



# United States Department of the Interior

## NATIONAL PARK SERVICE

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IN REPLY REFER TO:

N2623(490)

SEP 20 1988

### Memorandum

To: ~~Superintendents~~, Affected Parks  
Attn: Chief, Division of Natural Resource Management

From: Associate Director, Natural Resources

Subject: National Park Service Natural Resources Assessment and Action Program Report.

This report was completed in 1988 from the reports done by your park and other parks and regional offices in 1987. It represents a comprehensive examination of the status and condition of natural resources of the National Park System; funding and staffing resources available for park natural resource programs; and a five-year action program for addressing the parks' most significant natural resource problems.

I want to express my appreciation for all the work which went into compiling this data. I want to assure you that it has been used extensively by us for briefing the Assistant Secretary about our programs, for answering questions from members of the Congress about how we are spending our existing monies as well as about our needs, and to make decisions about the future direction of our programs.

Completion of this nationwide assessment is an important part of the Director's 12-Point Plan for the Service. I consider it a blueprint for our future natural resource management programs, and intend, with your support, to move ahead with this action plan. I anticipate future improvement in the condition of our natural resources, as a result of the commitment of the Regional Directors, made at our meeting in Everglades National Park, to use fee monies and other funds under park and regional control to address the major issues identified in this report as most significant.

In addition, recent revisions to the Resource Management Plan (RMP) guidelines incorporate components of the 1987 assessment process directly into the RMP. Thus, future assessments can be completed by aggregating existing information from the Resource Management Plans.

I am sending a copy of the final report to all those parks which reported that they contain natural resources of "primary" significance. With your copy of this report, please accept my thanks for an assessment job well done.

Attachment

*J. Eugene Hester*

# Natural Resources Assessment and Action Program Report



Natural Resources Programs  
National Park Service



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1 2 - P o i n t P l a n

● **DEVELOP A LONG-RANGE STRATEGY TO PROTECT OUR**  
1 **NATURAL, CULTURAL, AND RECREATIONAL RESOURCES**

The National Park Service will continue to lead the preservation of distinctive natural, cultural, and recreational resources for the enjoyment, appreciation, and education of present and future generations.

To do this we will utilize current management techniques that evaluate resource significance in context with similar resource classes to ensure that the resources receive appropriate protection. Our management decisions will give focus and guidance to assure research efforts meet critical needs.

Influences on national park areas come from activities within their boundaries and from external forces. Both hold the potential for irreversible damage to the flora and fauna, cultural resources, scenic values, and other special characteristics of units within the National Park System.

The system, of course, can encompass only select samples representing the best of our national heritage. State and local park systems also share in protecting this heritage, so we must work together. We will make better use of programs that have long extended our influence beyond park boundaries. We will continue to seek the advice, counsel, and participation of constituent groups, college and university professionals, private interests, governmental agencies, and the general public. We intend to:

- Ensure that resource inventory, identification, and evaluation is an accurate and continuing process; that resource management is based on such information as it becomes available, and that the most critical resource needs are addressed in the context of parkwide, regionwide, and servicewide priorities.
- Emphasize the planning, management, and interpretation of resources in relation to the entire ecosystem or historic context.
- Encourage the protection and enhancement of other publicly and privately owned cultural and natural resources.
- Ensure that suitable recreational resources are accessible to our increasingly urbanized America.

NATURAL RESOURCES ASSESSMENT AND ACTION PROGRAM

March 1988

National Park Service  
Office of Natural Resources  
Washington, D. C. 20013-7127  
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## NATURAL RESOURCES ASSESSMENT AND ACTION PROGRAM REPORT

I. EXECUTIVE SUMMARY . . . . .	1
II. TYPES OF NATURAL RESOURCES IN THE NATIONAL PARK SYSTEM . . . . .	6
III. STATUS OF NATURAL RESOURCES . . . . .	13
IV. MAJOR NATURAL RESOURCE ISSUES . . . . .	37
V. EXISTING PROGRAMS AND UNFUNDED PLANNED ACTIVITIES . . . . .	40
VI. FIVE-YEAR ACTION PROGRAM . . . . .	57

## I. EXECUTIVE SUMMARY

### NATIONAL PARK SERVICE NATURAL RESOURCE ASSESSMENT AND ACTION PROGRAM

#### INTRODUCTION

In 1985, the National Park Service (NPS) unveiled a 12-Point Plan for improving the protection, preservation and management of all units of the National Park System. The first of the 12 Points identified a need for "a long-range strategy to protect our natural, cultural, and recreational resources." To this end, the Park Service is developing improved resource management planning based on assessment of known natural and cultural resources according to standard criteria and the initiation of coordinated resource management actions by park, regional and headquarters managers.

The process began in 1986 when each of the ten regional offices prepared Natural and Cultural Resource Assessments and Action Programs which were synthesized into Systemwide reports and Action Programs in 1987. The Systemwide reports include: (1) a summary of the type, significance, condition, and documentation level of all known resources, and adverse impacts on them; (2) identification of major resource needs and issues; and (3) an Action Program establishing the primary goals of the Systemwide Natural and Cultural Resources Management Programs.

The Systemwide Action Programs provide the framework in which effective management decisions can be made and priorities set at the park and regional levels. The resource assessment data, which will be updated regularly, also provide a means to monitor Servicewide progress. As resource management goals are met, the updated assessment data will reflect the improved condition of the resources and the decreasing threats to their integrity.

#### ASSESSMENT RESULTS

The resource assessments by the regional offices have provided for the first time in many years a uniform body of data on the number, type, and status of the cultural and natural resources administered by the National Park Service. This information has enabled managers to identify and distinguish areas of greater from lesser need and obtain a better understanding of major resource problems.

Natural Resources. About two-thirds of National Park System units contain "primary" natural resources: resources mentioned in the park's enabling law or proclamation; resources central to the existence of the park or for which the park has become known; rare, threatened, or endangered species or officially designated critical habitat; or resources possessing outstanding esthetic qualities. Many other units also have natural resources of value to the park as a whole, but not meeting the criteria for primary.

Natural resources were grouped into six major categories (plant, animal, geologic, water, air and esthetic resources) and thirty subcategories.

Parks were then asked to characterize the condition of resources in these subcategories as "good," "fair," "poor," or "unknown" and to average these judgments into a summary of the condition of each major resource category.

The majority of natural resources are in good to fair condition. Their condition is more often fair than either good or poor, although many resources, especially animals, are in unknown condition. For all the major resource categories except primary animals, more parks have resources in good condition than in poor condition.

However, the assessment revealed serious inadequacies in the data needed to make decisions about the management of natural resources. In all major categories except for primary esthetic resources, more parks have inadequate data to support management actions than have adequate information; in fact, one fourth to one half of the parks reporting resources in each category report inadequate data on those resources.

About 200 parks reported that one or more of their natural resources were being adversely affected now or that impacts would probably occur in the next five years. Approximately 100 different types of impact were identified, the most common being exotic plants, general development and construction, grazing, and poaching.

#### MAJOR RESOURCE ISSUES & NEEDS

Several resource situations were repeatedly identified that can be best addressed as Systemwide resource management issues requiring special attention through policies, management priorities, or budget adjustments.

##### Natural Resources Issues

The natural resource protection issues listed below occur in most regions and their impacts are felt in parks all over the nation, even the largest and most remote.

1. Exotic and feral animals and plants are changing park ecosystems. Exotic plants and animals currently are the most widespread biological management problem in the Southeast Region parks. Mongooses are severely impacting the native animals of the Virgin Islands National Park, while feral hogs continue to destroy unique vegetation and wildlife in Great Smoky Mountains, Congaree Swamp, and Cumberland Island. Exotic animals compete with native ones for food and habitat and/or harm native plants by excessive trampling or feeding on them, as in Olympic National Park where research has shown that introduced goats are causing unacceptable impacts on native plants and soils.
2. Park ecosystems still show effects from historic, disruptive activities and need rehabilitation. Past agricultural, industrial, and development practices have removed native prairie and other vegetation types from areas now part of parks in the Midwest Region. Restoration of tallgrass prairie is now being done, with other plant communities being researched



for future restoration. Many parks in the Mid-Atlantic Region came into the system bearing the scars of previous resource exploitation, ranging from sand quarry operations at Fredericksburg and shale pits at Delaware Water Gap to coal mining at New River Gorge. Soil erosion, slope slumping, and acid mine drainage create unsafe or unsightly areas in these parks. Pre-park intensive grazing at Guadalupe Mountains National Park has heavily damaged vegetative cover there.

3. Visitors are adversely affecting park ecosystems. Among the major visitor impacts are disturbance to breeding animals, trampling, damage to vegetation, soil erosion from heavily used trails, and water pollution from intensive recreational uses. In the high elevations of North Cascades and Mount Rainier national parks, fragile alpine plant communities have been killed by excessive visitor trampling and must be restored. Heavy recreation use of fresh water ponds on Cape Cod causes concern about water quality there.
4. Consumptive uses within parks are affecting park ecosystems. Illegal hunting is a problem in many parks, either from deliberate poaching of game as in Yellowstone where elk are killed for velvet antlers, or from the legal hunter who may unwittingly wander across the park boundary in areas where boundaries are hard to mark and maintain. Authorized mineral exploration and extraction are managed to minimize impacts in two southeastern parks, Big Cypress and Big South Fork, but the cumulative effects of access roads, mined areas, traffic generated by mining, spills, etc., are significantly altering park natural resources by affecting water quality, water flow, vegetative communities, and wildlife habitat. Trespass grazing affects native vegetation in Wupatki National Monument and Guadalupe Mountains National Park. Installing and maintaining fencing is very expensive. It is estimated that 290 miles of fencing are needed in the Southwest Region alone.
5. Watershed development and other activities outside parks is affecting park air and water resources. Regulation of lake levels in Voyageurs National Park affects shore and marsh environments and is having severe impacts on native fish stocks, water birds, and aquatic plants. Run-off from landfills at Gateway National Recreation Area is a common source of water quality impacts. Landfills also are adjacent to Acadia National Park and Cape Cod and Fire Island national seashores. Concentrations of ozone in Acadia National Park frequently exceed the National Ambient Air Quality Standard, and in fiscal year 1986, more than half the white pine trees surveyed at Acadia showed symptoms of ozone injury.
6. Urban development along park boundaries is affecting park ecosystems and interrupting larger ecosystems on which park resources depend. This is a serious problem for most areas in the Western Region, but especially for Point Reyes, Golden Gate, Muir Woods, Pinnacles, Saguaro, Santa Monica Mountains and Cabrillo. The two units of Saguaro National Monument are separated from each other and the available habitat around each is being reduced by urbanization; deer and javalina populations formerly migrating between these units will become reduced. In the southeast, adjacent land development around the Everglades National Park and Big Cypress National Preserve has restricted the home range of the endangered Florida panther.

## ACTION PROGRAMS

Systemwide Action Programs for both natural and cultural resources were developed to establish priority activities for park system management. The Action Program for natural resources is a 5-year program based on three major goals. The Action Program for cultural resources is a 13-year program to accomplish four major goals. The goals and the actions being taken to achieve the natural resources program are summarized below.

### Natural Resources

1. Focus funds on the most important resource issues and projects, and provide additional funding to do the projects called for in resource management plans. Mitigation projects directed at the restoration and recovery of park resources represent the bulk (almost 50 percent) of the Service's needed natural resources projects. Currently, about 40 percent of the park natural resource base funds are applied to mitigation projects. However, because of the large backlog of mitigation needs that has been documented, only the application of a large portion of the fee revenues over the next five years (in addition to base funds) will allow the parks to make any measurable progress toward mitigation. In many cases, research and data collection must precede mitigation activities. With fee revenues available, parks will be able to undertake more of the park-specific research projects, freeing regional research monies to address the most important regional and multi-regional issues. Fee monies available to the Director for discretionary use will be targeted at Systemwide issues. The Washington Office will also continue to work to establish cooperative agreements with other agencies and organizations and identify the policies of other groups that might be changed to mitigate the effects of the issues listed above.
2. Provide more expert resource management personnel and upgrade the natural resource training of all park staff. The park and regional personnel need additional natural resources qualifications. The Service will attempt to meet this need through enhanced training. All the natural resource full-time and collateral duty personnel must be prepared through training to deal with the complex natural resources issues facing the parks today.

The Natural Resources Specialist Trainee Program should be increased to support a new 20-person class every 18 months rather than every 24 months. The Systemwide natural resources training program should be doubled to provide at least 20 courses each year, training a total of approximately 500 individuals. Systemwide (and regional) natural resources training programs should address the natural resources management issues identified in the assessment, with special emphasis on the needs of collateral duty personnel.

The regional training goal will be to complement and fill gaps in the Systemwide training offerings, and to provide some types of widely and/or frequently needed training that can be provided most efficiently at the regional level.

3. Improve park base-line information. A major Servicewide effort, supported by requested increases to base funding and a portion of park fee revenues earmarked for baseline data collection and monitoring projects, is required.

The need for better monitoring is the second largest need documented in park resource management plans (behind mitigation needs). This is a major issue in virtually every region. The objective will be to develop inventory and monitoring programs for at least 20 parks a year over the five years beginning in FY 1989, focusing initially on the larger natural resource units. Parks will establish or enhance existing inventory and monitoring programs to collect and assess data on the occurrence and condition of park resources. These programs will be based on the new guidelines of the Systemwide inventory and monitoring initiative. It is estimated that 10 to 20 percent of fee revenues available to the park could be directed at needs relating to inventory and monitoring.

4. Improve Servicewide research and disseminate research better within the Service. The Service needs to evaluate its research program and ensure that scientists are used to best effect and that our Cooperative Park Study Units are effective in addressing issues facing multiple regions. The Service also needs to maintain a cohesive publications program and a computerized data base of research publications.

#### IMPLEMENTING THE SYSTEMWIDE ACTION PROGRAMS

The Action Programs are being implemented Systemwide through several current and planned actions to improve the effectiveness and coordination of resource planning, management, and budget processes. As the assessments are periodically updated, progress will be monitored, and new or revised priorities and actions will be identified. To date the following steps have been initiated.

- ° All Regional Offices have developed natural and cultural resource Action Programs and have been directed to apply base funding and revenues from park entrance and user fees toward priority projects and issues identified in the Regional and Systemwide Action Programs.
- ° The Director will allocate his discretionary funds from fee collections (approximately ten percent) to critical natural and cultural resource issues.
- ° Basic inventory activity is being increased in FY 88 as the result of special appropriations of \$660,000 for inventory and monitoring of natural resources; \$410,000 for documentation and preservation of cultural resources; and \$2.9 million for object cataloguing. The Park Service's Washington Office is developing natural resource inventory and monitoring standards and procedures to support this activity.
- ° Guidelines for park Resource Management Plans are being revised to assure uniform resource status data and tracking mechanisms to monitor expenditures and project completion.
- ° Regional and Washington offices are expanding training programs to offer more courses on special priority topics such as prairie restoration. Increased emphasis will also be placed on the development of cross training for rangers, maintenance and administrative personnel on resource management issues.



