Clean Water Act, and The Endangered Species Act. These acts help protect the nation's resources, including those of the national parks. The implementation of these acts requires a high degree of technical expertise, analysis, and documentation from public land management agencies. To do the job right we need to provide the public with an excellent science program.

Our understanding of ecology has progressed a great deal since 1916. We have learned how complex are the important relationships within natural systems and we have learned about the points of vulnerability that require the most vigilance and care. We agree that it is fundamentally important to bring our understanding of natural systems into the management of our National Parks, objectively and professionally. The public is entitled to a science program that will provide it with useful and accurate information about park resources.

Sound factual information, the essence of science, must be the foundation for any prudent land management decision. Because NPS must make many controversial decisions—by definition decisions that do not please everyone—the science that underpins those decisions will be constantly in question. Decisions based on science have been, are, and will be controversial both within and outside the Service. All scientists do not agree on everything. It is essential for Congress and the NPS to have an ongoing dialogue about our successes and our failures in living up to the expectations of the American public.

Over the years many individuals and a number of outside review panels have proposed policies for the NPS science program. The origin of the NPS science program is usually traced to the 1930's and George Wright. Wright identified the need for inventorying the system's resources and for making science a necessary basis for good stewardship of its wildlife. Wright started the program with his own money for the first two years and died in a car accident in 1936. After a period of Civilian Conservation Corps funding the entire effort dwindled to 3 scientists by the end of

World War II. The program sputtered until the 1960's and the issuance of two reports: the Leopold Report (1963) on wildlife management and the Robbins Report (1963) on research in the National Parks. These reports were issued as a result of controversy over the NPS culling of the elk herd in the northern range of Yellowstone NP. These reports spurred the creation in 1967 of the Office of Natural Science Studies and a period of slow growth of both research and resource management programs through the early 1990's.

Under many administrations some progress was made, but not enough. Parks now have Resource Management Plans with lists of research and resource management projects in stated priorities that are needed to understand and address resource threats. We have completed Natural and Cultural Resources Assessments that are essentially servicewide resource management work-load analyses. These data bases can be used to report on our problems and needs within a park, regional, or servicewide perspective. We have a strong Natural Resource Inventory and Monitoring program that is efficient and effective in providing the basic information that identifies what we manage and in developing methodology to tell how they are faring. Inventorying and monitoring is not flashy science nor inexpensive, but it is important.

Our science training program is getting better. In the last two decades we have created the professional resource manager position and developed a Natural Resource Management trainee program that provided 1-2 years of training for 145 new park resource managers. Recently the basic park resource manager position was reevaluated in order to enhance the professionalism and career opportunities of these valuable resource stewards .

Our Natural Resource Management Program also seeks private sponsorship for resource management projects ($2 million in the last two years) and we have just announced 4 National Park Science/Canon Legacy Scholarships for dissertations on science topics specific to national park issues.

The effort to better our science program is not limited to our natural resources program. Last year the Service adopted a Social Science Plan in order to better understand all aspects of park visitation, economics, and visitor expectations and satisfaction. The new visiting Chief Social Scientist reports to our Associate Director, Natural Resource Stewardship and Science. Dr. Machlis, a professor at the University of Idaho, will serve a 3-year term. He will then be replaced by another academic leader in social science.

We have established a record of major scientific contribution in areas such as the role of fire in natural ecosystems, coastal barrier island dynamics, and the influence of exotic species in natural systems. There are many examples of NPS science determining issues important to park preservation: air quality impacts at Grand Canyon, the restoration of water quality and quantity in the Everglades, the management of off-road vehicles at Cape Cod and Fire Island National Seashores, and the removal of exotic species such as burros at several Southwestern parks, to name a few.

Lets tall: about reports from governmental and private sources that show the need for greater scientific underpinning of the management of park resources and visitor services. It's a matter of priorities. The press of increased visitation to parks and our corresponding focus on visitor services competes for limited resources. The cost of new construction of facilities as well as the corresponding maintenance necessary for large infrastructure often leads Superintendents to divert resources away from science, toward other pressing needs. At the park level we often have "brushfires" of the moment; as a result we neglect investment in science until a crisis develops. Good science cannot be a "brushfire" activity.

Science has never been an explicit mission of the National Park Service, although various reviews have recommended that research become an integral mandate for park management. In 1993, the Secretary of the Interior created the National Biological Survey (NBS), in part to consolidate all Interior research programs into one research agency, and in part to answer some of the criticism that had been directed at the NPS science program. One of these criticisms was that the research of scientists was managed by park superintendents. The creation of NBS solved this problem as it resulted in the transfer—not the eradication—of roughly $20 million and 168 researchers and technicians, or roughly 1.6% of the NPS operational budget to NBS. Resource management programs (roughly 6–8% of the operational budget) remained with NPS, as did our resource managers—those who apply science to park programs and make recommendations to management.

NBS, now the Biological Resources Division (13RD) of the US Geological Survey (USGS), is pledged to continue both research and extension services in direct support of national parks. In concert with the three other programmatic divisions (geology, water, mapping), the USGS has a broad range of scientific resources which can

be brought to bear on NPS issues. USGS/BAD has already established an Ombudsman Panel to help address NPS concerns. In addition, we have an agreement with USGS/BAD to share funding for technicians, and an annual needs assessment process has been set up to determine how USGS/BAD can best service NPS's needs.

Nevertheless, NPS science needs to go far beyond the available government? conducted research. To provide a larger program of applied science for its managers, NPS has worked with USGS/BAD to initiate a national network of 16 university-based units, called Cooperative Ecosystem Studies Units (CESU's), which build on the former NPS Cooperative Park Studies Units and augment the Cooperative Research Units. USGS/BAD research scientists at cooperating universities will shortly be joined by a NPS senior scientist who will serve not as a practicing researcher but as a broker, contracting officer's representative, and liaison, to find the best source of technical support for park management in a wide array of disciplines (from archaeology to education, to communications, to zoology). This individual will also serve as a bridge between park management, USGS/BAD, and university scientists. When suitable units do not exist, competitive awards will be used to jointly establish new CESUs. Other land-management and science-related agencies will join these units. By joining together in our regional research efforts we believe that federal agencies will, over time, work more efficiently by jointly planning and providing information relevant to their needs.

We are confident that these steps will provide a science program that meets our needs. They will also solve many of the problems found by reviews of the NPS science program.

Over the years, the NPS has adopted increasingly science-driven policies toward management of the most significant biological components of national park ecosystems. NPS Management Policies (1988) calls for maintaining "natural environments evolving through natural processes minimally influenced by human actions." This means managing for native (generally, pre-European contact) ecosystem components and functions "evolving" through time. While the policy tends away from both the earlier mistake of predator control and the problems associated with the culling of prey species, NPS policy allows for management intervention to correct for disturbing human influences. Because of the pervasiveness of human influences in today's world, few true cases of natural process regulation (or as some see it "hands off ") management are practical.

This policy appears most controversial for the management of large mammals, especially predators and ungulates, as these species can have very significant impacts beyond park boundaries. These mammals can proliferate or decline rapidly depending on the changing ecosystem conditions. Their fate stirs very strong emotions among the various publics. Because of the controversy of any management action—either controlling animal herd numbers as at Gettysburg National Military Park currently, or in maintaining free-roaming herds of elk and bison as at Yellowstone, cooperative efforts with state and other federal agencies are common, and full public involvement (via the NEPA process) is the rule.

There is a lot of disagreement among researchers about whether Yellowstone's northern range is overgrazed. My colleagues are prepared to participate in the debate as scientists. Some, like Professor Sam McNaughton of Syracuse University, who recently reviewed Wildlife Policies in the US National Parks by Dr. Fred Wagner and others, say it isn't. Indeed there are many scientists who believe that the elk herd and the habitat are healthy and productive—despite high numbers of elk resulting from nearly a decade of mild winters. We would be happy to provide you with copies of their work.