## II. TYPES OF NATURAL RESOURCES IN THE NATIONAL PARK SYSTEM

### Background

The parks were asked to define their resources for purposes of the Assessment as "primary," "secondary," and "other." Primary resources were defined as resources specifically mentioned in the park's enabling legislation or proclamation; central to the existence of the park or for which the park has become known; rare, threatened, or endangered species or officially designated critical habitat; or possessing outstanding esthetic qualities. Secondary resources were defined as resources of value to the park as a whole, but not meeting the criteria for a primary resource. Other resources were defined as resources not contributing significantly to the value of the park. The Assessment instructions noted, and it should be reemphasized, that such groupings do not reflect the Service's legal requirement to protect all resources and values of parks.

Each park was asked to indicate on a checklist each of their primary, secondary, and other resources using six major resource categories and 30 subcategories (see Table II. 1).

### General Findings

About three-fourths of the 337\* parks in the System reported that they contain one or more categories of natural resources (animal, plant, geologic, water, air, or esthetic). (See Figure II.1).

The subcategories of resources reported by the most units of the National Park System were: terrestrial mammals; esthetic resources; birds; reptiles and amphibians; terrestrial invertebrates; fresh surface water; soils; forest/woodland vegetation; freshwater fish and invertebrates; groundwater; and, not unexpectedly, air resources (see Table II.2). It should be noted that no attempt was made to measure the extent of the different types of resources in each park. The checklist only indicated that the category or subcategory was represented in that park. Therefore, a large natural area and a small one would count equally in the survey. Relative numbers of parks and extent of acreage by region is shown in Figure II.2.

The natural resource subcategories reported by the fewest NPS units were: geysers/hot springs; glaciers; tundra/alpine vegetation; marine mammals; desert vegetation; saltwater vegetation; salt surface water; and caves/sinkholes. Surprisingly, not all of the parks that reported natural resources reported air and soils. It is possible that air was not reported in all cases because it is taken for granted or that some resource managers do not perceive that air purity or visibility is important to their parks. In all cases, parks should have reported those resources, at least as "other" resources.

### Primary Resources

About two-thirds of the parks in the System reported that they contain primary natural resources. About a tenth of the parks with primary resources reported that they have them in only one major resource category; about 40 percent reported that they have them in all six major resource categories.

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\*In FY 87 at the time of the assessment, there were 337 units. Currently there are 341.

TABLE II.1: NATURAL RESOURCE CATEGORIES AND SUBCATEGORIES

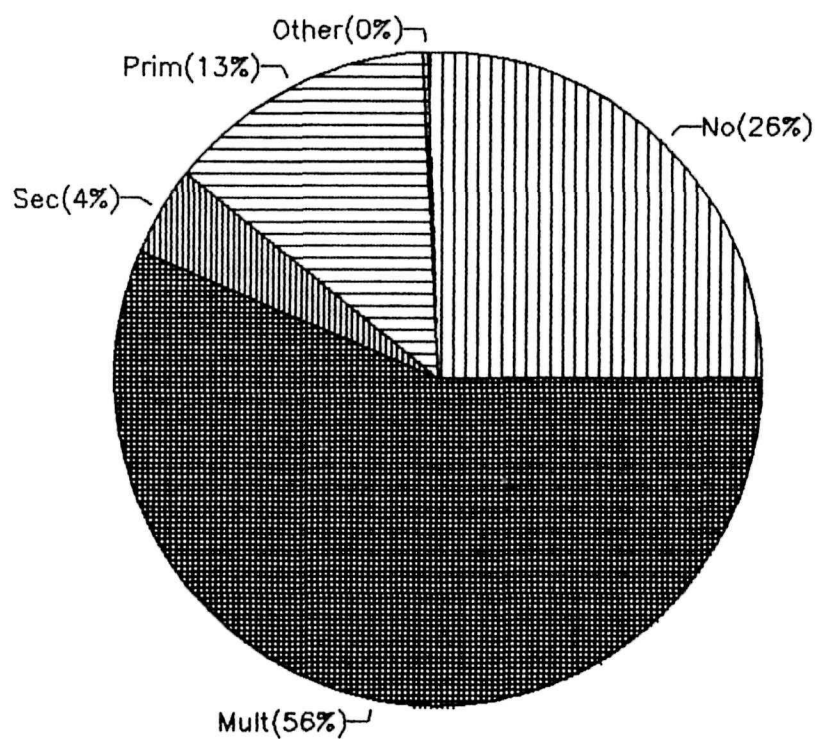
ANIMAL RESOURCES	Marine Fish and Invertebrates Freshwater Fish and Invertebrates Terrestrial Invertebrates Reptiles and Amphibians Birds Marine Mammals Terrestrial Mammals
PLANT RESOURCES	Grassland/Prairie Vegetation Forest/Woodland Vegetation Mixed Shrubland Vegetation Tundra/Alpine Vegetation Desert Vegetation Freshwater Vegetation Saltwater Vegetation Beach/Dune Vegetation Manipulated Landscape Vegetation*
GEOLOGIC FEATURES	Plains/Plateaus Mountains/Volcanoes Caves/Sinkholes Cliffs/Gorges/Canyons Shores/Islands Fossils Glaciers Soils
WATER/HYDROLOGIC FEATURES	Fresh Surface Water Geysers/Hot Springs Groundwater Salt Surface Water
AIR RESOURCES	Visibility Purity
ESTHETIC RESOURCES**	

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\* Horticultural, historical and agricultural landscapes dealt with in a resource management plan.

\*\* Defined as resources that are rooted in human perception, inspiration, and enjoyment, and whose loss cannot necessarily be said to affect physical resources in a harmful manner. They include scenic vistas, such as views of seashores, glaciers, waterfalls, mountains, deserts, and vast open spaces; solitude; freedom from unnatural noise; natural sounds, such as bird songs or waterfalls; and pleasant smells, such as wildflower smells.

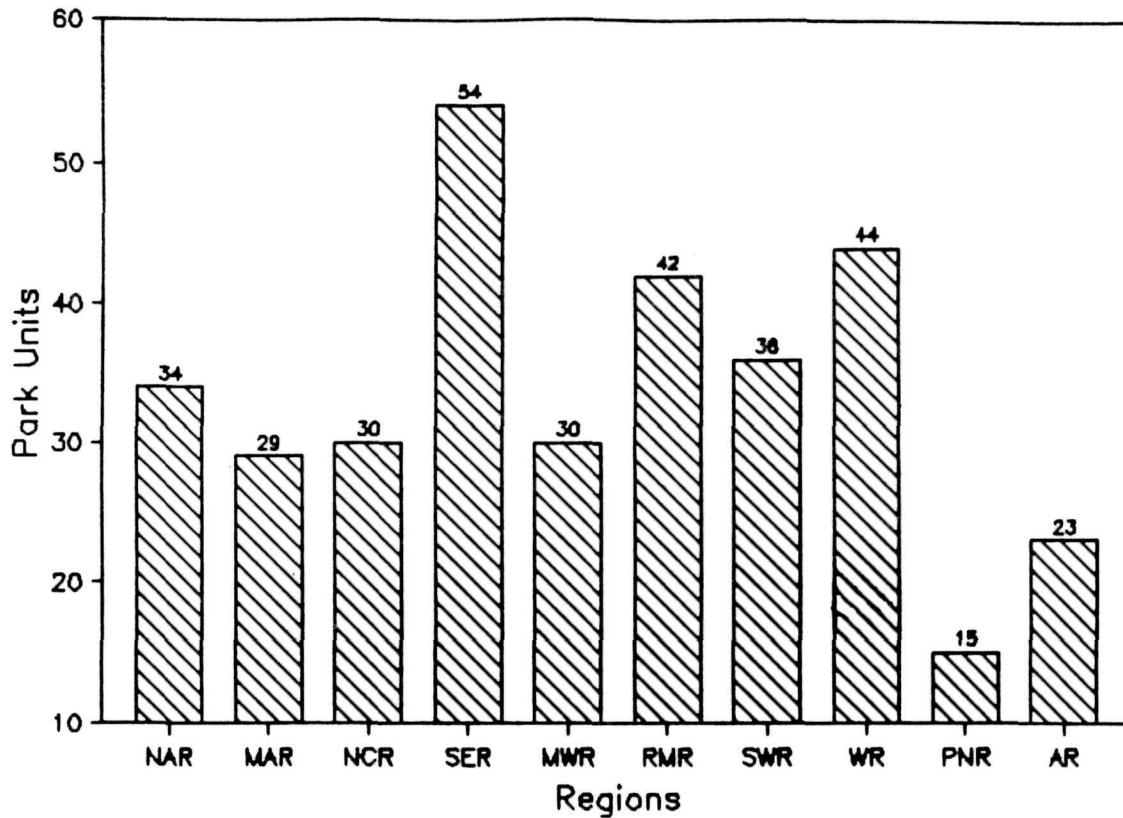
FIGURE II.1: NUMBER OF PARKS REPORTING NATURAL RESOURCES



No Natural Resources	86 (26%)
Secondary Natural Resources Only	15 ( 4%)
Primary Natural Resources Only	45 (13%)
Other Natural Resources Only	1 ( 0%)
Multiple Types of Natural Resources	190 (56%)



FIGURE II.2: NPS UNITS PER REGION



Note: Figures provided by WASO Land Resources Division.

TOTAL PARK AREA PER REGION

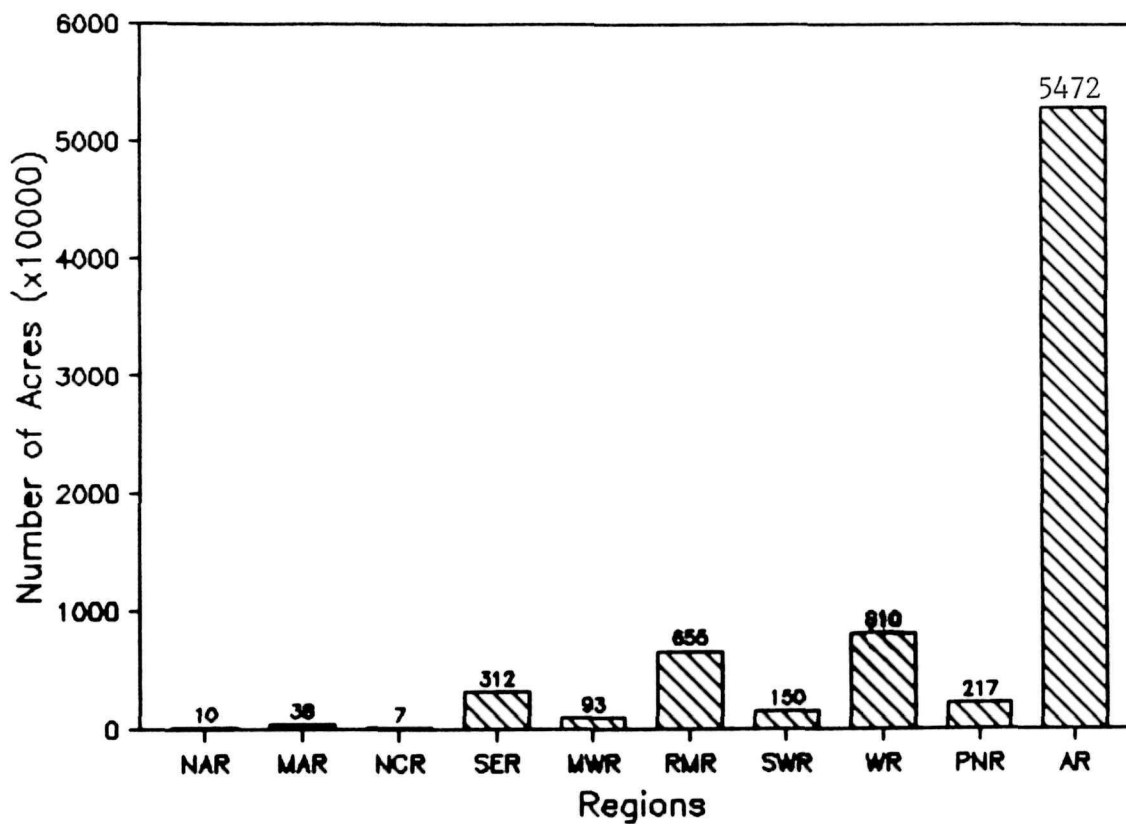


TABLE II.2: TYPES OF NATURAL RESOURCES BY MAJOR CATEGORY AND SUBCATEGORY  
(Number of Parks)

<u>Resource Type*</u>	<u>Total</u>	<u>Prim</u>	<u>Secd</u>	<u>Other</u>
ANIMAL RESOURCES	234 (69%)	147 (44%)	154 (45%)	63 (19%)
Marine Fish and Invertebrates	61	41	20	6
Freshwater Fish and Invertebrates	171	86	79	34
Terrestrial Invertebrates	196	75	92	41
Reptiles and Amphibians	198	78	102	41
Birds	221	127	114	35
Marine Mammals	37	27	12	1
Terrestrial Mammals	223	110	124	38
PLANT RESOURCES	249 (74%)	192 (57%)	140 (42%)	47 (14%)
Grassland/Prairie Vegetation	99	64	40	8
Forest/Woodland Vegetation	180	117	73	15
Mixed Shrubland Vegetation	96	54	45	9
Tundra/Alpine Vegetation	30	26	3	2
Desert Vegetation	42	31	16	4
Freshwater Vegetation	136	68	59	17
Saltwater Vegetation	44	35	9	2
Beach/Dune Vegetation	61	47	14	3
Manipulated Landscape Vegetation	142	85	56	24
GEOLOGIC FEATURES	221 (66%)	172 (51%)	119 (35%)	38 (11%)
Plains/Plateaus	61	40	24	4
Mountains/Volcanoes	65	56	12	0
Caves/Sinkholes	56	35	21	5
Cliffs/Gorges/Canyons	104	82	29	3
Shores/Islands	79	60	20	4
Fossils	64	34	27	11
Glaciers	23	20	3	0
Soils	182	86	88	27
WATER AND HYDROLOGIC FEATURES	216 (64%)	149 (45%)	107 (31%)	36 (11%)
Fresh Surface Water	183	126	66	22
Geysers/Hot Springs	18	14	3	2
Groundwater	165	74	81	21
Salt Surface Water	45	36	8	2
AIR RESOURCES	215 (64%)	128 (38%)	90 (26%)	17 (5%)
Visibility	190	121	60	13
Purity	200	111	76	15
ESTHETIC RESOURCES	222 (66%)	174 (51%)	64 (19%)	9 (3%)

\*The figures in the resource subcategories do not add to the figures in the major resource categories because the figures in the major resource categories represent the number of parks reporting a resource in one or more of the subcategories. Similarly, the figures in the columns do not add to the figures in the "total" column. The "total" figures represent the number of parks reporting one or more primary, secondary, or other resources. Percentages are of the total number of parks, 337.

The primary resources reported by the most parks were: esthetic resources; birds; fresh surface water; air resources; forest/woodland vegetation; terrestrial mammals; and air purity. The primary resources reported by the fewest parks were: geysers/hot springs; glaciers; tundra/alpine vegetation; marine mammals; desert vegetation; fossils; caves/sinkholes; saltwater vegetation; and salt surface water (see Table II.2).\*

Some types of resources in the System were reported to be mostly "primary." Over 80 percent of the parks with tundra/alpine vegetation, mountains/volcanoes, and glaciers reported that they have primary resources in these subcategories. Over 70 percent of all parks with marine mammals, desert vegetation, saltwater vegetation, beach/dune vegetation, cliffs/gorges/canyons, shores/islands, geysers/hot springs, salt surface water, and esthetic resources reported that they have primary resources in these subcategories.

A lower proportion of the parks that reported the more common resource types reported that the resources were primary. For example, only 58 percent of the parks reporting birds and 50 percent of the parks reporting terrestrial mammals reported that they have primary resources in those subcategories.

Over a tenth of the parks in the System reported that all of their resources are primary. All of the Alaska parks reported that all of their resources are primary under the provisions of the authorizing legislation for the Alaskan parks, the Alaska National Interest Lands Conservation Act (ANILCA). ANILCA directs the Service to maintain the natural environmental integrity of the natural resources within the Alaskan parks unimpaired.

About 40 percent of the parks that reported primary natural resources are parks that generally are considered cultural resource units. This is indicative of the Service's recognition that "cultural" parks often have natural resources and values.

### Secondary Resources

Over half of the parks in the System contain "secondary" resources. Over 90 percent of the parks with secondary resources also contain primary resources.

The secondary resources reported by the largest number of parks were: terrestrial mammals; birds; reptiles and amphibians; terrestrial invertebrates; soils; groundwater; and freshwater fish and invertebrates. The secondary resources reported by the fewest parks were: tundra/alpine vegetation; glaciers; geysers/hot springs; salt surface water; saltwater vegetation; mountains/volcanoes; marine mammals; beach/dune; and desert vegetation (see Table II.2).

More parks reported secondary than reported primary terrestrial invertebrates, reptiles and amphibians, terrestrial mammals, soils, and groundwater.

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\*Although few parks reported glaciers and tundra/alpine vegetation, they are very extensively represented in the Alaska parks where one glacier alone covers 450,000 acres.



### Other Resources

About a fifth of the parks in the System reported "other" resources. Only one park (Carl Sandburg Home NHS) reported only other natural resources. About half of the parks in the System reported primary and/or secondary resources, but not other resources. Three Regions (Alaska, North Atlantic, and Midwest) had no parks that reported other resources. Over half of the parks that did identify other resources in the remaining seven Regions generally are considered cultural resource parks.

The other resources reported by the largest number of parks were: terrestrial invertebrates; reptiles and amphibians; terrestrial mammals; freshwater fish and invertebrates; and birds. The other resources reported by the fewest number of parks were: mountains/volcanoes; marine mammals; geysers/hot springs; salt surface water; and tundra/alpine vegetation.

Because "other" resources were identified in an inconsistent fashion from park to park and Region to Region and were defined as not significantly contributing to the value of parks, they are not further analyzed in this Servicewide synthesis.

### III. STATUS OF NATURAL RESOURCES IN THE NATIONAL PARK SYSTEM

#### A. ADEQUACY OF DATA ON NATURAL RESOURCES

##### Background

Parks were asked to judge the adequacy of their data on "primary," "secondary," and "other" resources by the 30 resource subcategories and to summarize (by averaging) the overall adequacy of their data by major category (animal, plant, geologic, air, water, and esthetic resources).

Parks were asked to report whether existing data are "currently adequate" for dealing with management questions and making informed natural resource management decisions; "currently marginally adequate" for dealing with management questions and making informed resource management decisions or because park managers have not identified any major natural resource management activities requiring data; or "currently inadequate" for dealing with management questions and making informed natural resource management decisions.

##### General Findings

In all major resource categories, except for primary esthetic resources, the proportion of parks reporting inadequate data on their resources was higher than the proportion of parks with adequate information on the resources (see Table III.1 and Figure III.1). In most categories, the percentage of parks reporting marginally adequate data was greater than the percentage reporting adequate or inadequate data. The adequacy of data on primary resources is no better, on average, than the adequacy of data on secondary resources. Data needs appear to be greater for animal resources than for any other major category of resources, and less for esthetic resources.

##### Adequacy of Data by Major Resource Category

Approximately 65 percent of the parks with primary resources reported inadequate data on the primary resources in at least one major resource category. Seven percent reported inadequate data on all major categories in which they have primary resources. About a tenth of the parks with primary resources reported adequate data on resources in all major categories in which they have resources.

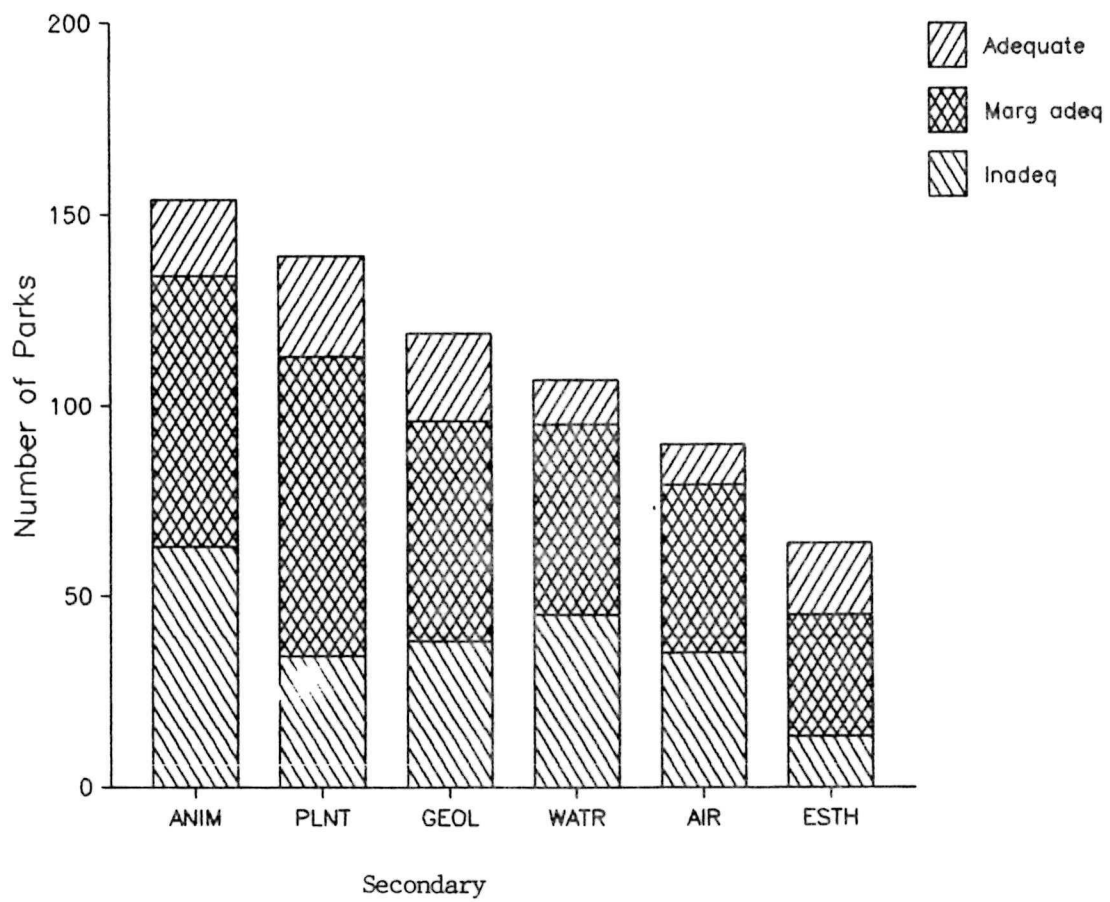
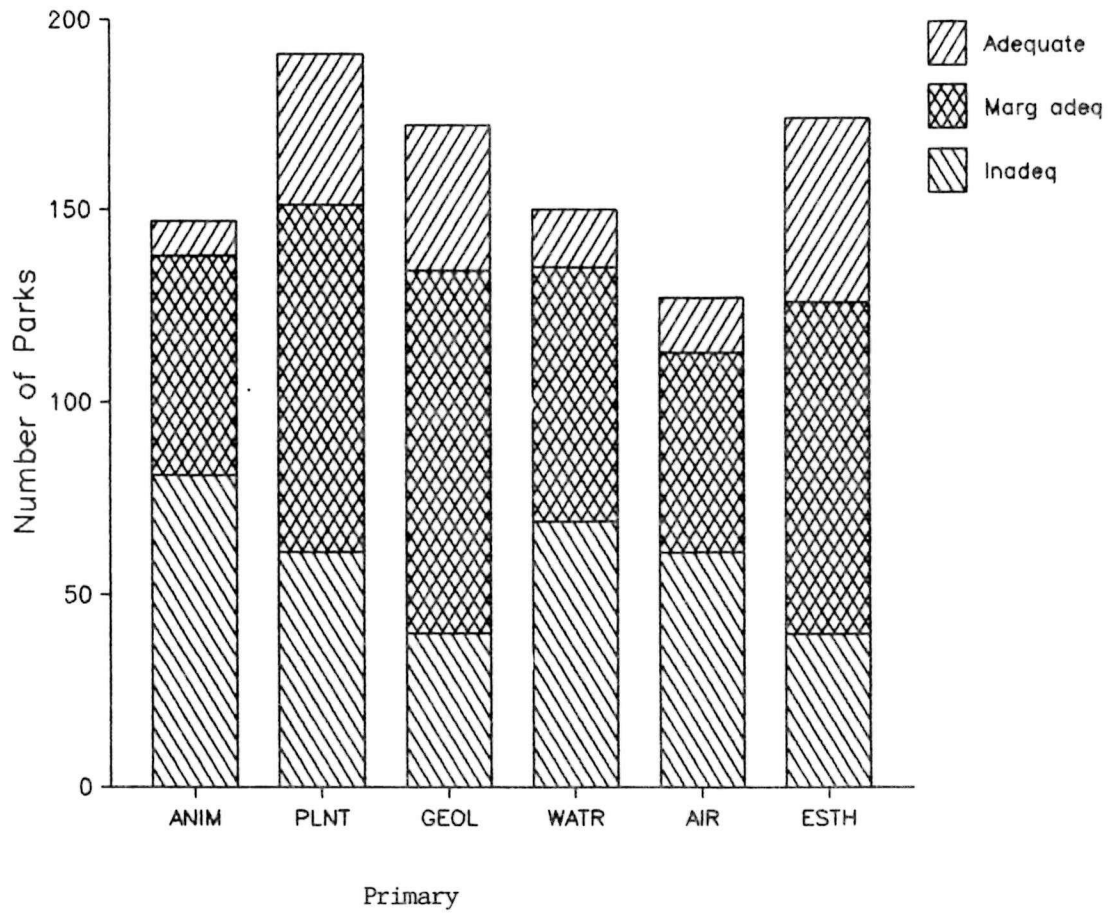
Approximately 60 percent of the parks with secondary resources reported inadequate data on the secondary resources in at least one major resource category. About a tenth reported inadequate data on all major categories in which they have secondary resources. Fewer than a tenth of the parks with secondary resources reported adequate data on resources in all major categories in which they have resources.

TABLE III.1: ADEQUACY OF DATA ON RESOURCES BY MAJOR RESOURCE CATEGORY  
(Number of Parks)

<u>Primary Resources</u>				
<u>Resource Category</u>	<u>Total</u>	<u>Adequate</u>	<u>Marg. Adequate</u>	<u>Inadequate</u>
Animal Resources	147 (100%)	9 ( 6%)	57 (39%)	81 (55%)
Plant Resources	192 (100%)	40 (21%)	91 (47%)	63 (32%)
Geologic Features	172 (100%)	38 (22%)	94 (55%)	40 (23%)
Water & Hydrologic Features	149 (100%)	14 ( 9%)	66 (44%)	69 (41%)
Air Resources	128 (100%)	14 (11%)	52 (41%)	61 (48%)
Esthetic Resources	174 (100%)	48 (28%)	86 (50%)	40 (23%)

<u>Secondary Resources</u>				
<u>Resource Category</u>	<u>Total</u>	<u>Adequate</u>	<u>Marg. Adequate</u>	<u>Inadequate</u>
Animal Resources	154 (100%)	20 (13%)	71 (46%)	63 (41%)
Plant Resources	140 (100%)	26 (19%)	80 (57%)	34 (24%)
Geologic Features	119 (100%)	23 (19%)	58 (49%)	38 (32%)
Water & Hydrologic Features	107 (100%)	12 (11%)	50 (47%)	45 (42%)
Air Resources	90 (100%)	11 (12%)	44 (49%)	35 (39%)
Esthetic Resources	64 (100%)	19 (30%)	32 (50%)	13 (20%)

FIGURE III.1  
ADEQUACY OF DATA



#### Adequacy of Data By Resource Subcategory

Generally, the parks also reported that they had adequate information on mountains/volcanoes, plains/plateaus, cliffs/gorges/canyons, and glaciers. For the following categories more than three-quarters of the parks with resources in the subcategory reported marginally adequate or adequate information on the resources (see Table III.4): primary and secondary esthetic resources and manipulated landscape vegetation; primary beach/dune vegetation; and secondary geysers/hot springs, tundra/alpine vegetation, shores/islands, desert vegetation, salt surface water, mixed shrubland vegetation, and forest/woodland vegetation.

The resource categories for which the highest percentage of parks reported that they have inadequate data are: both primary and secondary terrestrial invertebrates, and marine fish and invertebrates; primary freshwater fish and invertebrates, freshwater vegetation, groundwater and reptiles and amphibians; and secondary caves/sinkholes.



TABLE III.2: DATA ADEQUACY BY SUBCATEGORY FOR PRIMARY RESOURCES  
(Number of Parks)

<u>Resource</u>	<u>No. of Parks Reporting</u>	<u>Marginally Adequate</u>	<u>Adequate</u>	<u>Inadequate</u>
Aesthetics	174	48	86	40
Beach/Dune Vegetation	47	12	23	10
Birds	127	17	58	52
Caves/Sinkholes	35	3	16	16
Cliffs/Gorges/Canyons	82	35	36	10
Desert Vegetation	31	5	13	13
Forest/Woodland Vegetation	117	22	54	40
Fossils	34	7	11	15
Fresh Surface Water	126	16	57	53
Freshwater Fish/Invertebrates	86	5	35	46
Freshwater Vegetation	68	7	16	43
Geyers/Hot Springs	14	2	5	7
Glaciers	20	8	8	4
Grassland/Prairie Vegetation	64	12	28	20
Groundwater	74	4	23	47
Manipulated Landscape Veget.	85	31	36	18
Marine Fish and Invertebrates	41	5	6	26
Marine Mammals	27	1	12	13
Mixed Shrubland Vegetation	54	8	26	18
Mountains/Volcanoes	56	21	23	12
Plains/Plateaus	40	16	16	8
Purity	111	12	44	55
Reptiles and Amphibians	78	6	25	46
Salt Surface Water	36	2	17	16
Saltwater Vegetation	35	3	14	17
Shores/Islands	60	8	28	23
Soils	86	15	34	36
Terrestrial Invertebrates	75	4	14	55
Terrestrial Mammals	110	9	53	48
Tundra/Alpine Vegetation	26	3	13	10
Visibility	121	16	51	54

TABLE III.2 (Cont.): DATA ADEQUACY BY SUBCATEGORY FOR SECONDARY RESOURCES  
(Number of Parks)

<u>Resource</u>	<u>No. of Parks Reporting</u>	<u>Adequate</u>	<u>Marginally Adequate</u>	<u>Inadequate</u>
Aesthetics	65	19	32	13
Beach/Dune Vegetation	14	3	7	4
Birds	114	20	62	32
Caves/Sinkholes	21	2	8	11
Cliffs/Gorges/Canyons	29	9	11	9
Desert Vegetation	16	4	9	3
Forest/Woodland Vegetation	73	19	36	18
Fossils	27	3	13	11
Fresh Surface Water	66	9	29	28
Freshwater Fish/Invertebrates	79	4	37	37
Freshwater Vegetation	59	4	27	28
Geyers/Hot Springs	3	0	3	0
Glaciers	3	0	3	0
Grassland/Prairie Vegetation	40	8	21	11
Groundwater	81	10	35	37
Manipulated Landscape Vege.	56	21	26	9
Marine Fish and Invertebrates	20	2	3	10
Marine Mammals	12	5	1	5
Mixed Shrubland Vegetation	45	4	30	11
Mountains/Valcanoes	12	7	4	1
Plains/Plateaus	24	8	13	3
Purity	76	9	33	34
Reptiles and Amphibians	102	11	45	46
Salt Surface Water	8	3	3	3
Saltwater Vegetation	9	0	6	3
Shores/Islands	20	6	10	4
Soils	88	17	42	28
Terrestrial Invertebrates	92	9	34	49
Terrestrial Mammals	124	16	63	45
Tundra/Alpine Vegetation	3	0	3	0
Visibility	60	6	33	20

## B. CONDITION OF RESOURCES

### Background

The parks were asked to characterize the condition of each subcategory of their "primary," "secondary," and "other" resources as "good," "fair," "poor," or "unknown" and to summarize the condition of major resource categories by averaging their subcategories. The parks were given the definitions listed below for identifying resources in good, fair, and poor condition. Park managers were directed to use their best judgment in applying these standards to resource condition.