In addition, we recently completed a report on a 5-year research program on conditions in the northern range. The findings presented in these peer-reviewed articles suggest that the issue is not the disaster that our critics would contend. We welcome a rigorous and continuous review of these articles and would be happy to provide you with a copy of this report.

We believe that current debate is warranted and healthy, and we have moved to bring new perspectives into the science issues. Last August we hosted a session at the Ecological Society of America on this issue, inviting a new generation of ecologists to consider the appropriate approach to managing this incredible biological resource. In March we will present this issue at the 62nd North American Wildlife and Natural Resource Conference of the Wildlife Management Institute.

In September of this year we are inviting both sides of the debate to present their cases to the judgment of their peers at the annual meeting of the Wildlife Society. We believe that this effort will lead to a scientific consensus on the probable outcomes of the alternatives available for the management of the Northern range.

Beyond science, what many are actively questioning in the elk and bison issues at Yellowstone NP (including the Brucellosis issue) is the park's interpretation and

implementation of the natural process regulation policy. We believe our mission, our policies, and our values reflect the overall expressed interests of the American public. In fact, the public strongly supported our management policies for Yellowstone when we put the policies out for public comment in 1988. We will continue to seek public guidance in the application of these policies and values in Yellowstone National Park. In cooperation with other state and federal agencies, we are committed to completing a Draft long-term Bison Management Plan Environmental Impact Statement this summer.

We also understand the need to be in the forefront of utilizing the best science for the basis of our management decisions in what we believe to be the world's best system of natural and cultural parks in the world. We are confident that we are taking steps to make this a reality.

I appreciate your close interest and support to reach this goal. I will be happy to respond to your questions.

TESTIMONY OF DR. MARK SCHAEFER, DEPUTY ASSISTANT SECRETARY FOR WATER AND SCIENCE, U.S. DEPARTMENT OF THE INTERIOR

Science and Resource Management in the National Park System.

Mr. Chairman and members of the Subcommittee, I appreciate the opportunity to join Director Roger Kennedy to present testimony on science and resource management in the National Park System. For the past year I have assisted Secretary Babbitt with scientific issues at the Department of the Interior, including science and the National Parks. I am accompanied by Dr. Denny Penn, Chief Biologist of the new Biological Resources Division of the U.S. Geological Survey (USGS).

Consistent with congressional direction, the Secretary transferred the National Biological Service to the USGS on October 1, 1996. The Biological Resources Division became the fourth USGS division, joining the Geologic, Mapping, and Water Resources Divisions already in existence. This arrangement places most of the physical and biological research activities of the Department of the Interior within one organization, an arrangement that will be advantageous in addressing a broad range of scientific needs of the department, including those of the National Park Service.

Ensuring the Highest Quality Science.

The Department of the Interior is committed to ensuring that the highest quality science underpins resource management decisions. Over the last four years the Secretary has made the pursuit of this goal one of his highest departmental priorities. I would like to point to just a few of the initiatives directed toward this goal:

(1) Independence of research programs. Research should be conducted in a way that ensures its objectivity and independence from influence by those who have a stake in the outcome of a research effort. Therefore, the Secretary moved the Department's biological research activities out of the bureaus that have resource management and regulatory responsibilities. At the same time he established stronger linkages to the bureaus to ensure that the research needs of managers are identified and met.

(2) Multidisciplinary research activities. By consolidating Department of the Interior research programs in the U.S. Geological Survey, the physical and biological sciences are housed within the same institution. This fosters the kind of multidisciplinary studies that are key to addressing resource management questions. It also allows biological scientists to benefit from the advanced mapping and geographic information systems technologies available at USGS.

The considerable scientific strength of all USGS divisions will move ecosystem science forward in the National Parks and elsewhere. For example, the High-Priority Digital Base Data Program, which USGS initiated in 1994, helps support park and ecosystem management by providing digital map products required for habitat assessment, archaeological site monitoring, and fire management.

(3) Connecting research programs to the needs of resource managers and others. Through a needs assessment program conducted by the USGS Biological Resources Division the research needs of managers are identified and prioritized on an annual basis. Available funding is then matched to these needs. In addition, the Department of the Interior Science Board, chaired by the Secretary, brings senior department managers and scientists together on a regular basis to discuss needs, capabilities, and priorities as they relate to the department's mission responsibilities.

(4) Connecting research programs to the needs of states and tribes. The department is continually working to strengthen the connection between USGS research and the needs of states and tribes. The USGS already cooperates with approximately 1100 state and local governments in all 50 states and Puerto Rico. In addi-

tion, the Biological Resources Division has conducted an extensive survey of the needs of state natural resources managers. More than 250 senior agency leaders in 50 states, including fish and game, parks, natural resources, and related agencies, were interviewed. The results, which are now in the analysis and report-writing stage, will be used by USGS to guide future activities.

To strengthen ties with the states and tribes, we are considering the establishment of informal regional Natural Resources Science Forums. These Forums would be designed to facilitate communication and coordination of research needs among land and resource managers. The Forums would also foster additional collaborative programs with state, tribal, university, nongovernmental, and industry scientists.

(5) Taking advantage of talent in the nation's universities and leveraging limited funds through research collaborations. We are working to broaden and strengthen the Department's existing Cooperative Park Study Unit (CPSU) program. Under the new name of Cooperative Ecosystem Study Units (CESUs), the program will work to include scientists from other Department of the Interior bureaus and perhaps other federal agencies and collocate them in a university setting. The program will undertake cooperative research activities pertaining to the parks as well as other public lands. The CESU program is designed to build on and interconnect existing federal and university research activities. CESUs will undertake multidisciplinary studies, foster information and technology transfer, and aid in the training of university and government scientists. This arrangement will allow selected government scientists to rotate in and out of a university setting, a cycle that supports career advancement. Collaboration with the Water Resource Institutes, often located at the same universities will also facilitate multidisciplinary study.

(6) Ensuring viable technical support activities. The Park Service maintains scientific and technical, but largely non-research, staff to assist park superintendents in meeting near- and long-term need scientific needs. This includes inventory and monitoring activities to assess the status and trends of natural resources. These activities need to continue to receive financial support and to grow when budget priorities allow.

Science for the Parks.

The National Park Service is charged with protecting the nation's natural and cultural treasures. Among these treasures is Yellowstone National Park, the nation's first National Park, established by the 42nd Congress on March 1, 1872—125 years ago this Saturday. Since that time the system has grown to include more than 375 sites nationwide. It is interesting to note that Yellowstone was established as a direct result of the scientific expeditions led by geologist Ferdinand Hayden who reported on the great physical and biological diversity of this area.

Another geologist, John Wesley Powell surveyed vast areas of the arid West, including a famous expedition down the Colorado River. Powell's observations led to the establishment of Grand Canyon National Park. I mention these historical facts to underscore the close connection between science—and more specifically USGS—and the National Parks. John Wesley Powell was the second Director of the USGS. Exploration and science are behind the establishment of most of the nation's national parks.

Today, most of the United States has been explored, and the role of science is less one of discovering new natural assets and more one of providing the basis for effective stewardship of our Nation's lands and resources. As the populations of areas surrounding the parks grow, pressure on these resources increases, and controversy about ways to protect the parks arise. Science provides an objective foundation for sound natural resources management. The "new" USGS is dedicated to providing this objective foundation.

A wealth of studies have provided insights as to how science can and should contribute to the management of the parks. Two key reports in the early 1960s, *Wildlife Management and the National Parks* (the "Leopold report") and *A Report by the Advisory Committee to the National Park Service on Research* (the "Robbing report"), pointed to the importance of strong scientific programs in aiding in the management of the Parks. The Robbins report underscored the "distinctions between research and administrative decision-making." More recently, the National Research Council report Science and the National Parks, published in 1992, calls for greater "organizational and budgetary autonomy" of its science program, and makes a number of other recommendations for advancing park programs. We believe the creation of a new Biological Resources Division within the USGS will facilitate stronger, more independent research programs in support of park resources management.