"Condition" was defined as the relative physical integrity of a resource in relation to an undisturbed, natural state (except manipulated landscapes). In the case of a manipulated landscape, "physical integrity" was related to park landscape management objectives. "Disturbance" was defined as demonstrable damage to natural features, communities, or populations, except damage by natural processes.

Resources in "good" condition were defined as those that: (1) remain largely unaffected by human activities and free from impacts that detract from the visitor experience; (2) do not require additional management action; (3) if plants or animals, are free from infestation or disease not a natural part of ecosystem processes and unaffected by exotic species that threaten to significantly change the structure and functioning of the ecosystem; (4) if plants or animals, exist in numbers and composition adequate for them to continue to flourish; (5) if geological features, remain undisturbed by human intervention.

Resources in "fair" condition were defined as those that: (1) are affected by human activities to the extent that the quality of the visitor experience is diminished; (2) if plants or animals, have been moderately affected by pest infestation or disease not a natural part of ecosystem processes or by exotic species, but exist in numbers and composition sufficient to contribute to the natural functioning of the ecosystem; (3) if geological processes, have been moderately disturbed by human intervention.

Resources in "poor" condition were defined as those that: (1) are so affected by human activities that visitors are prevented from experiencing those values for which the area was known or was designated; (2) if plants or animals, have been affected by pest infestation or disease not a natural part of ecosystem processes or by exotic species, and their numbers and composition are inadequate to ensure the continued natural functioning of the ecosystem; (3) if geological features, have been seriously disturbed by human intervention.

Resource managers categorized resources in "unknown" condition where they had inadequate information to judge the condition of resources using these guidelines.

## General Findings

More parks reported that the condition of their resources is fair than either good or poor, although many reported resources in unknown condition, particularly animal resources (see Table III.3 and Figure III.2). For all of the major resource categories, except primary animals, the proportion of parks with resources in good condition is higher than the proportion in poor condition.

### Condition of Resources by Major Resource Category

Approximately 40 percent of the parks having natural resources reported that all their primary and secondary resources, looked at by major resource category, are in either fair or good condition. About a tenth reported that all of their resources are in good condition. Only two percent reported that all of their resources are in poor condition.

However, approximately 40 percent of the parks having primary natural resources and approximately 20 percent of the parks having secondary natural resources reported that at least one of their major resource categories is in poor condition.

### Condition of Resources by Resource Subcategory

The resource subcategories for which a relatively high percentage of parks reported primary resources in good condition are: primary and secondary geysers/hot springs and fossils; primary tundra/alpine vegetation, saltwater vegetation, and mixed shrubland vegetation; and secondary caves/sinkholes, esthetic resources, shores/islands; and groundwater (see Table III.4). Generally, parks also reported that mountains/volcanoes, plains/plateaus, cliffs/gorges/canyons are in good condition--geologic resources that are difficult to imagine in poor condition.

In most primary and secondary resource subcategories, at least half of the parks with resources in the subcategory reported that the resources are in fair or good condition. More than three-quarters of the parks with primary and secondary mixed shrubland and tundra/alpine vegetation; primary manipulated landscape vegetation; and esthetic resources; and secondary forest/woodland vegetation and desert vegetation reported that the resources were in fair or good condition.

By contrast, the resource subcategories for which a relatively high percentage of parks reported that the resources were in poor condition are: primary and secondary grassland/prairie vegetation and beach/dune vegetation; secondary fresh and salt surface water; and secondary shores/islands.

The resource subcategories for which a relatively high percentage of parks did not know the condition of the resources are: primary and secondary terrestrial invertebrates, reptiles and amphibians, marine mammals, and freshwater fish and invertebrates and secondary freshwater vegetation.

TABLE III.3: CONDITION OF NATURAL RESOURCES BY MAJOR  
RESOURCE CATEGORY

(Number of Parks)

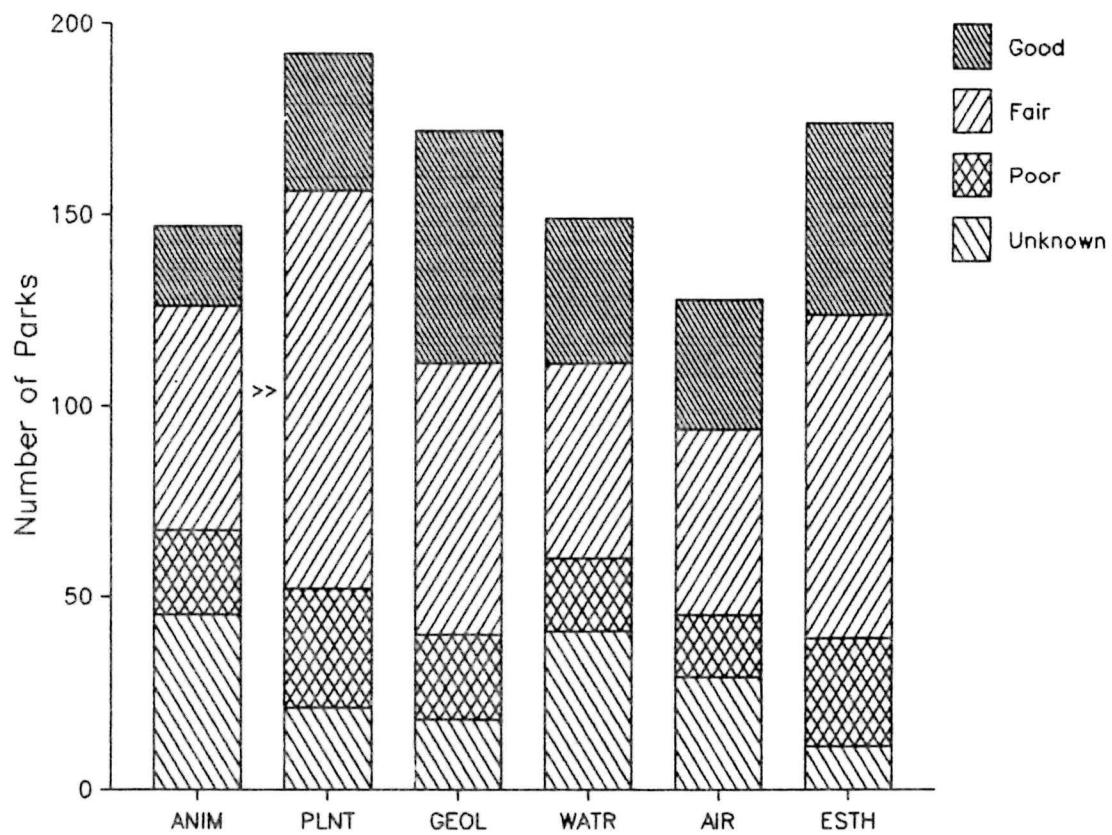
<u>Primary Resources</u>					
<u>Resource Category</u>	<u>Total</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>Unknown</u>
Animal Resources	147 (100%)	21 (14%)	59 (40%)	22 (15%)	45 (31%)
Plant Resources	192 (100%)	36 (19%)	104 (54%)	31 (16%)	21 (11%)
Geologic Resources	172 (100%)	61 (35%)	71 (41%)	22 (13%)	18 (11%)
Water Resources	149 (100%)	38 (25%)	51 (34%)	19 (13%)	41 (27%)
Air Resources	128 (100%)	34 (27%)	49 (38%)	16 (12%)	29 (23%)
Esthetic Resources	174 (100%)	50 (29%)	85 (49%)	28 (16%)	11 ( 6%)

<u>Secondary Resources</u>					
<u>Resource Category</u>	<u>Total</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>Unknown</u>
Animal Resources	154 (100%)	34 (22%)	54 (35%)	4 ( 3%)	62 (40%)
Plant Resources	140 (100%)	32 (22%)	77 (55%)	10 ( 8%)	21 (15%)
Geologic Resources	119 (100%)	30 (25%)	52 (44%)	9 ( 7%)	28 (24%)
Water Resources	107 (100%)	29 (27%)	30 (28%)	10 ( 9%)	38 (36%)
Air Resources	90 (100%)	22 (24%)	37 (41%)	5 ( 6%)	26 (29%)
Esthetic Resources	64 (100%)	26 (41%)	28 (44%)	4 ( 6%)	6 ( 9%)

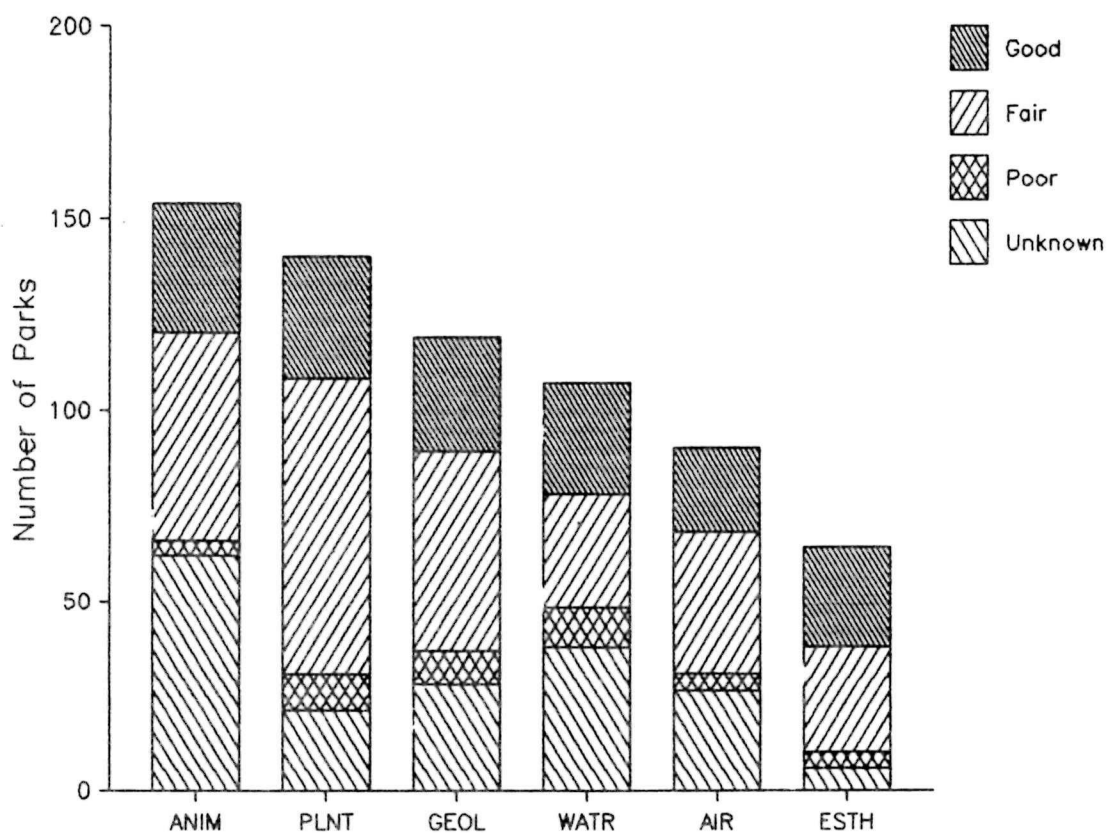


FIGURE III.2

Condition of Natural Resources



Primary



Secondary

TABLE III.4: CONDITION OF PRIMARY RESOURCES BY SUBCATEGORY  
(Number of Parks)

<u>Resource Subcategory</u>	<u>No. of Parks Reporting*</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>
Aesthetics	174	50	85	28
Beach/Dune Vegetation	47	12	19	10
Birds	127	26	52	20
Caves/Sinkholes	35	9	10	4
Cliffs/Gorges/Canyons	82	52	17	7
Desert Vegetation	31	5	14	3
Forest/Woodland Vegetation	117	22	61	18
Fossils	34	14	10	4
Fresh Surface Water	126	29	48	19
Freshwater Fish/Invertebrates	86	13	30	8
Freshwater Vegetation	68	13	19	11
Geysers/Hot Springs	14	7	2	1
Glaciers	20	13	4	0
Grassland/Prairie Vegetation	64	5	32	19
Groundwater	74	18	16	8
Manipulated Landscape Veget.	85	13	58	10
Marine Fish and Invertebrates	41	5	17	5
Marine Mammals	27	4	6	4
Mixed Shrubland Vegetation	54	16	25	4
Mountains/Volcanoes	56	38	15	1
Plains/Plateaus	40	21	12	3
Purity, Air	111	26	37	13
Reptiles and Amphibians	78	5	24	7
Salt Surface Water	36	11	12	1
Saltwater Vegetation	35	11	10	4
Shores/Islands	60	15	25	11
Soils	86	20	34	13
Terrestrial Invertebrates	75	14	5	5
Terrestrial Mammals	110	21	43	17
Tundra/Alpine Vegetation	26	12	11	1
Visibility	121	36	47	17

\*Columns of good, fair, and poor numbers do not add to the number of parks reporting the resource because some resource subcategories were reported "unknown" as to condition.

TABLE III.4 (Cont.): CONDITION OF SECONDARY RESOURCES BY SUBCATEGORY  
(Number of Parks)

<u>Resource Subcategory</u>	<u>No. of Parks Reporting*</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>
Aesthetics	65	26	28	4
Beach/Dune Vegetation	14	3	6	4
Birds	114	38	38	0
Caves/Sinkholes	21	10	1	1
Cliffs/Gorges/Canyons	29	16	7	2
Desert Vegetation	16	4	8	1
Forest/Woodland Vegetation	73	21	35	8
Fossils	27	11	5	2
Fresh Surface Water	66	15	20	8
Freshwater Fish/Invertebrates	79	10	22	7
Freshwater Vegetation	59	9	16	5
Geyers/Hot Springs	3	3	1	0
Glaciers	3	2	0	0
Grassland/Prairie Vegetation	40	6	22	5
Groundwater	81	29	17	4
Manipulated Landscape Vege.	56	17	32	4
Marine Fish and Invertebrates	20	4	4	0
Marine Mammals	12	3	3	0
Mixed Shrubland Vegetation	45	11	27	1
Mountains/Volcanoes	12	8	3	0
Plains/Plateaus	24	14	4	1
Purity, Air	76	18	29	5
Reptiles and Amphibians	102	22	23	2
Salt Surface Water	8	2	3	1
Saltwater Vegetation	9	1	5	0
Shores/Islands	20	8	7	4
Soils	88	15	43	8
Terrestrial Invertebrates	92	16	17	1
Terrestrial Mammals	124	29	52	3
Tundra/Alpine Vegetation	3	1	2	0
Visibility	60	20	19	3

\*Columns of good, fair, and poor numbers do not add to the number of parks reporting the resource because some resource subcategories were reported "unknown" as to condition.

### Resources Reported in Poor Condition

Although only 12 to 16 percent of parks reported an entire resource category (plants, animals, air, etc.) to be in poor condition, 40 percent of the parks had at least one case in which some individual resource was in poor condition (See Examples).

Of these resources reported to be in poor condition, the vast majority are threatened in some manner, half of them severely.

### Actions Being Taken

Many of the actions being taken to address threats to park resources are also addressing resources in poor condition (See discussion in Section C, "Threats to Natural Resources"). In half of the cases where a resource is in poor condition, there is also inadequate data on which to base management decisions.

Parks were asked to use poor condition as a factor in prioritizing their unfunded needs. Forty-nine percent of the total unfunded needs would be targeted at resources in poor condition.

## Examples of Primary Resources in "Poor" Condition

### Theodore Roosevelt NP

Riparian woodlands have been seriously infested with leafy spurge and, to a lesser extent, Canada thistle. In 1970, leafy spurge covered about 32 acres of riparian woodland; currently it extends more than 600 acres. The spurge is rapidly replacing the native vegetation.

### Dinosaur NM

The ranges of several rare and endangered fish species (humpback chub, squawfish, razorback sucker) have been fragmented and habitat has been lost or significantly altered by dams and other water developments. Population levels are very low and recruitment is often minimal or nonexistent. Bonytail chub has probably been extirpated from the park.

### Rocky Mountain NP

Mountain meadow vegetation has been seriously impacted by the invasion of exotic plants. Alpine and subalpine soils have been severely affected in areas of high visitor use.

### Glen Canyon NRA

Fresh surface water at Lake Powell (springs and beaches) has been contaminated by human use and cattle. Water is not potable; bacteria levels exceed human health standards. Riparian vegetation in upper reaches has been severely impacted by cattle and has been invaded by exotic plants.

### Fire Island NS

Saltwater vegetation (salt marshes) and soils have been contaminated with DDT.

### Valley Forge NHP

Freshwater fish and invertebrates in Valley Creek affected by toxic chemicals, sewage and sedimentation. Creek has been dammed, dredged, and channelized.

### Acadia NP

Scenic vistas (esthetic resources) now being maintained for visitors to view the beauty of the Maine coastline are changing in quality because of adjacent development.

### Cape Cod

Bird resources, including piping plovers, roseate terns and least terns are declining because of loss of habitat, human disturbance, and predation.



## Examples of Secondary Resources in "Poor" Condition

### Acadia NP

Soils in steep areas and shallow poorly developed zones are suffering erosion because of concentrated visitor use. This is particularly a problem at Ocean Drive, Sand Beach, Cadillac Summit and in park campgrounds.

### Great Sand Dunes NM

Soils in the campgrounds are in poor condition because of compaction and erosion caused by sustained heavy use.

### Mesa Verde NP

Reptiles are in poor condition because of rattlesnake populations declining or moving out of park.

### Fossil Butte NM

Grassland/prairie vegetation has been heavily impacted by grazing and trampling, which has resulted in reduction or removal of some native grasses and the introduction of exotic species.

### Wilson's Creek NB

Riparian woodlands have been lost to domestic wood-cutting in pre-park days and to overbrowsing by elk and to Dutch Elm disease in recent years.

### Allegheny Portage Railroad NHS

The historic lakebed which should be in herbaceous vegetation is now partially forested.

### Valley Forge NHP

Freshwater fish and invertebrates in Valley Creek affected by toxic chemicals, sewage and sedimentation. Creek has been dammed, dredged, and channelized.

## C. THREATS TO NATURAL RESOURCES

### Background

The parks were asked to complete a Threats Questionnaire for each source of a threat affecting the park's primary, secondary, and/or other natural resources now or in the foreseeable future. For each source reported, parks were asked to indicate the resource categories and subcategories affected by the threat source, the impact level (severe, moderate, or low) of the threat source, and whether the effects of the threat source on the resource would be increasing, diminishing, or staying the same over the next five years.

The term "threat" was defined as a negative impact to park resources, values, and purposes; or to park management objectives; or to visitor experience.

The severity of a threat to resources in a subcategory was measured in terms of how the visitor enjoyment of the resources will be affected, how the integrity of the resources will be affected, or how long the resources will be affected.

- Severe:       The resource's value to the visitor will be lost for a generation (25 years) or more; or  
  
                  The resource will be lost entirely or the ecosystem will be impaired to the extent that its normal functioning is disrupted beyond recovery or its recovery will not be possible within this generation (25 years).
- Moderate:     Visitors will be able to experience the resource's values, but their enjoyment will be reduced or the intended experience will be changed; or  
  
                  The resource or ecosystem will be impaired, but will continue to exist and will be able to recover its original values within this generation (5 to 25 years).
- Low:           Visitors will probably not notice the change in the experience; or  
  
                  The resource or ecosystem will be affected, but not impaired; or  
  
                  The resources will recover within the near future (less than 5 years).

### General Findings

A total of approximately 1,750 existing and prospective threat sources were documented, affecting or anticipated to affect roughly 200 parks. These threat sources were of 102 different types. More than 80 percent of the threat sources reported are existing, as opposed to prospective. Almost 15 percent of the prospective threat sources were indicated as being certain to occur within the next two years.

Approximately 70 percent of the resources reported threatened are primary, and approximately 25 percent secondary. Approximately 30 percent of all threats to primary resources are severe, while fewer than 15 percent of all threats to secondary resources are severe (See Figure III.3).

Overall, about 45 percent of all threat sources are judged to be increasing in their effect on resources, about 20 percent of all threat sources are staying at the same level of effect, and less than 10 percent are diminishing in their resource effects. For 25 percent of all threat sources, the trend of the resource impacts is unknown.

### Types of Threat Sources

The types of threat sources affecting park natural resources can be grouped into eight major categories: agricultural; biological; development/construction; air pollution/waste disposal; minerals; physical processes; visitor/people; and water supply and control (See Table III.5). In general, visitor/people sources (hunting and fishing, poaching, overcrowding, off-road vehicle use, illegal collecting); biological sources (exotic plants and animals, insect infestation, feral animals); development/construction sources (general and residential construction, roads, utilities); and air pollution/waste disposal sources (particulates, ozone, acid deposition, non-toxic and toxic waste disposal) are the most prevalent, both in terms of the number of individual threat occurrences and the number of parks affected. In terms of individual threat source categories, exotic plants, general development/construction, grazing, and poaching are widespread, significant threat sources.

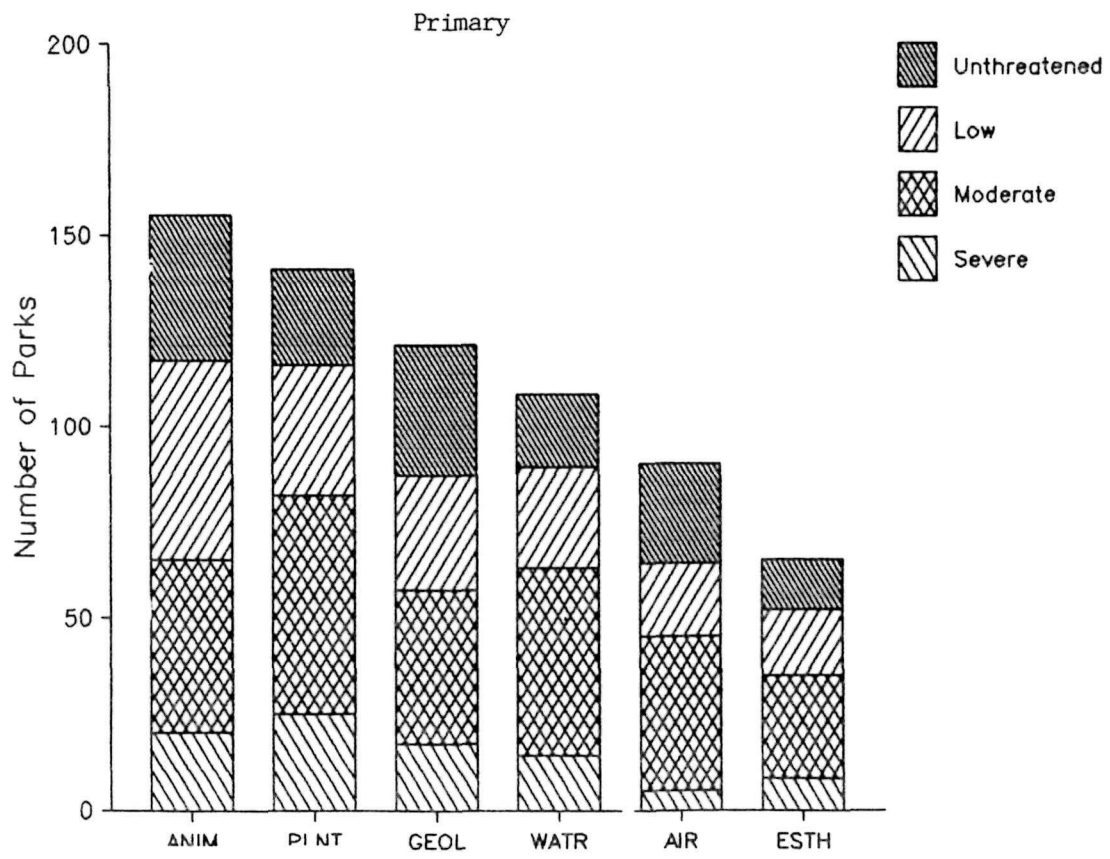
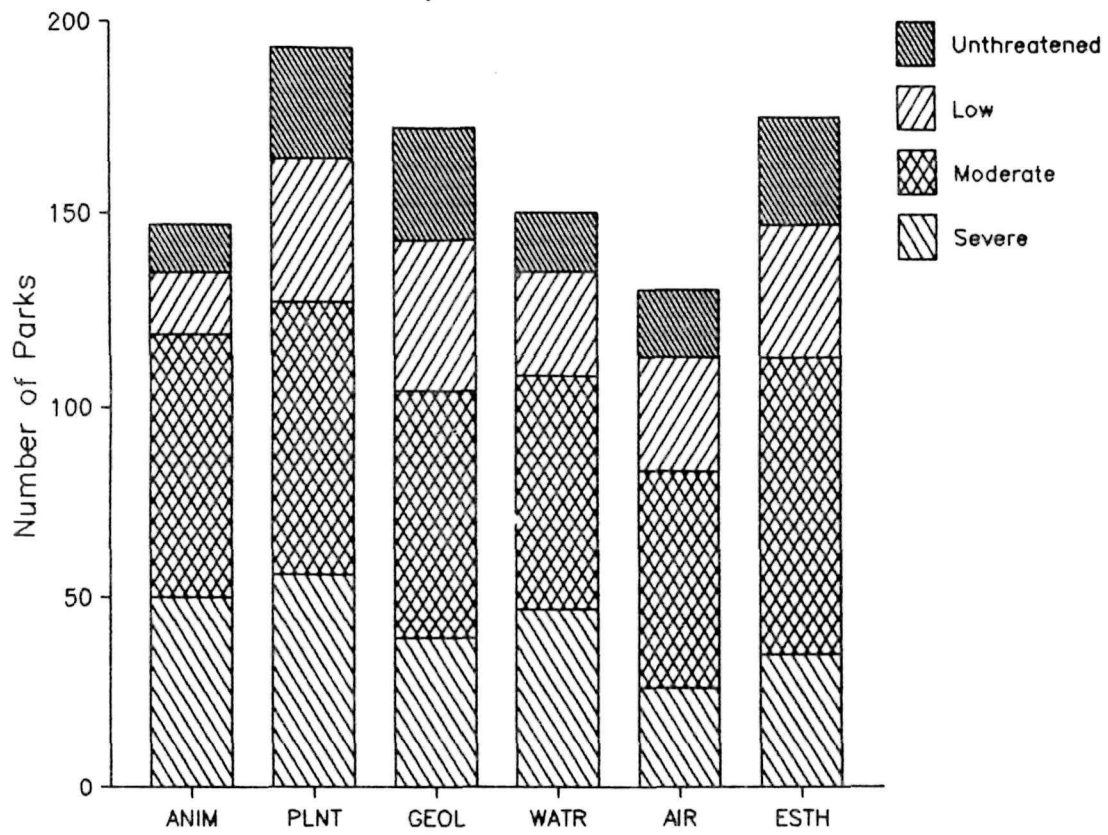
### Types of Resources Threatened

The types of resources most often reported threatened (total number of cases in which a resource is under severe, moderate or low threat) include esthetic resources, terrestrial mammals, forest/woodland vegetation, fresh surface water, birds, and freshwater fish and invertebrates (see Table III.6). These are also the categories which are most often severely impacted. The types of sources which most often cause severe impacts on park resources include exotic plants, grazing, oil and gas exploration, general development and construction, toxic waste disposal, and dams and other water control projects (See examples).