Future Challenges.

The Secretary has made strong, objective research programs in support of effective resource management a top priority. With increased visitation within the national parks and increasing population surrounding them, maintaining the ecologi-

cal integrity of these systems will be a particular challenge. At the same time, continuing constraints on federal funding will require the search for innovative approaches to ensure adequate support for key research activities. We are committed to working with you Mr. Chairman and members of the subcommittee to advance the department's scientific programs generally and National Park Service programs specifically.

APPENDIX I

APPENDIX I

NATIONAL PARK UNITS GAO VISITED IN 1995

Park unit	Location
Antietam National Battlefield	Maryland
Bandelier National Monument	New Mexico
Denali National Park and Preserve	Alaska
Glacier National Park	Montana
Harpers Ferry National Historical Park	Maryland, Virginia, and West Virginia
Hopewell Furnace National Historic Site	Pennsylvania
Lake Mead National Recreation Area	Nevada and Arizona
Padre Island National Seashore	Texas
Pecos National Historic Park	New Mexico
Shenandoah National Park	Virginia
Statue of Liberty National Monument and Ellis Island	New York and New Jersey
Yosemite National Park	California

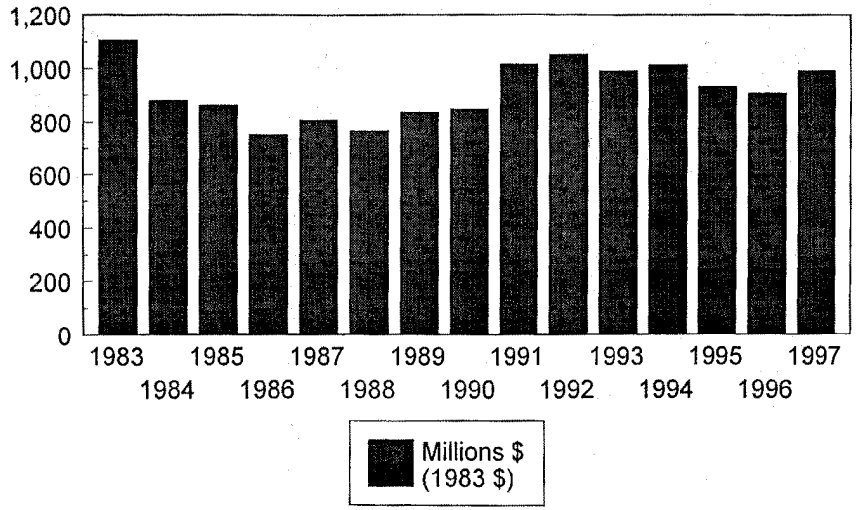
NATIONAL PARK UNITS GAO STUDIED IN 1996

Park unit	Location
Arches National Park	Utah
Crater Lake National Park	Oregon
Gettysburg National Military Park	Pennsylvania
Indiana Dunes National Lakeshore	Indiana
Lake Meredith National Recreation Area	Texas
Minute Man National Historical Park	Massachusetts
Olympic National Park	Washington
Saguaro National Park	Arizona

(141021)

Insert on Page 149, Line 3203

NPS BUDGET
in constant 1983 dollars



ATTACHMENT A

DO LIVESTOCK OR WILD UNGULATES HAVE A GREATER IMPACT ON RIPARIAN AREAS?

A COMPARISON OF WILLOW COMMUNITIES ON THE U.S. SHEEP EXPERIMENT STATION AND IN YELLOWSTONE NATIONAL PARK - -

OR WHY WE NEED AN INDEPENDENTLY FUNDED PROGRAM TO REVIEW PARK SCIENCE.

Testimony presented at the Oversight Hearing on Science and Resource Management in the National Park System held by the U.S. House of Representatives Subcommittee on National Parks and Public Lands, February 27, 1997.

by

Dr. Charles E. Kay
Ph.D. Wildlife Ecology
Adjunct Assistant Professor
Department of Political Science
Logan, UT 84322
(801) 797-2064

INTRODUCTION

In 1922, 16,645 acres along the Continental Divide in the Centennial Mountains of southwestern Montana were withdrawn from the Public Domain and transferred to the U.S. Sheep Experiment Station headquartered in Dubois, Idaho. Elevations in the Odell (12,885 A) and Tom (3,760 A) drainages range from 9,800 feet on Slide Mountain to 7,000 feet along the lower reaches of Odell Creek. After leaving the Sheep Station, Tom and Odell Creeks flow through Bureau of Land Management (BLM) acreage, and then private lands, before entering Red Rock Lakes National Wildlife Refuge and emptying into Upper Red Rock Lake.

Two bands, each of approximately 2,000 ewes and lambs, now graze the two allotments in Odell Creek and the one allotment in Tom Creek for 60 days in July and August under rest-rotation management. In the past, however, when the Station had three bands of sheep, each allotment was grazed every year. Coniferous forests cover nearly 65% of the area while montane and subalpine grasslands (20%) and perennial tall-forb communities (15%) produce most of the forage. The Centennial's tall- forb communities are climax and do not represent retrogressive plant succession (Ecret 1986).

The Station's Centennial summer range has been grazed by domestic sheep since 1922, but cattle have never been permitted. Elk (Cervus elaphus), moose (Alces alces), and mule deer (Odocoileus hemiouus) also use the Sheep Station's summer range. Deep snow, however, forces all but moose to migrate to distant lower-elevation wintering areas in Montana or Idaho (BLM 1990).

Yellowstone National Park (2.2 million acres) was set aside as our nation's and the world's first national park in 1872. Park administrators originally thought there were not

enough game animals so they killed predators and fed wintering elk, bison (Bison bison), and other wild ungulates. By the late 1920's, however, concerns grew that the unnaturally large elk population was severely overgrazing the park, and in particular Yellowstone's northern winter range. In fact, the National Park Service was so convinced elk were destroying Yellowstone that from 1949 to 1968 rangers shot over 13,500 elk to reduce the northern herd. Under mounting political opposition, though, the Park Service abandoned its control program in 1968 and by the early 1970's had switched to "natural regulation" or "hands-off" management (Kay 1990).

Under "natural regulation," predation is an assisting but non-essential adjunct to the regulation of ungulates through density-dependent homeostatic mechanisms; i.e., the animals will self-regulate without destroying the range. Elk and other wild ungulates are limited by food, and according to the Park Service, thousands of animals starving to death is natural. If wolves (Canis lupus) or other predators are present, they would only kill animals slated by nature to die of other causes and would not limit or lower ungulate numbers. In the current debate over reintroducing wolves to Yellowstone, the Park Service has never said wolves are needed to control the elk herd, and in fact, that agency and the U.S. Fish and Wildlife Service adamantly deny that wolves will have any significant impact on Yellowstone's game populations (Kay 1996).

The Park Service also denies that Yellowstone was ever or is now overgrazed (Houston 1982, Despain et al. 1986). Today, the agency contends that large numbers of elk (12-15,000+) have wintered on the park's northern range for the last 8-10,000 years and that those animals have been in equilibrium with Yellowstone's plant communities. According to the Park Service, any recent (1872-1990) vegetation changes are due primarily to suppression of lightning fires, normal plant succession, or climatic change, not

ungulate grazing (Singer et al. 1994). The agency also steadfastly maintains that Yellowstone's elk have not competitively excluded sympatric herbivores, such as smaller ungulates or beaver (Castor canadensis) (Kay 1990).

Both the U.S. Sheep Experiment Station and Yellowstone National Park are part of what is termed the Greater Yellowstone Ecosystem (see Figure 1) (Tixier 1986). National and regional environmental groups, such as the Greater Yellowstone Coalition (GYC), not only support "natural regulation," "hands-off," "let-nature-take-its-course" management, but would like to extend that program to other lands in the ecosystem (Harting and Glick 1994). Those same environmental groups, though, would like to see livestock grazing reduced or eliminated, because they claim cattle and domestic sheep are overgrazing the range and damaging sensitive riparian areas (Harting and Glick 1994). In fact, GYC has called for closure of the U.S. Sheep Experiment Station because it contends that sheep have overgrazed the Station's Centennial summer range causing massive erosion (GYC 1986, Lewis 1993). Soil erosion is claimed to be so bad that it, via Tom and Odell Creeks, has filled in Upper Red Rock Lake miles below the U.S. Sheep Experiment Station (BLM 1990).

As studies throughout the West have demonstrated, riparian areas, and especially willow (Salix spp.) communities, can easily be damaged if livestock are improperly managed (Platts 1991). So if the U.S. Sheep Experiment Station's summer range has been overgrazed, riparian areas in the Odell and Tom Creek drainages should reflect that condition. Willows should be heavily browsed, short-statured, and declining (Platts et al. 1987). Furthermore, if sheep grazing has been so severe as to cause lake-filling soil erosion miles downstream, the Station's riparian areas should also reflect that fact. Overbank deposits, mud flows, and debris flows should have buried willow communities and choked stream channels. On the other hand, if "natural regulation" represents the

epitome of ecosystem management as claimed by GYC and others, then Yellowstone National Park's willow communities should be in a near pristine state or at least be in better condition than those grazed by livestock (Kay 1990, Chadde and Kay 1991, Wagner et al. 1995, Kay and Platts 1997).

METHODS

At the request of the U.S. Sheep Experiment Station, I surveyed and measured willow communities in the Tom and Odell Creek drainages during the summer of 1993 (Kay 1994a) and then compared those data to my earlier research in Yellowstone National Park (Chadde and Kay 1998, 1991; Kay 1990, 1994b; Kay and Chadde 1992; Kay and Wagner 1994; Kay and Platts 1997). I used repeat photographs, and inside-outside exclosure height and canopy-cover measurements to determine the condition and trend of willow communities in Yellowstone Park. There are, however, no long-term willow exclosures on the Sheep Station or in the Centennial Mountains. Instead, I surveyed all of Tom and Odell Creek on foot or horseback, as the Station's summer range is largely unroaded, and I measured ten representative willow communities for height and canopy cover (Kay 1994a). I also conducted a repeat-photo study for the entire Centennial Mountains, including riparian areas.

Since the abundance of beaver can be used to judge the long-term health of streamside willow communities, overgrazed areas generally have fewer beaver, I also recorded beaver activity on the Station's summer range, similar to my previous work in Yellowstone Park (Kay 1990, 1994b; Chadde and Kay 1991). Here I only summarize my findings, but details of my study designs, methods, and results are found in the papers cited above.

RESULTS

Willow Communities

I made 44 repeat photosets of willow communities on Yellowstone Park's northern range, dating to the 1870's. In 41 of those comparisons, tall willows have totally disappeared (see Figure 2), while in the other three, only 5 to 10 percent of the original tall willows remain (also see published repeat photos in Kay 1990, 1992; Chadde and Kay 1991; Wagner and Kay 1994; Kay and Platts 1997). In 1871, Captains Barlow and Heap toured Yellowstone Park, and on the northern range, they reported "thickets of willows along the river banks" (Chadde and Kay 1991:236). Philetus Norris, Yellowstone's second superintendent, noted that the park was "well supplied with rivulets invariably bordered with willows" (Chadde and Kay 1991:236). Since that time, though, the area occupied by tall willow communities on the northern range has declined by 95% or more.

Measurements of total willow canopy cover and height inside and outside four ungulate-proof exclosures constructed on the park's northern range back in the late 1950's and early 1960's show that repeated browsing by wild ungulates, primarily elk, is having a severe impact on Yellowstone's willow communities. At permanent transects outside exclosures, willows had a canopy cover of only 14% while those same species inside totaled 95% canopy cover. Outside, willows averaged only 13 inches tall, while inside, plants averaged 108 inches (9 feet) (see Figure 3). Female plants outside exclosures produced no catkins or seeds, while protected willows produced over 300,000 seeds per square meter of canopy cover, a difference that is statistically and ecologically significant (Kay and Chadde 1992).

Willows inside Yellowstone's exclosures today, in physical appearance, resemble those found on the park's northern range during the 1870's. This suggests that the level of ungulate use inside the exclosures approximates the level of ungulate use when Yellowstone Park was established. The same is true of aspen (Populus tremuloides) and conifer communities. Historical photographs of woody species show no evidence of the ungulate browsing or high-lining that are now common (Kay and Wagner 1994). Today, even species such as Engelmann spruce (Picea engelmannii), the least palatable conifer in the park, have had all their lower branches consumed by starving elk. In 1871, though, Yellowstone's conifers had branches down to the ground (Kay 1990, Kay and Wagner 1994).

In contrast to present conditions in Yellowstone Park, willow communities on the Sheep Station's Centennial Mountains range are generally in good to excellent condition (see Figure 4). On ten plots, total willow canopy cover ranged from 77% to 104% and averaged 93% (Kay 1994a), while the mean height of the three major willow species ranged from 47 to 153 inches (13 feet). Many willows, though, showed extensive signs of repeated browsing by wild ungulates, primarily wintering moose, not domestic sheep. First plants were browsed to 3 m or more, well above what domestic sheep can reach, and second, willow height declined with decreasing elevation.

Normally, willows of the same species tend to decrease in height with increasing elevation due to environmental factors, but on the Sheep Station this pattern was reversed. On Spring Creek, for instance, Geyer's willow (Salix geyeriana) had a mean height of 52 inches at the lowest elevation sample site compared to a mean of 83 inches on the uppermost plot ($p <. 001$). The same was true on Twin Basin Creek, 54 versus 87 inches ($p < .001$), and along Odell-Meadow Creeks, 68 versus 83 inches ($p < .001$). Communities

at lower elevations also had less total willow canopy cover than stands at higher elevation -- range 77% - 89% versus 100% to 104% (Kay 1994a). This pattern of shorter willows at lower elevations and taller plants at higher elevations appears related to the intensity of winter moose browsing. Deepening snow at higher elevations apparently limits moose utilization on those sites.

Repeat photographs also demonstrate that managed livestock grazing has had little impact on willow communities in the Centennial Mountains (see Figure 5). Of the more than 100 repeat photosets that I made in the Centennials, including five that date to 1872, 28 depict riparian communities. Unlike Yellowstone Park, none of the willows in the Centennial photosets show any significant decline. Instead, willows have increased in several photos. Since the Centennials are part of the Yellowstone Ecosystem, this is further evidence that willows in the park have not declined due to climatic change or the other factors postulated by the Park Service.

Beaver

Beaver were exceedingly common on Yellowstone Park's northern range during the 1800's, but are now ecologically extinct due to repeated ungulate browsing of the willows and aspen beaver need for food and dam building materials. Even as late as the 1920's, a detailed survey of one small portion of the park's northern range reported extensive active dams and 232 beaver. When repeated during the 1950's, though, no beaver nor any recent activity were recorded, and when I redid that study in 1986-88, I found no beaver nor any activity since the 1920's (Kay 1990, Chadde and Kay 1991, Kay and Platts 1997).

In contrast, today there are more active beaver colonies in the Sheep Station's Odell

Creek drainage than the Park Service has reported for all of Yellowstone Park's northern range (Kay 1994a). Without tall willows and beaver in Yellowstone, biodiversity has been greatly reduced and many streams have downcut lowering watertables. A recent study reported 100 times more bank erosion on denuded streams in the park than on those same, willow-lined streams outside the park (Rosgen 1993). Since beaver is a keystone species, its loss has ramifications far beyond the demise of a single species (Naiman et al. 1988, Kay 1994b, Pollock et al. 1995).