### Location of Threat Sources

Approximately one-third of all sources are internal to the park boundary, one-third are sources located external to the park, and the remaining one-third

FIGURE III.3  
Severity of Threats



Secondary

TABLE III.5: SOURCES PRODUCING THREATS

<u>Name of Source Type</u>	<u>No. of Times Source Reported</u>	<u>No. of Parks Affected</u>	<u>No. of Regions Affected</u>
Exotic Plants (Introduction/Invasion)	101	88	10
General Construction/Development	64	53	10
Insecticide/Herbicide Applic. (Agric.)	56	44	7
Exotic Animals (Introduction/Invasion)	56	44	10
Hunting/Fishing	50	33	10
Grazing/Trampling-Livestock (Domestic)	49	47	8
Poaching	49	47	8
Overcrowding	43	27	9
Road or Highway-Construct/Operate	40	34	9
Waste Disposal (Non-Hazardous)	40	34	10
Wildlife Harassment	39	30	9
Air Pollution-Particulates	38	34	9
Wildfire	38	36	7
Off-Road Vehicle Use (Including Snowmobiles)	37	36	10
Specimen/Artifact Collection (Illegal)	37	33	10
Waste Disposal (Toxic/Hazardous)	37	31	9
Trail Use By Hikers or Horses	35	31	10
Air Pollution-Ozone	33	33	9
Residential Construction/Development	31	29	8
Water Supply/Control Projects (General)	31	29	8
Oil and Gas-Exploration	30	29	8
Aircraft Flight Paths	29	29	7
Insect Infestation	29	29	9
Dam/Artificial Reservoir	28	26	8
Water Erosion/Gullyying	28	27	7
Feral Animals	28	26	7
Acid Precip/Deposition (Particulates)	23	23	8
Air Pollution-Sulfates	23	23	7
Camping	22	22	8
Vandalism	22	21	7
Timber Harvest (Periodic)-Forest Management	21	20	7
Mineral Extraction Activities (General)	21	20	8
Oil and Gas-Extraction	21	18	5
Plant Succession (Native)	21	19	9
Acid Precip/Deposition (Wet Pollutants)	20	20	10
Commercial Construction/Development	19	16	7
Sewage Treatment Plant-Construct/Operate	19	19	9
Powerline-Construct/Operate	18	18	6
Noise (Visitor)	17	16	7
Power Generating Plant-Construct/Operate	16	14	7
Disease-Animal	16	15	7
Coal-Extraction	15	14	4
Siltation/Sedimentation	14	14	6
Disease-Plants	14	13	6
Rip-Rap/Groins/Jetty/Breakwater	13	12	8
Mineral Exploration Activities (General)	12	11	7
Campfire Building	12	12	6
Utilities (General)-Construct/Operate	11	11	6
Fertilizer Application (Agriculture)	11	11	6
Physical Processes (General)	11	9	6
Trail (Pedest/Horse)-Construct/Operate	10	9	6
Timber Harvest (One-Time)	10	10	5
Flooding/High River Discharge	10	10	5



TABLE III.5 (con't.): SOURCES PRODUCING THREATS

<u>Name of Source Type</u>	<u>No. of Times Source Reported</u>	<u>No. of Parks Affected</u>	<u>No. of Reg Affected</u>
Irrigation Network-Development	9	8	2
Abandoned Mineral Operations	9	9	5
Vehicle Pathway (Other)-Construct/Operate	8	8	5
Canal/Artificial Waterway	8	8	4
Sand and Gravel-Extraction	8	8	2
Airport-Construct/Operate	7	7	4
Ditching/Diking for Wetland Drainage	7	6	4
Hardrock-Extraction	7	7	3
Spoil Deposition (Mining/Minerals)	7	7	4
Eutrophication	7	7	6
Transportation Facilities-Construct/Operate	6	6	4
Railroad-Construct/Operate	6	6	4
Bridge-Construct/Operate	6	6	3
Arson	6	6	4
Military/DOE Activities-General	6	6	4
Mass-Wasting (Landslides/Slumping/Etc.)	6	6	3
Pipeline-Construct/Operate	5	5	4
Water Supply/Control Project (Other)	5	5	3
Livestock Feces Runoff	5	5	3
Geothermal-Exploration	5	4	4
Military Exercises/Equipment	5	5	5
Nuclear Dump Site Characterization (DOE)	5	5	3
Cloud Seeding/Unnatural Weather	5	5	2
Coal-Exploration	4	4	2
Mineral Materials (Other)-Extraction	4	4	3
Acid Precip/Deposition (Gaseous Pollutants)	4	4	2
Wind Erosion	4	4	4
Wind Storm/Tornado	4	4	4
Drought	4	3	3
Removal/Loss of Native Species	4	3	2
Overpopulation-Native Species	4	4	3
Utility (Other)-Construct/Operate	3	3	2
Stream Channelization	3	3	2
Channel Dredging	3	3	3
Mineral Materials (Other)-Exploration	3	2	1
Geothermal Development	3	3	2
Placer-Extraction	3	3	2
Transport Facil (Other)-Construct/Operate	2	2	1
Hardrock-Exploration	2	2	2
Precipitation (Extreme)	2	2	2
Water Treatment Plant-Construct/Operate	1	1	1
Peat-Extraction	1	1	1
Weapons Testing (Non-Nuclear)	1	1	1
Drainage by Natural Causes	1	1	1
Tectonic Processes	1	1	1
Volcanic Eruption	1	1	1
Temperature Extremes	1	1	1
Boating	1	1	1

TABLE III.6: THREATENED RESOURCES BY SUBCATEGORY

<u>Resource Subcategory</u>	<u>Total Threats Cases</u>	<u>Severe Threat</u>	<u>Moderate Threat</u>	<u>Low Threat</u>
Aesthetics	680	242	296	142
Terrestrial Mammals	524	100	262	162
Forest/Woodland Vegetation	486	115	231	140
Fresh Surface Water	461	130	196	135
Birds	406	107	166	133
Freshwater Fish/Invertebrates	397	131	177	89
Soils	284	77	133	74
Freshwater Vegetation	195	69	72	54
Reptiles/Amphibians	194	49	78	67
Mixed Shrubland Vegetation	175	32	100	43
Air - Purity	163	41	71	51
Groundwater	162	54	67	41
Air - Visibility	158	46	61	51
Grassland/Prairie Vegetation	158	56	78	24
Manip. Landscape Vegetation	133	29	67	37
Terrestrial Invertebrates	132	36	50	46

TABLE III.6 (cont'd): THREATENED RESOURCES BY SUBCATEGORY

<u>Resource Subcategory</u>	<u>Total Threat Cases</u>	<u>Severe Threat</u>	<u>Moderate Threat</u>	<u>Low Threat</u>
Plants - General	126	31	54	41
Animals - General	124	18	58	48
Desert Vegetation	117	25	67	25
Cliffs/Gorges/Canyons	80	21	42	17
Marine Fish/Invertebrates	72	29	28	15
Fossils	67	24	20	23
Shores/Islands	65	27	25	13
Beach/Dune Vegetation	61	29	13	19
Air Quality - General	58	3	40	15
Saltwater Vegetation	44	8	27	9
Salt Surface Water	40	15	16	9
Mountains/Volcanoes	38	16	10	12
Water/Hydrologic Features	38	4	26	8
Marine Mammals	33	7	18	8
Caves/Sinkholes	30	11	10	9
Geologic Features - General	26	4	14	8
Plains/Plateaus	24	8	8	8
Geysers/Hot Springs	16	11	2	3
Glaciers	1	0	1	0

## Examples of Natural Resources Severely Threatened

### Everglades

Degradation of the quality of water delivered to the park from upstream sources is severely affecting several park resources, including fresh surface water, groundwater, salt surface water, animals, and plants. High levels of herbicides, pesticides, and fertilizers coming off private agricultural lands to the east and north of the park are causing algal blooms, loss of native algae, and alterations in the structure of aquatic communities.

### Olympic

Salmon and steelhead stocks of the park are depressed because of over-harvest, and loss of habitat outside the park. Hatchery enhancement has caused interbreeding with non-native stocks and displacement of wild fish, causing unknown, but suspected detrimental, effects on native stock. Artificial enhancement of the fishery results in continuing over-harvest of native stocks and further decreases in natural spawning.

### Yosemite

Peregrine falcons in the park are affected by buildup of DDT in their bodies, causing eggshell weakening similar to that caused by DDT. Breeding is usually unsuccessful in the 3rd to 5th year. DDT is also still entering the system as a minor constituent in domestic agricultural sprays and as an uncontrolled element of agricultural sprays in Latin American countries. Insectivorous birds accumulate this DDT and become prey to park falcons.

### Grand Canyon

Five coal and oil fired power plants near Grand Canyon have plans to build more plants in the future. Two of them have already been implicated as significantly contributing to haze in the park; additional plants will probably have a detrimental effect on visibility.

### Voyageurs

Regulation of lake levels in four major park lakes for power generation and flood control is having severe impacts on native fish stocks, water birds, aquatic plants, and animals dependent on shore and marsh environments.

are sources occurring both within and outside the park. Two-thirds of all the threats reported can be tied to sources located solely or partially outside the park, hence harder for the park to influence.

External threat sources most often occur at least partially on private lands (involved in almost 75 percent of the external threats reported) and/or on lands owned or administered by state or local government (involved in more than 50 percent of all external threats). More than 20 percent of all external threats involved a source located on lands administered by another bureau within the Department of the Interior. In most cases, these Department-related threats arise from a complex pattern of land ownership in which the Department is one owner in an area where a major development is taking place such as energy development.

General and residential construction and development, insecticide and herbicide applications, air pollution from ozone and particulates, oil and gas exploration, and toxic or hazardous waste disposal are the most common sources of threats where the source is located entirely outside the park. Exotic plants and animals; hunting, fishing and poaching; wildfire; general construction and development; and insecticide/herbicide application are the most common sources where the source is located both inside and outside the park. The most common internal sources of threats are illegal specimen and artifact collection, off-road vehicles, overcrowding, exotic plants, and trail use.

#### Actions Being Taken

For more than 80 percent of the threats sources reported, parks indicated they were currently taking actions to address the threat. Parks reported that monitoring of the affected resource(s) and of the threat are the two actions most frequently being taken, with each occurring in more than half of the threat situations reported. Negotiation or consultation with the party responsible for the threat source is occurring in more than 30 percent of the threat situations reported.

The parks reported that resource and threat monitoring and negotiation/consultation also are the three types of actions most often needed as further responses to deal with threats to parks. Where the threat source involves another Department of the Interior agency, parks are more active in their efforts to resolve the problems reporting that they are taking actions beyond monitoring in approximately 50 percent of the cases where the impacts are moderate or low and in approximately 70 percent of the cases where the impact is severe.

#### IV. MAJOR ISSUES IN NATURAL RESOURCES MANAGEMENT

##### Background

For the assessment, the Regions were asked to describe narratively those issues which are of concern either because they currently are demanding substantial amounts of funding and attention or because they are problem areas which need more attention to bring resource conditions up to good or to remove threats. Chiefly, regions discussed issues which are in the problem category. The list in Table IV.1 contains all major issues discussed by Regions. Some additional issues were described by one or two Regions as important locally, but are not mentioned here as major Servicewide issues.

The need for increased staffing and funding and better baseline information on natural resources were listed by so many regions that they appeared to be major issues; however, they are treated as part of the needed actions rather than as problems. These needs are further described under the sections on funding, personnel, and adequacy of data. They are discussed in the Action Program section of this report. To simplify the discussion of Regional and Servicewide actions in relation to these issues, they were combined into seven major issue statements (listed below), loosely grouped according to the type of activities which were the cause of concern. The issues relating to rare and endangered plant and animal species are included in these broader categories which are statements about the reasons for problems relating to rare and endangered species.

##### General Findings

The most common issues are not surprising. They have been identified in earlier reports and have been the subject of Servicewide concern and actions for some time.

1. Exotic, feral, and pest animals and plants are changing park ecosystems.  
Includes the impacts of both exotic, introduced plants and animals, pest species such as gypsy moth which affect native vegetation and, secondarily, animals; feral dogs, cats, hogs, etc.; and species, which may be native, but which in urban parks have multiplied unchecked such as squirrels, raccoons, etc.
2. Park ecosystems still show effects from historic, disruptive activities and need rehabilitation.  
This category includes the impacts of past agricultural practices; unnatural fire regimes which have altered native plant communities, former industrial sites or other erosion-causing development, including old mining scars.
3. Recreational visitors are affecting park ecosystems.  
Includes visitor impacts on animals, plants and soils. Impact may be from disturbance to breeding animals, damage to vegetation from trampling or breaking, excessive soil erosion from trail use, water pollution from intensive recreation use, etc.

4. Consumptive uses within parks are affecting park resources.  
Includes the management of authorized hunting and commercial fishing, control of illegal hunting, management of authorized mineral exploration and extraction within parks, management of permitted grazing, and control of trespass grazing.
5. Watershed development outside of parks is affecting park water resources and activities outside parks are affecting park air resources.  
Includes major changes to water supply and/or quality from development upstream such as water control dams existing or planned, water use by holders of upstream water rights, clearing of large areas for development, timber harvest, or agriculture, use of agricultural chemicals, run-off from landfills, mined areas, or oil spills. Also includes coastal water development such as dredging.  
  
Includes effects from long-range transport of air pollutants or from the air pollution effects of energy and/or mineral development or industrial or urban development near park boundaries. Includes effects on water resources from acid deposition, effects on plants from a variety of air pollutants, and loss of scenic vistas due to increasing regional haze.
6. Urban development on park boundaries is affecting park ecosystems and interrupting larger ecosystems on which park resources depend.  
Includes the effects on scenic and esthetic resources of commercial and residential development near park boundaries, the problems of adjacent landowners who cut trees or introduce exotic plants into park areas, increasing trash carried or blown into parks, noise which affects visitor perceptions, and the loss of larger ecosystems on which park plant and animal species may depend, especially large, migrating animals.



Table IV.1: MAJOR NATURAL RESOURCES ISSUES

Degradation of Park Resources Due to Native Animal Species Overpopulation

Impacts on Threatened, Endangered and Other Sensitive Animals

Loss of Threatened, Endangered and Other Sensitive Plants

Degradation of Park Resources Due to Non-Native Animals

Degradation of Park Resources Due to Non-Native Plants

Disruption of Native Plant Communities and Accelerated Erosion Due to Past Land Practices

Disruption of Natural Fire Regimes

Loss of Cultural Landscapes

Disruption of Natural Coastal Dynamics

Disruption of Park Resources Due to Mineral Extraction and Geothermal Activities

Degradation of Park Water Quality Due to External Activities

Alteration of Natural Flow Regimes/Groundwater Levels

Lack of Secure Water Rights

Visibility Impairment and Biological Damage Caused By Air Pollution (includes wet and dry deposition)

Noise, Visual, and Biological Impacts Related to Aircraft Overflights

Visual and Biological Impacts of Urbanization and Other Near-Park Development on Park Resources

Loss of Biological Diversity

Visitor Use Impacts on Park Resources (non-consumptive uses)

Loss of Park Resources Due to Consumptive Practices (hunting, fishing, poaching, grazing, mining)

Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them

Loss of Fragile and Irreplaceable Cave Resources

## V. EXISTING PROGRAMS AND PLANS

### A. FUNDING

#### Background

All expenditures on natural resources management were recorded, not only actions funded out of the resources management and water resources studies budget subactivities, but also a pro rata portion of maintenance and visitor protection subactivities when these funds were spent on activities directly supporting natural resources management objectives.

The funds spent on natural resources management were further classified into the type of activity performed--research, mitigation, monitoring, enforcement, and training, defined as follows:

- ° Research is the systematic acquisition of data to test ideas and provide new information, such as determining the size of the genetic pool needed to maintain a viable contained population of large ungulates such as elk.
- ° Mitigation/manipulation is the performance of prescribed actions in the field to preserve a resource or return it to a desired condition, such as eliminating non-native animals and plants from park areas; restoring natural landscapes and ecosystems; improving habitat; or controlling erosion.
- ° Monitoring is the repeated collection of data over time to determine changes and rates of change in a resource or the collection of baseline data and surveys to establish resource conditions, such as measuring levels of specific air pollutants; sampling groundwater for contamination; estimating the numbers and assessing the condition of animal or plant populations; or conducting baseline surveys of the presence, distribution, and abundance of rare plants.
- ° Enforcement activities are field operations that encourage and ensure that park users observe regulations, such as preventing poaching of game animals; enforcing resource protection requirements on oil and gas operations; preventing other unauthorized activities that would damage natural resources; or issuing permits for collecting or research.