CONCLUSIONS

Willow communities on the Sheep Station's Centennial Mountains range are in much better condition than those in Yellowstone Park. Contrary to popular claims (Harting and Glick 1994), Yellowstone is not an intact natural ecosystem, but instead is highly degraded. The park today does not represent the conditions that existed when Yellowstone was declared the world's first national park in 1872. Repeated browsing by unnaturally large numbers of elk and other wild ungulates has completely altered willow and other communities. Instead of being in pristine condition, Yellowstone's riparian communities are among the worst overgrazed in the entire West due to "natural regulation" management (Patten 1993, Wagner et al. 1995, Kay and Platts 1997).

U.S. Sheep Experiment Station riparian areas, on the other hand, are generally in good to excellent condition. Over 70 years of managed grazing by domestic sheep have had little impact on willow or other plant communities (Ecret 1986). Moreover, there is no evidence of sheep-induced overgrazing or soil erosion, lake filling or otherwise. Siltation behind beaver dams is not excessive, and debris or mud flows have not buried riparian

communities or stream channels (Kay 1994a). Clearly, unregulated wild ungulate populations can have a greater impact on western riparian communities than well managed grazing by domestic livestock. These data also demonstrate that agency claims that Yellowstone Park is not overgrazed and blanket claims by GYC that livestock are destroying areas outside the park are simply not true. Several streams in the park have now blown-out and downcut to Pleistocene gravels, something that has not happened in over 12,000 years, because elk and other "naturally regulated" ungulates have destroyed the woody riparian vegetation that once protected those streambanks (Beschta and Platts 1986, Elmore and Beschta 1987). This is not only a clear violation of the park's organic act, but of other federal statutes, as well.

These data also demonstrate that the greatest threat to the Yellowstone Ecosystem is "natural regulation" management, and that unless ungulate populations are controlled, they will severely impact plant and animal communities. These data also show that neither the Park Service nor GYC can be trusted to evaluate the consequences of their management philosophies. Thus, not only do we need a Park Service science program separate from park management, but Congress must also insure that funding is available for independent scientists, who are willing to critically evaluate key aspects of park programs. Money may be the root of all evil, but money is also the root of all science. Without adequate funding, there will be no independent review of park management and America's heritage will continue to be lost.

LITERATURE CITED

Beschta, R.L., and W.S. Platts. 1986. Morphological features of small streams: Significance and function. Water Resources Bull. 22:369-379.

Bureau of Land Management. 1990. Centennial Mountains wilderness suitability study/ MFP amendment/environment impact statement – Final. U.S. Bureau of Land Management, Montana State Office, Billings, MT. BLM-MT-ES-90-004-4332. 269 pp.

Chadde, S.W., and C.E. Kay. 1988. Willows and moose: A study of grazing pressure, Slough Creek exclosure, Montana, 1961-1986. University of Montana, Montana Forest and Conservation Experiment Station Research Note 24. 5 pp.

Chadde, S.W., and C.E. Kay. 1991. Tall willow communities on Yellowstone's northern range: A test of the "natural regulation" paradigm. Pages 231-262 in Keiter, R.B., and M.S. Boyce, eds. The Greater Yellowstone Ecosystem: Redefining America's wilderness heritage. Yale University Press, New Haven, CT. 422 pp.

Despain, D.G., D. Houston, M. Meagher, and P. Schullery. 1986. Wildlife in transition: Man and nature on Yellowstone's northern range. Roberts Rinehart Inc., Boulder, CO. 142 pp.

Ecret, R.L.V. 1986. An ecological analysis of the tall forb community of the Centennial Mountains, Montana. M.S. Thesis, University of Idaho, Moscow, ID. 84 pp.

Elmore, W., and R.L. Beschta. 1987. Riparian areas: Perception in management. Rangelands 9:260-265.

Greater Yellowstone Coalition. 1986. A model for integration and management for the Centennial ecosystem. Unpub. Rep., Greater Yellowstone Coalition, Bozeman, MT. 184 pp. Submitted as part of the written testimony on the BLM Draft Centennial Mountains Wilderness EIS; see BLM 1990: Comment page 91 QQ.

Harting, A., and D. Glick. 1994. Sustaining greater Yellowstone, a blueprint for the future. Greater Yellowstone Coalition, Bozeman, MT. 222 pp.

Houston, D.B. 1982. The northern Yellowstone elk: Ecology and management. MacMillan Pub., New York, NY. 474 pp.

Kay, C.E. 1990. Yellowstone's northern elk herd: A critical evaluation of the "natural regulation" paradigm. Ph.D. Dissertation, Utah State University, Logan. 490 pp.

Kay, C.E. 1992. Yellowstone before and after. Montana Stockgrower 64(1):32-34.

Kay, C.E. 1994a. An evaluation of willow communities on the U.S. Sheep Experiment Station's Centennial Mountains summer range. Unpub. Rep. on file, U.S. Sheep Experiment Station, Dubois, ID 83423. 26 pp. + 10 Figures, 3 Tables, and 3 Appendices.

Kay, C.E. 1994b. The impact of ungulates and beaver on riparian communities in the Intermountain West. Natural Resources and Environmental Issues 1:23-44.

Kay, C.E. 1996. Wolf recovery, political ecology, and endangered species. The Independent Institute, Oakland, CA. 46 pp.

Kay, C.E., and F.H. Wagner. 1994. Historic condition of woody vegetation on Yellowstone's northern range: A critical test of the "natural regulation" paradigm. Pages 151-169 in Despain, D.G., ed. Plants and their environments' - - Proceeding of the first biennial scientific conference on the Greater Yellowstone Ecosystem. U.S. National Park Service, Denver, CO. Tech. Rep. NPS/NRYELL/NRTR-93/XX. 347 pp.

Kay, C.E., and S.W. Chadde. 1992. Reduction of willow seed production by ungulate browsing in Yellowstone National Park. Pages 92-99 in Clary, W.P., E.D. McArthur, D. Bedunah, and C.L. Wambolt, eds. Proceedings -- Symposium on ecology and management of riparian shrub communities. U.S. For. Ser. Gen. Tech. Rep. INT-289. 232 pp.

Kay, C.E., and W.S. Platts. 1997. Viewpoint: Ungulate herbivory, willows, and political ecology in Yellowstone. J. Range Manage. 50:139-145.

Lewis, E. 1993. Seeking refuge: Changes needed so wildlife refuges don't become islands. Greater Yellowstone Report 10(3):9.

Naiman, R.J., C.A. Johnston, and J.C. Kelley. 1988. Alteration of North American streams by beaver. Bioscience 38:753-762.

Patten, D.T. 1993. Herbivore optimization and overcompensation: Does native herbivory on western rangelands support these theories? Ecol. Applications 3:35-36.

Platts, W.S. 1991. Livestock grazing. American Fisheries Society Special Publication 19:389-424.

Platts, W.S., C. Armour, G.D. Booth, M. Bryant, J.L. Bufford, P. Cuplin, S. Jensen, G.W. Lienkaemper, G.W. Minshall, S.B. Monson, R.L. Nelson, J.R. Sedell, and J.S. Tuhy. 1987. Methods for evaluating riparian habitats with applications to management. U.S. For. Ser. Gen. Tech. Rep. INT-221. 177 pp.

Pollock, M.M., R.J. Naiman, H.E. Erickson, C.A. Johnston, J. Pastor, and G. Pinay. 1995. Beaver as engineers: Influences on biotic and abiotic characteristics of drainage basins. Pages 117-126 in Jones, C.G., and J.H. Lawton, eds. Linking species and ecosystems. Chapman and Hall, New York, NY. 387 pp.

Rosgen, D.L. 1993. Stream classification, streambank erosion, and fluvial interpretations for the Lamar River and main tributaries. Unpub. Rep. on file, National Park Service, Yellowstone National Park, Mammoth, WY. 22 pp. + 29 Figures.

Singer, F.J., L.C. Mark, and R.C. Cates. 1994. Ungulate herbivory of willow on Yellowstone's northern winter range. J. Range Manage. 47:435-443.

Tixier, J.S. 1986. The Greater Yellowstone: An introduction to an area and its issues. Western Wildlands 12(3):2-6.

Wagner, F.H., R.B. Keigley, and C.L. Wambolt. 1995. Comment: Ungulate herbivory of willows on Yellowstone's northern winter range: Response to Singer et al. (1994). J. Range Manage. 48:475-477.

Figure 1. Map showing the location of Yellowstone National Park and the U.S. Sheep Experiment Station's summer range in the Centennial Mountains.

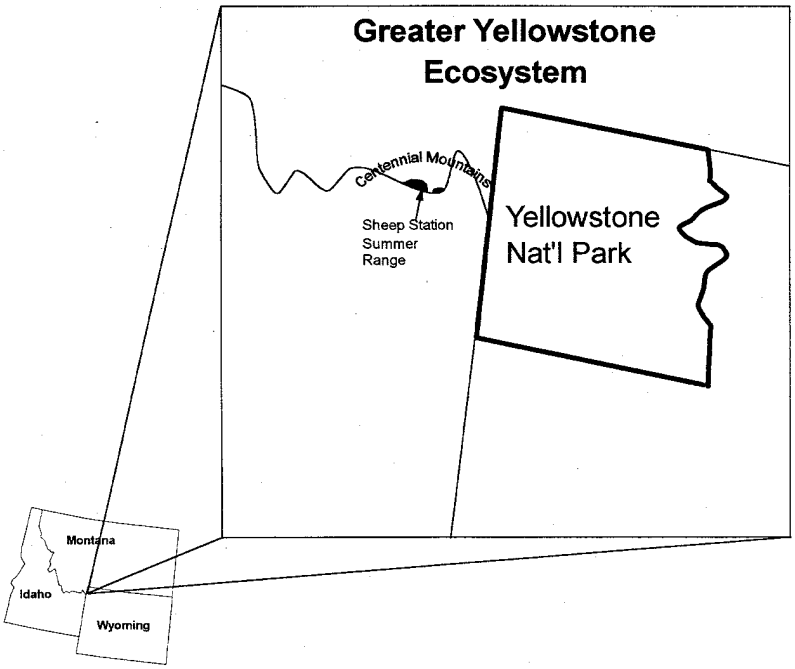


Figure 1.

Figure 2. A repeat photoset showing the dramatic impact native ungulates have had on willow communities in Yellowstone National Park. (a) Willows in this 1915 photograph already show the effects of repeated browsing, but are still plentiful. (b) By the 1950s, however, tall willows had been completely eliminated by repeated ungulate browsing. Contrary to what one might expect, Yellowstone Park contains some of the worst overgrazed riparian areas in the entire West. This is one of 44 repeat photosets of willows made in the park by Charles E. Kay.

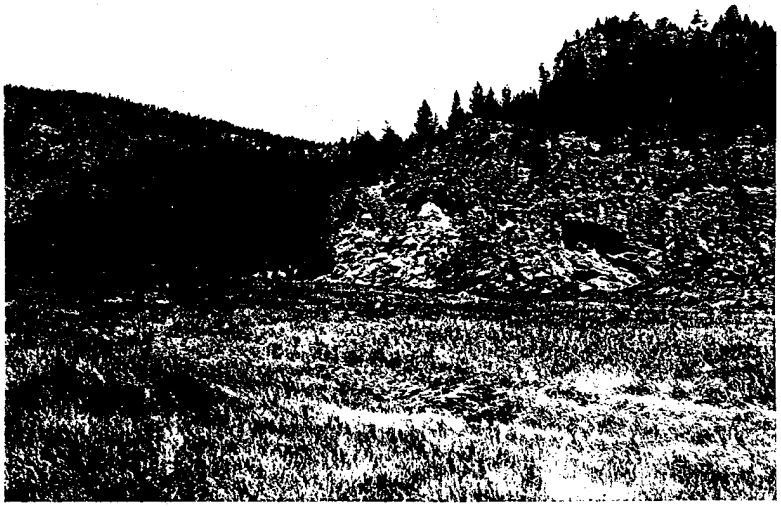


Figure 3. Fenceline contrast of willows inside (photo left) and outside (photo right) a fenced exclosure in Yellowstone National Park. Where elk and bison have been excluded, willows are in excellent condition - - similar to willow communities present in 1872 when Yellowstone was established as the world's first national park. Even to the casual observer, it is obvious that Yellowstone is severely overgrazed. This evidence, however, has been ignored by the Park Service and environmentalists because it does not support their political agendas. Photo by Charles E. Kay.

Figure 4. Willow communities on the U.S. Sheep Experiment Station's Centennial Mountains summer range. (a) Willows along Spring Creek had 100% canopy cover and an average height of nearly 7 feet. Note the 6 foot red and white survey pole for scale. (b) Willows along Twin Basin Creek also had 100% canopy cover with an average height of more than 7 feet. Again, note the survey pole for scale. Both 1993 photographs by Charles E. Kay used with permission of the U.S. Sheep Experiment Station, Dubois, ID.

Figure 5. A repeat photoset of willows along Miners Creek in the Centennial Mountains. The original photograph was taken in 1910 while the retake was made in 1994. Despite yearly grazing by cattle and sheep, the willows are unchanged except where disturbed by recent road constriction. Repeat photoset by Charles E. Kay used with permission of the U.S. Sheep Experiment Station, Dubois, ID.

1910

1994

Science and Ecosystem Management in the National Parks. Edited by W.L. Halvorson and G.E. Davis. The University of Arizona Press, Tucson, AZ, USA. 1996. xii + 364 pp., 16 illustrations, 6 tables, 7 photographs, 15 maps. $40.00. ISBN 0-8165-1566-2 (cloth).

A 1992 National Research Council (NRC) study of science in the American national parks (Risser et al. 1992) commented that there had been "a dozen reviews" of science in the National Park Service (NPS) since the early 1960s. All urged an expanded research program to provide a base of scientific information essential to effective management of the complex ecosystems on many of the 368 units of the National Park System. This book is powerful testimony to the wisdom of those recommendations.

The 16 chapters, each separately authored, are divided into 5 parts. The 2 chapters of Part 1, "Historical Perspective," outline the struggle of some individuals in NPS and advisors outside the agency to bring its policy setting out of "belief-based advocacy" into a pattern of enlightened, science-based decision making in order to provide effective protection of park resources. Yet as recently as 1991-92, the research outlay was only 2 percent of the NPS budget (Wagner et al. 1995:95).

The 12 chapters of Parts 2-4 discuss research on an array of resource problems in 11 national parks and monuments, Indiana Dunes National Lakeshore, and Ozark National Scenic Riverways. They illustrate the complexity of these systems; and they portray the sophisticated research approaches and methodology, long-term commitment, and continuing monitoring needed to provide the understanding for sound management.

The 5 chapters of Part 2 ("Long-Term Versus Short-Term Views") emphasize the importance of long-term research efforts both because of the time needed to develop an understanding of these complex systems, and because they change over time and

understanding depends on analysis over their ranges of variation. A 30-year research effort has documented the importance of fire in maintaining the mixed-conifer forests of Sequoia, Yosemite, and King's Canyon National Parks and led to the use of prescribed burning in their management programs. A 50-year data-set on fishing effort and removal of Yellowstone Lake cutthroat trout along with changes in fishing regulations now provides an understanding of fishing effects on the population and related responses of white pelicans, ospreys, and grizzly bears. A 32-year series traces interactive population changes in Isle Royale moose and wolf populations. A half century of research has explored alternative hypotheses on the causes of saguaro-cactus decline in Saguaro National Monument (now a park). Chapter 7 discusses the long history of research on invasive alien species into the Hawaiian Islands where the number of alien plant, land-bird, mammalian, reptilian, amphibian, and fish species approach or exceed the number of natives. And it summarizes the efforts at controlling or eliminating these in the 2 Hawaiian national parks.