#### General Findings

Approximately \$80 million, or roughly a tenth of the Service's total appropriation, was spent in FY 1986 on natural resources management, including about \$4 million from sources outside the Service. The \$80 million includes not only the amount allocated to natural resource divisions and programs, but that portion of enforcement monies spent directly protecting natural resources and a portion of maintenance funds spent on natural resources restoration projects. Of the total funds spent for natural resources activities, park base funds alone

constituted more than half and park and Regional base funds combined constituted nearly two-thirds (see Figure V.1).

Of the total expended on natural resources activities from all funding sources, about 25 percent is used for research activities, about 35 percent for mitigation- or manipulation-type activities, 20 percent each in monitoring and enforcement activities, and about 2 percent for training (see Figure V.2 and Table V.1). This funding breakdown remains roughly the same if one looks only at the park and Regional base funds, with a somewhat larger proportion going for enforcement, and slightly less for research.

About 60 percent of the total Servicewide expenditure for natural resources management is for personnel support (salaries and expenses), with the remainder supporting other project costs (contracts, supplies, travel, etc.). For park base funds only, almost 80 percent goes toward personnel support costs (see Figure V.3).

Sixty percent of Regional base funds goes to research, and about 30 percent to mitigation. This is indicative of the use of the Regional natural resources or science base primarily to support research projects which cannot be funded with existing park base funds, to address needs occurring in different parks at different times, or those which are multipark in nature.

The two percent of total Servicewide natural resources funds used for training compares with approximately one percent of the Service's operating budget (Operation of the National Park System) spent on all training Servicewide.

#### Allocation of Park Base Funds

The allocation process for park base funds is generally as follows: Each park allocates a portion of its base funds to resource issues. These allocations are made by the Superintendents and, for the most part, are based on the parks' resource management plans and historical proportions of park funding for such purposes. Problems addressed, level of funding, approaches, and personnel support are quite varied at each park. In general, parks use base funding to undertake mitigation management and enforcement activities and to collect data that will help answer a specific management question. Park studies usually attempt to assess impacts or develop mitigation strategies.

#### Type of Activities Supported by Base Funds

Table V.2 shows the park and Regional base funds spent (in FY 1986) on activities classified by resource category. This includes data for the top 100 (by total cost) base funded activities in each Region. For most Regions, the 100 largest activities represented more than 75 percent of their natural resources base funded expenditures.

Of the total amount spent on activities included in Table V.2, approximately 60 percent is from park base only; 25 percent from Regional base only; and the remaining 15 percent represents activities that are funded by a combination of park and Regional base funds.

FIGURE V.1

## Natural Resources Funds by Source

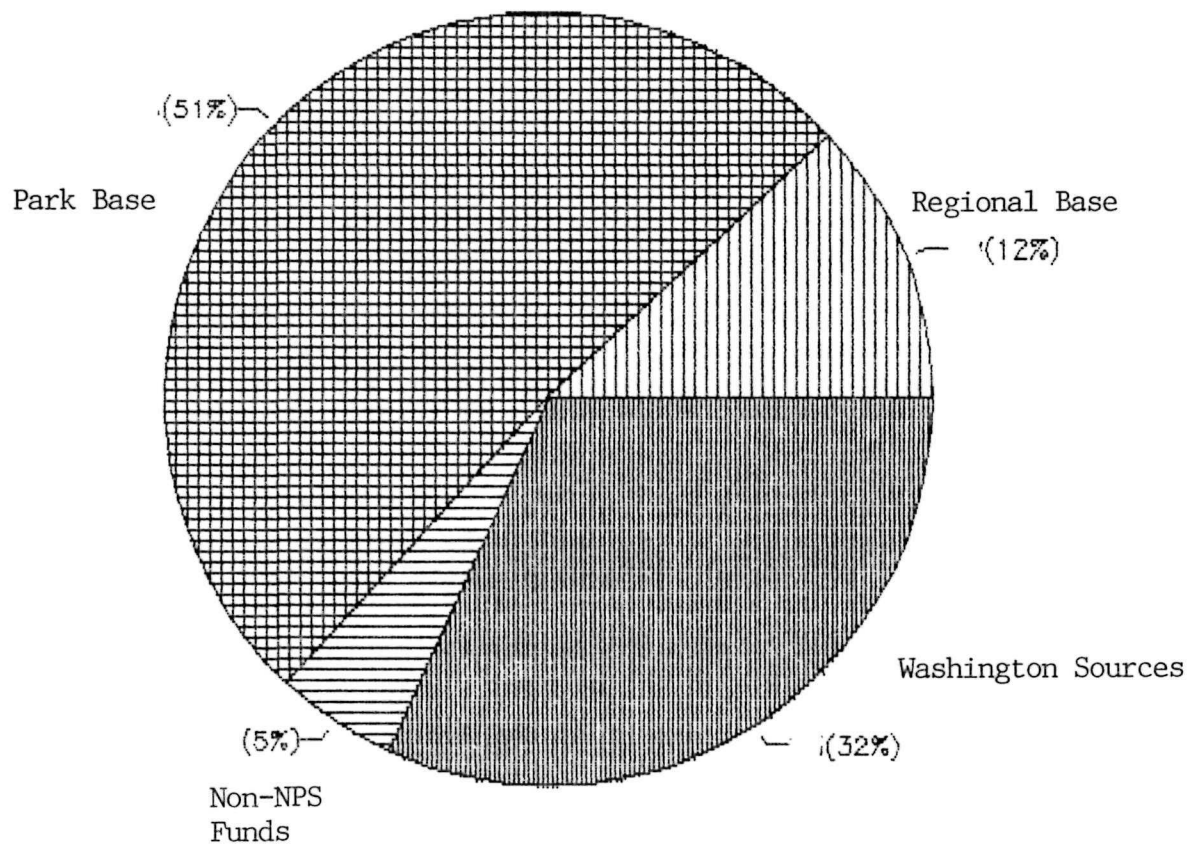


FIGURE V.2

## How Natural Resource Dollars Are Used

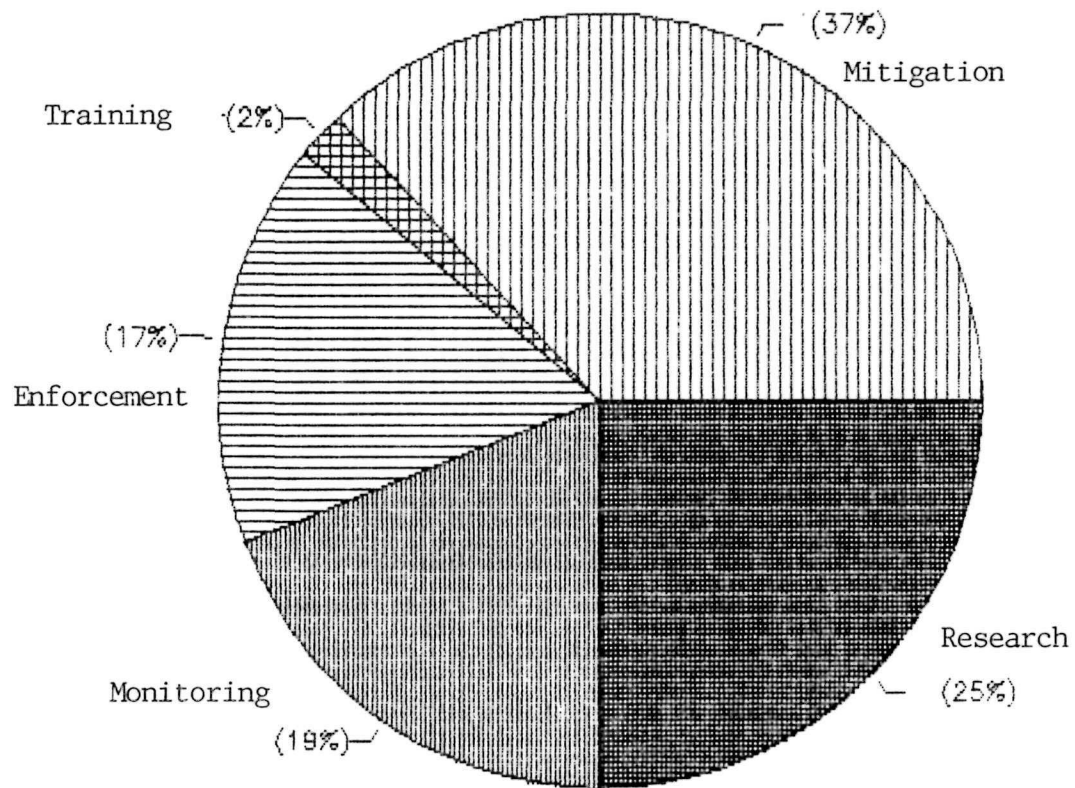
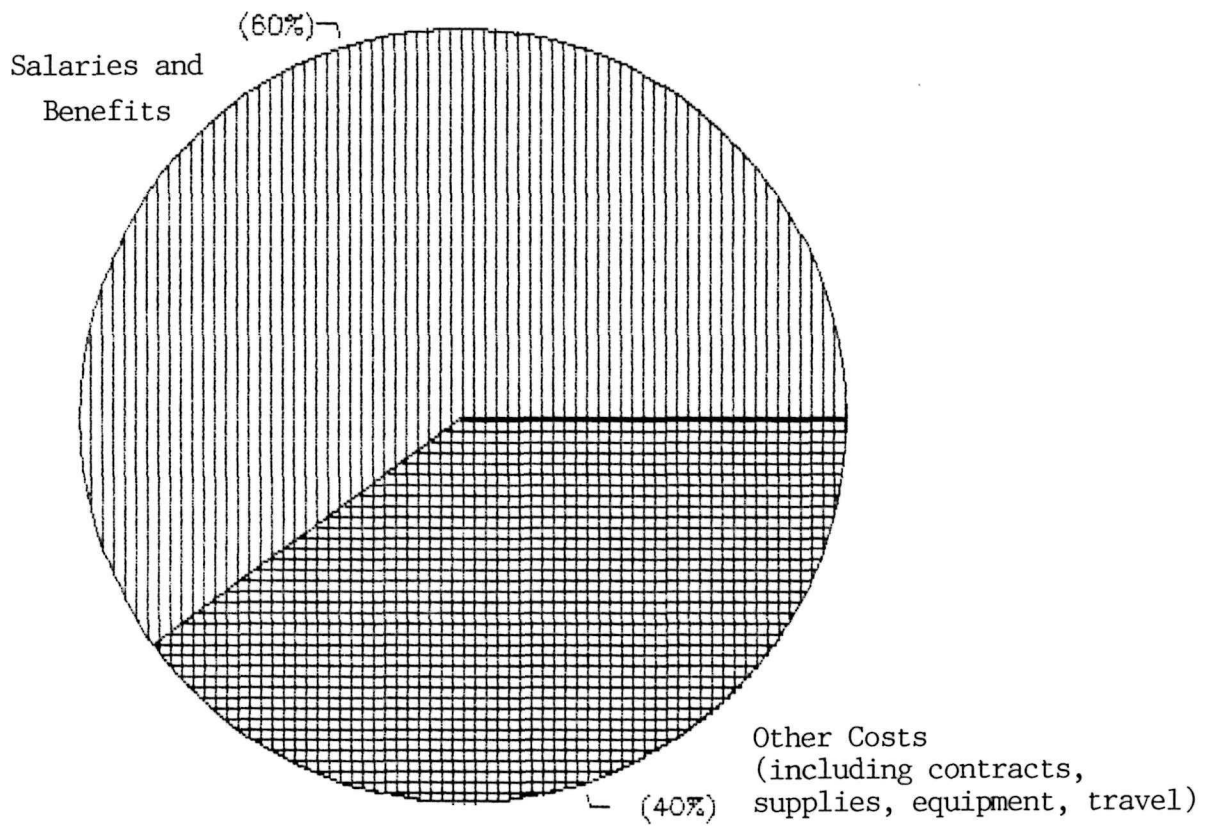


TABLE V.1: FY 1986 NATURAL RESOURCES FUNDING  
(\$ in Thousands)

FUND SOURCE	TOTAL FOR NAT. RES. ACTIVITIES	NATURAL RESOURCES FUNDING BY EXPENSE TYPE				NATURAL RESOURCES FUNDING BY ACTIVITY TYPE			
		PERSONL	PROJ SUP	OTHER	RESRCH	MIT/MAN	MONITR	ENFRCE	TRAIN
Park Base	40986.9	32547.3	8093.2	338.7	3633.4	15381.2	8520.8	12930.0	507.2
Region Base	9711.0	5829.3	3680.3	197.9	5782.3	2999.8	588.9	208.4	131.6
NRPP Program	5918.1	1100.2	4533.6	129.2	3230.1	1861.8	627.5	96.5	102.2
Air Quality	3965.1	191.3	3738.8	35.0	1179.8	320.0	2439.9	0.0	25.4
Water Resources	2276.2	682.5	1531.0	7.7	936.0	741.3	558.4	31.0	9.5
Fire Program	2474.2	1137.1	1206.5	130.6	506.0	1306.9	458.5	48.2	154.6
Acid Precipitation	486.5	42.5	443.5	0.5	324.1	6.6	155.3	0.0	0.5
Other NPS	9803.3	5732.2	3442.6	627.6	920.9	6511.0	1007.3	676.6	687.5
Non NPS	4386.6	1070.6	3273.5	32.0	3221.9	592.6	530.6	25.8	10.5
TOTALS:	80007.9	48333.0	29943.0	1499.2	19734.5	29721.4	14887.2	14016.5	1629.0

FIGURE V.3

## Servicewide Funds



## Park Base Funds

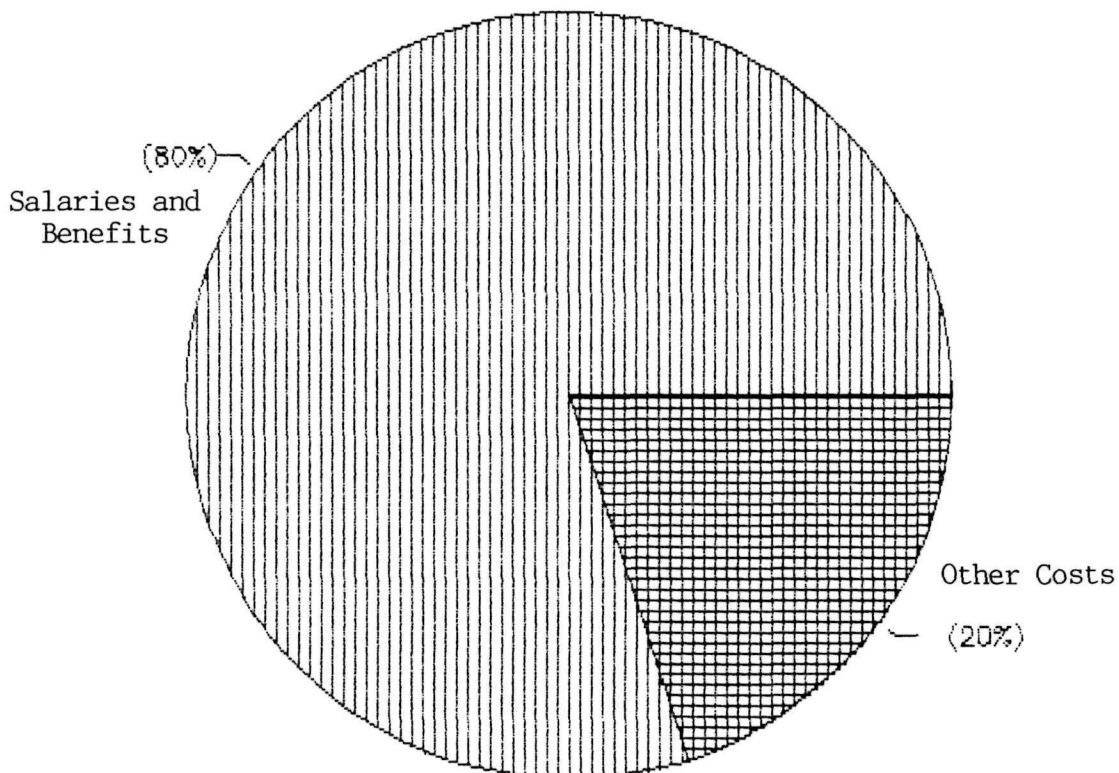




TABLE V.2: FY 1986 NATURAL RESOURCES ACTIVITIES SUPPORTED BY BASE FUNDING  
IN ORDER OF DESCENDING COST (\$ in Thousands)