Four Part 3 ("No Park Is an Island") chapters describe sophisticated research on groundwater hydrology, air-quality source analysis, and urban encroachment which has provided a base of evidence for legal action. Groundwater pumping over an extensive southern Nevada and southeastern California region lowers the water level in a spring pond sustaining endangered Devil's Hole pupfish in Death Valley National Monument. Sewage and toxic-waste discharge into a number of distant groundwater basins could adversely affect the diverse, fragile cave biota of Mammoth Cave National Park through interbasin exchanges termed "distributary flow." And tracer experiments have shown that

nearly half of the visibility problem in Grand Canyon, on average, is attributable to emissions from the Navajo Generating Station near Page, Arizona.

The 3 research examples of Part 4 ("Protection Versus Use") wrestle with the 2-homed dilemma that has beset NPS since establishment of the first park. The importance of long-term monitoring is shown in each case: impact of recreational use on threatened and endangered plants species in Indiana Dunes, impacts of growing wilderness use over a 20-year period in the Sierra Nevada parks, and effects of increasing recreational river use in the Ozark Riverways. Limitation of use is implied by each of these studies if serious resource damage is to be avoided.

The 2 final chapters making up Part 5 ("Beyond Denial: Managing with Knowledge") are authored by the book's 2 editors, Davis and Halvorson for Chapter 15 and the 2 in reverse order for 16. Their purpose is to extract key generalizations or object lessons that emerge from and cut across the case studies.

Several important issues of NPS science and management policy, not explicitly discussed in the chapters, will occur to readers with in-depth knowledge of the agency as they read the case studies. One is the continuing and ambiguous use of the word "natural" in NPS policy. Park ecosystems are preserved to allow the unfolding of "natural" processes, the term generally implying the absence of human influence and some approximation of presumed conditions prevailing before European contact. Much of NPS resource management consequently eschews advertent management in a policy commonly called "natural regulation."

But mounting archaeological and anthropological evidence is demonstrating that

North American landscapes, including areas now in national parks, were profoundly altered by human hunting, burning, cultivation, and plant use by a large pre-Columbian population of Native Americans. Chapter 3 acknowledges this in the case of anthropogenic fire in maintaining the mixed-conifer forests of the Sierra Nevada prior to European arrival. The Sierra Nevada parks have now instituted prescribed burning to perpetuate and simulate these man-made prehistoric conditions. Would then the advertent control of ungulate populations, now thought to have been held at low levels by aboriginal hunting in many areas in prehistory, and currently at high numbers ravaging park ecosystems, be any different in principle?

A second issue that will impress readers is the wide range of scientific expertise needed to provide the data base to manage this immense National Park System. The few case studies described in the book involved research in belowground and surface hydrology; atmospheric chemistry; and an immense array of ecological problems ranging from aquatic (lake, stream, cave) systems, through vegetation questions (from dunal forbs to sequoias), to such environmental factors as fire, pathogens, predation, and manifold human impacts.

The second issue leads to a worrisome third. A major purpose of the book is to illustrate the importance of long-term research in providing a knowledge base for sound management of park resources, and hopefully to stimulate expansion of the NPS research capability. Developing the limited research effort in NPS by the time this book was written had been an uphill struggle in the face of bureaucratic resistance, at times bordering on belligerence, in an agency that historically did not have a significant charter for,

commitment to, or appreciation of science (Risser et al. 1992, Wright 1992, Wagner et al. 1995).

In October 1993, NPS scientists were transferred into the new National Biological Survey (NBS) eventually (October 1996) to be relegated to a Biological Resources Division within the U.S. Geological Survey. This new entity was expected to continue providing research services to the parks while at the same given expanded responsibilities for surveying and researching the nation's biological resources.

But the Survey was not given additional personnel. Thus it is a zero-sum game, and one cannot avoid the suspicion that the parks will see reduction in the already inadequate research services. Moreover, with the research now buried in a division of a separate Interior agency, will it be easier for some park superintendents to ignore research results that challenge existing policy as occurred in a number of parks when the research was in the parent agency (Risser et al. 1992, Wright 1992, Wagner et al. 1995)? One can only hope that this book, largely written before NBS formation, does not become an irony, entreating an expansion of the meagre park-related research support underway at the time of writing, but in fact doing so at the zenith of that effort.

This is an excellent book. It provides a vivid sample of the diversity of resources in this magnificent national asset, the National Park System, and the range of difficult resource-management problems confronting the System. And it makes a convincing case that a scientific knowledge base, derived from effective, long-term research, is essential to effective protection of that asset. Will decision makers hear the message?

6

RISSER, P.G., A.M. BARTUSKA, J.W. BRIGHT, R.J. CONTOR, J.F. FRANKLIN, T.A. HEBERLEIN, J.C. HENDEE, I.L. MCHARG, D.T. PATTEN, R.O. PETERSON, R.H. WAUER, AND P.S. WHITE. 1992. Science and the national parks. National Academy Press, Washington, D.C. xiv + 122 pp.

WAGNER, F.H., R. FORESTA, R.B. GILL, D.R. MCCULLOUGH, M.R. PELTON, W.F. PORTER, AND H. SALWASSER. 1995. Wildlife policies in the U.S. national parks. Island Press, Washington, D.C. x + 242 pp.

WRIGHT, R.G. 1992. Wildlife research and management in the national parks. Univ. Illinois Press, Urbana, IL. viii + 233 pp.

– **Frederic H. Wagner.** Department of Fisheries and Wildlife, College of Natural Resources and Ecology Center, Utah State University, Logan, UT 84322-5205, USA.

Working Relationships Between The National Biological Service and the National Park Service:

A Survey of Managers and Scientists

17 April 1996

Natural Resource Stewardship and Science Directorate
National Park Service
Washington, DC

PART ONE
NPS Managers and the NBS
Survey Results

A survey of National Park Service (NPS) managers was conducted to understand the perceived effects of the transfer of NPS scientists to the National Biological Service (NBS).

Methods

A survey of NPS managers was conducted during February 1996. Survey forms were sent electronically to all park superintendents. Results were tabulated by hand. A staff member in the NPS Natural Resource Stewardship and Science WASO office read the open-ended comments and condensed them into lists.

108 responses were received, including 70 superintendents. 20 respondents currently have NBS scientists duty-stationed in their park(s).

There are several limitations. The respondents are not a systematic sample of NPS managers. The views of non-respondents may differ from those who did respond. Respondent's evaluations are based on perceived changes in service and assistance; actual changes may vary from these perceptions.

The results are useful as representing the opinions of selected NPS managers, and illustrating the range and diversity of views among NBS partners within the NPS.

Key Findings from Questions

Respondents were asked to rate the level of research and technical assistance they received from NPS scientists before and after the transfer of NPS scientists to NBS. The proportion of respondents receiving assistance regularly declined from 49% to 19%. The proportion of respondents receiving occasional assistance increased from 40% to 50%, and the proportion of respondents never receiving such assistance increased from 11% to 32%.

Respondents were asked whether they received research and technical assistance from NBS scientists *not* formerly with the NPS. 5% received such assistance regularly, 24% occasionally, and 71% reported no such assistance.

Respondents were asked if they had requested in the last year short-term assistance from former NPS scientists now with the NBS. 15% reported making regular requests, 52% reported occasional requests, and 31% reported making no requests for technical assistance.

Key Themes from Comments

Many of the respondents provided written comments in answer to open-ended questions included in the survey. A wide range of views is included, from "NBS is a major partner" to "more distant from good science in DOI than before the NBS was created." The list of transcribed comments is available from NPS. Several key themes emerge.

1. NPS managers define science as including applied research, small projects to solve specific resource management problems, technical assistance and facilitating access to the wider scientific community. Many perceive the transfer of scientists to NBS as significantly reducing their access to small applied research projects, technical assistance and problem-solving skills.

2. Many NPS managers feel they cannot receive scientific assistance easily or without providing the NBS with additional funds. They perceive the lack of funding as a significant barrier to NBS effectiveness in serving their needs.

3. NPS managers require research focused at park scales, for they perceive their resource management problems, opportunities and decision-making to be at the park level. They understand the value of regional and national-level research, but believe the NBS reduces its ability to provide research and technical assistance to parks by focusing on issues and scales larger than those of park management concerns.

4. NPS managers from small parks perceive that the NBS is not meeting their needs, due to a) its focus on larger ecological scales, b) the reduction of technical assistance, and c) a chronic lack of research funds for small parks.

5. NPS managers want DOI scientists to be field scientists, familiar with park resources, issues and concerns. They are interested in building long-term working relationships with the scientists

they depend on for information and guidance. Some managers perceive the NBS as discouraging such a field scientist approach, or as making such science-manager relations more difficult.

6. NPS managers perceive increased communication difficulties with science providers. Some managers felt this was due to a changed focus of scientists, having to deal with a different organizational culture that does not fully understand park needs and circumstances, and inadequacies in NBS efforts to reach out to, and work with, parks.

Conclusions

Among those NPS managers who responded to the survey:

- the perceived level of research and technical assistance regularly provided by former NPS scientists has declined,
- the proportion of managers receiving no assistance has increased, and
- additional assistance from other NBS scientists is occasionally provided to some NPS managers.

Some NPS managers are pleased with service provided by the NBS. Many NPS managers feel that the NBS is not providing needed services, and that the full range of science activities critical for sound, credible park management has become more difficult and expensive to access. Finally, many NPS managers feel that their access to needed research and technical assistance is declining at the same time that they require a sound scientific basis for management actions.

PART TWO
NBS Scientists and the NPS
Survey Results

A survey of National Biological Service (NBS) scientists formerly with the National Park Service (NPS), was conducted to understand the perceived effects of the transfer of NPS scientists to the NBS.

Methods

A survey of selected NBS scientists was conducted during February 1996. Survey forms were sent electronically to all former NPS scientists now assigned to the NBS. This included scientists stationed in park units and at Cooperative Park Studies Units. Results were tabulated by hand, and several staff members in the NPS Natural Resource Stewardship and Science WASO office read and condensed the open-ended comments into lists. 47 responses were received.

There are several limitations. The respondents are not a systematic sample of former NPS scientists. The views of non-respondents may differ from those who did respond. Evaluations are based on perceived changes in activities; actual changes may vary from these perceptions. The results are useful as representing the opinions of selected NBS scientists, and as illustrating the range and diversity of views among former NPS scientists now with the NBS.

Key Findings from Questions

Respondents were asked to estimate the proportion of their work time used for research, technical assistance (including training of NPS personnel), and other activities (such as administrative duties, university teaching and professional activities). The proportion of respondent's work time spent on research averaged 52%, with a range from 5-100%. The proportion of time spent on technical assistance averaged 26%, with a range from 0-70%. The proportion of time spent on other activities averaged 21%, with a range from 0-75%. Other activities included CPSU administration, project administration, proposal writing, budgeting, serving as contracting officer's technical representative on projects, serving on advisory groups, tasks forces and recovery teams, project reviews, professional activities and many other activities.

Respondents were asked to estimate the proportion of overall work time used for research, technical assistance and other activities they currently devote to support of NPS units and other NPS needs. The proportion of work time spent on NPS-related research averaged 50%, with a range from 0-90%. The proportion of work time spent on NPS-related technical assistance averaged 15%, with a range from 0-40%. The proportion of work time spent on NPS-related other activities averaged 14%, with a range from 0-65%. Other NPS-related activities included teaching and training, resource management assistance, serving on NPS advisory groups, task forces, and staff teams, and project administration.

Respondents were asked to estimate the proportion of their research activities that *formerly* (prior to moving to the NBS) resulted from specific park requests or from NPS priority-setting actions (such as the NRPP process). The average was 90%, with a range from 20-100%. When asked what amount of their research formerly addressed a specific issue contained in a park Resource Management Plan, 66% reported "all", 32% reported "most", and 2% reported "some". Respondents were asked to estimate the *current* proportion of research activities resulting from park requests or NPS priority-setting actions. The average was 69%, with a range from 0-100%. When asked what amount of their research currently addressed a specific issue contained in a park Resource Management Plan, 45% reported "all", 38% reported "most", 13% reported "some", 2% reported "none", and 2% replied "don't know".

Respondents were asked to what extent their NBS supervisor encouraged them to discuss research and technical assistance needs with NPS park personnel. 53% were "highly encouraged", 26% were "somewhat encouraged", 15% were "neither encouraged or discouraged", 2% were "somewhat discouraged", and 2% were "highly discouraged".

Respondents were asked about the amount of financial, logistic and other support, beyond that transferred with them from the NPS, that they now had available from parks compared to when they were part of the NPS. 9% reported "more now", 32% reported "about the same", and 55% reported "less now".

Key Themes from Comments

Many of the respondents provided written comments in answer to open-ended questions included in the survey. A wide range of views was expressed, from "the NBS is administratively challenged" to "the creation of the NBS is a positive". The list of transcribed comments is available from the NPS. Several key themes emerge.

1. The establishment of the NBS and transfer of NPS scientists to the new agency has meant a major reallocation of the time, money and resources available to these scientists. Many respondents described substantial changes in the distribution of their activities. Changes included a decline in their ability to provide technical assistance to park managers, and an increase in their administrative responsibilities. Some respondents reported that they are now more able to conduct interesting and credible research.

2. In a period of constrained budgets and growing research needs, funding for research is a critical issue. Many respondents felt that funding--not simply the amount available but the source, process and purpose of research supp . . -was a driving forc in how they chose to conduct their activities. Some respondents felt that their support had declined, both from within the NBS and from the parks. Some respondents felt that the NBS did not properly fund techaical assistance to park managers.

3. A shift has taken place regarding the scales at which NBS scientists now work. Many respondents felt that NBS budgets, mission and supervision have combined to move them from park-specific to larger scale research. Some respondents perceived the shift as a positive change. Others perceived the shift as a negative, because it separated them from serving park needs and working directly with park managers. In addition, many respondents felt that technical assistance to parks was administratively and strategically more difficult within the NBS.

4. For former NPS scientists, organizational changes have been stressful and frustrating. Respondents have been involved in establishing the NBS, transferring from the NPS to the new agency, integrating with USFWS research activities and interacting with an NPS itself undergoing change. Words like "catastrophic", "wasting time", "chaotic" suggest difficulty in adapting to the new situation. Organizations have cultures, and the shift from the NPS (with its long tradition) to the NBS (with its initial and subsequent changes) has affected many former NPS scientists.

Conclusion

The perceived proportion of time spent on research activities requested by the NPS has declined from an average of 90% prior to the NBS to 69% currently.

Among those NBS scientists who were formerly with the NPS and responded to the survey:

- a majority of their time was spent on NPS-related activities,
- of the time they spend on NPS activities, 63% is spent on research, 19% on technical assistance and 18% on other activities including administration,
- one-fifth of the respondents were either not encouraged or actively discouraged from providing technical assistance to NPS managers, and
- over half felt that their support from NPS parks had declined.

In addition, respondents felt that transfer from the NPS to the NBS had noticeably changed their activities--reallocating time and effort, decreasing the capacity to provide technical assistance, altering the scale of research projects, reducing morale, and separating them from the NPS.