<u>Resource Category</u>	<u>No. of Parks w/ Resource</u>	<u>No. of Parks w/ Activity</u>	<u>Total No. of Activities</u>	<u>Total Cost</u>	<u>Funding Source</u>		
					<u>Park Base</u>	<u>Region Base</u>	<u>Both</u>
Plants - General	249	79	179	6,485.3	2,162.0	3,364.6	958.7
Animals - General	234	65	114	4,521.9	3,045.2	1,266.9	209.8
Terrestrial Mammals	223	85	154	3,747.6	1,977.3	850.8	919.5
Manip. Landscape Vegetation	142	78	170	3,459.4	2,839.5	162.1	457.8
Forest/Woodland Vegetation	180	72	144	2,880.3	2,155.1	497.7	227.4
Fresh Surface Water	183	60	101	2,554.0	1,691.4	121.5	741.1
Aesthetics	222	60	111	2,333.3	1,610.5	305.3	417.5
Geologic Features - General	221	23	42	1,507.2	1,303.4	46.3	157.5
Soils	182	26	41	1,243.7	153.5	160.7	929.5
Birds	221	40	75	803.3	571.9	109.5	148.9
Water/Hydrologic Features	216	35	57	798.1	357.4	245.9	194.8
Marine Fish/Invertebrates	61	14	25	773.2	651.3	121.9	0.0
Shores/Islands	79	18	32	608.6	360.7	237.5	10.4
Grassland/Prairie Vegetation	99	30	44	557.1	423.5	42.3	91.3
Beach/Dune Vegetation	61	10	18	549.4	524.3	10.0	15.1
Freshwater Fish/Invertebrates	171	27	38	480.8	373.2	86.5	21.1
Fossils	64	6	9	384.0	319.2	0.0	64.8
Tundra/Alpine Vegetation	30	8	12	309.5	212.2	97.3	0.0

TABLE V.2(cont'd): FY 1986 NATURAL RESOURCES ACTIVITIES SUPPORTED BY BASE FUNDING  
IN ORDER OF DESCENDING COST (\$ in Thousands)

<u>Resource Category</u>	<u>No. of Parks w/ Resource</u>	<u>No. of Parks w/ Activity</u>	<u>Total No. of Activities</u>	<u>Total Cost</u>	<u>Funding Source</u>		
					<u>Park Base</u>	<u>Region Base</u>	<u>Both</u>
Mixed Shrubland Vegetation	96	15	20	294.7	85.6	132.5	76.6
Air Quality - General	215	24	34	284.5	218.6	28.3	37.6
Terrestrial Invertebrates	196	35	49	250.8	231.6	16.1	3.1
Desert Vegetation	42	10	16	247.6	147.5	69.7	30.4
Caves/Sinkholes	56	11	18	243.4	126.8	112.6	4.0
Cliffs/Gorges/Canyons	104	6	6	186.2	186.2	0.0	0.0
Freshwater Vegetation	136	8	12	155.8	96.9	58.9	0.0
Groundwater	165	11	13	137.6	25.0	112.6	0.0
Reptiles/Amphibians	198	8	9	128.4	85.4	43.0	0.0
Mountains/Volcanoes	65	3	13	89.5	89.5	0.0	0.0
Air - Purity	200	20	24	81.7	46.2	15.0	20.5
Marine Mammals	37	6	8	64.7	31.2	33.5	0.0
Air - Visibility	190	5	5	55.5	40.7	6.8	8.0
Geysers/Hot Springs	18	3	4	38.1	23.0	15.1	0.0
Salt Surface Water	45	4	4	29.3	29.3	0.0	0.0
Saltwater Vegetation	44	4	6	25.4	25.4	0.0	0.0
Glaciers	23	2	5	18.2	18.2	0.0	0.0
Plains/Plateaus	61	0	0	0.0	0.0	0.0	0.0

\* Note - General categories do not total subcategories. Table includes only the 100 largest activities in each region, about 75% of the total funded.

Over half of the base funded activities relate to plant or animal resources. Plant-oriented projects comprise about 36 percent of the total number of activities and animal-oriented projects comprise about 28 percent. Activities relating to geological resources constitute about 10 percent of the base funded activities, and esthetic resource-related activities about 6 percent. About 14 percent of the activities relate to air or water resources, areas which are funded primarily from Servicewide funds.

The largest amount of money (in terms of FY 1986 project funding) was spent in the major categories of animals, plants, geological features, and esthetics and the subcategories of terrestrial mammals, forest and woodland vegetation, manipulated landscape vegetation, fresh surface water, and soils.\*

The average cost of an individual activity was approximately \$20,000 for most of the major resource categories. Activities relating to geological features averaged slightly more, at almost \$26,000 each, and activities in the air category averaged less than \$7,000 each.

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\* For each activity listed, Regions were asked to select the one resource category which most closely related. Selection of a major category (e.g., animals or plants) over a more specific subcategory (e.g., terrestrial mammals) indicates a more comprehensive activity which would not fit a single subcategory.

## B. PERSONNEL

In FY 1986, approximately 1550 Full Time Equivalents (1 FTE = 1 work year) performed natural resources management duties in the parks and Regional Offices. In addition, in FY 1986 the Service had about 125 FTE's supporting the Servicewide natural resources program in Washington, the Denver/Ft. Collins natural resources field offices, the Boise Fire Center, and at the Albright Training Center (See Table V.3). This is roughly 10 percent of the Service's total number of FTE's and compares to other, larger program areas as follows: interpretation and visitor services comprises about 14 percent of the Service's total FTE's; maintenance about 33 percent of the total number; visitor protection and safety about 20 percent.

The Service currently has about 300 FTE's assigned to natural resources specialist positions (those in technical series such as biologist, geologist, ecologist, etc.). Natural resources specialists comprise slightly less than one-fifth of the total number of natural resources FTE's, and fewer than 2 percent of the total FTE's in the Service. Fewer than 5 percent of the natural resources FTE's are allocated to research scientist positions (positions classified in the research grade evaluation and research grant administration programs). Almost half of all the natural resources FTE's are in the Ranger (025) job series. An additional 30 percent of the natural resources FTE's are assigned to natural resources duties under other non-specialist series including, primarily, maintenance (see Figure V.3).

The Assessment revealed that a large number of individuals who do natural resources work are working less than full-time on natural resources duties ("full-time" is defined here as 75 percent or more of an individual's time). More than 70 percent of all the individuals who work in natural resources resources in the Service work in this "collateral duty" capacity. Most of these collateral duty individuals are in the 025-Ranger series or in other non-specialist series. Slightly more than 10 percent of the individuals in the natural resources specialist category are collateral duty.

Of the individuals spending 75 percent or more of their time on natural resources duties, approximately 40 percent are natural resources specialists and scientists, with 60 percent in Ranger or "other" positions.

TABLE V.3. FY 1986 NATURAL RESOURCES PERSONNEL

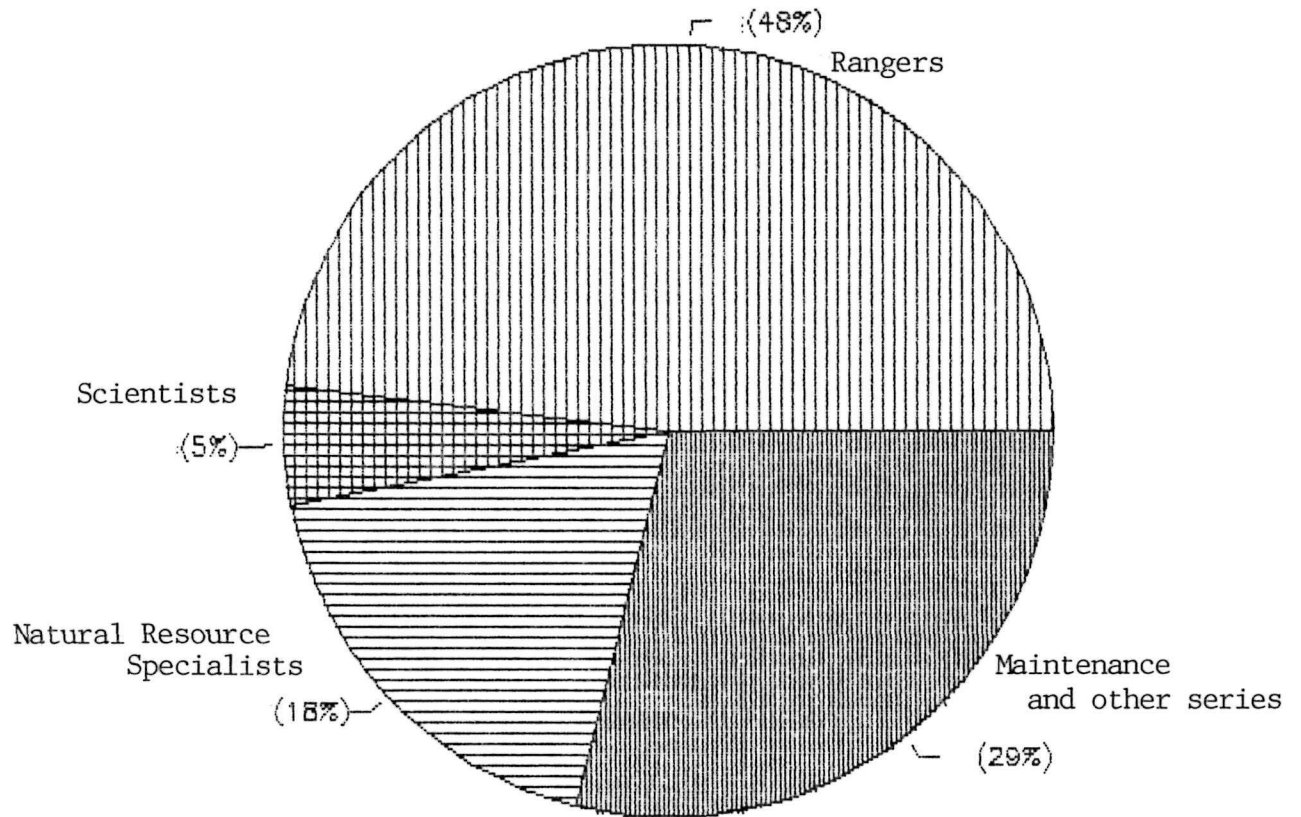
TYPE OF NPS EMPLOYEE	# OF NPS EMPLOYEES BY % TIME SPENT ON NAT. RES.*		FTE'S OF NAT. RES. WORK
	0-74%	75-100%	
Research Scientist	40	76	78
Natural Resources Specialists	62	409	309
025 - Natural Resources Management	2,267	474	811
Others - e.g. maintenance	970	454	485
TOTALS:	3,339	1,413	1,683

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\* Under each percentage time category column is the number of individuals who spend time on natural resources management, rather than the number of FTEs. Example: a person working 50% of his/her time each year on natural resources management is counted as "1" under the 0%-74% column whether he/she is full time, part time, or seasonal. Therefore, the total of individuals may be much larger than the number of FTEs.

FIGURE V.3

## Natural Resources FTE's by Job Classification



### C. NATURAL RESOURCES MANAGEMENT PLANS

Approximately 250 park units have natural resources and, therefore, are required to have an approved natural resource management plan. Of these, fifteen parks currently do not have an approved plan. Twelve of these are in Alaska, where provisionally approved draft resource management plans currently are pending final approval. The remaining three parks without approved plans are Saint Paul's Church National Historic Site in North Atlantic Region, (a small site without extensive natural resources), Kaloko-Honokohau National Historic Park and Great Basin National Park. The latter two are newly established areas where plans are expected to be approved in 1988.

About 15 percent of the approved natural resource management plans were not currently updated (based on their respective Regional plan update schedule) as of May 1, 1987.



## D. UNFUNDED PLANNED ACTIVITIES

### Background

The parks were asked to submit to the regions all projects identified as needed in their natural resources plans and currently unfunded. From this list, the Regions were asked to prioritize their unfunded projects, including those activities which they do not expect to be able to accomplish if park, Regional, and Washington office funding levels remain the same over five years. Currently unfunded projects which would be done over the next five years are described in the Five Year Action Program.\* It is important to note that, while the unfunded project list describes all short- and long-term projects needed for optimum natural resource management, the list is not static. As research is completed, new steps to treat resource problems may be identified. As long-term monitoring is improved, new problems may be recognized.

### General Findings

The assessment identified over 2,500 unfunded natural resource projects, totaling between \$250 and \$300 million, which would require approximately \$50-55 million per year if addressed over the next five years to address.\*\*

Over half of the projects relate to primary resources. Total unfunded activities associated with addressing severely threatened primary resources in all categories are estimated to require about \$20 million per year if addressed in the next five years.

Approximately 50 percent of the total funding needed for projects involves the mitigation component of the work. Approximately 30 percent of the total is for research. Twenty percent is for monitoring. Fewer than three percent of the total would go to enforcement or training components (see Table V.4). (One reason that enforcement is relatively low is that, historically, enforcement needs have been defined in park work plans other than the resource management plans).

About two-thirds of the projects would deal with animal and plant resources. Only about a tenth relate to geologic resources. Fewer than five percent relate to esthetic resources. The subcategories having the largest unfunded project costs are terrestrial mammals, manipulated landscape vegetation, and plants general (see Table V.5).

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\* Rocky Mountain Region left out a portion of unfunded needs, which they had not prioritized.

\*\* The number of unfunded projects is variable, as some parks were "lumpers" and some were "splitters." One park might submit two or three projects on a related subject, whereas another would submit a single large project.

TABLE V.4: UNFUNDED PLANNED ACTIVITIES BY ACTIVITY TYPE

(\$ in Thousands)

<u>Activity Type</u>	<u>FY 86 Funding</u>	<u>% of Total Funding</u>	<u>Unfunded Needs</u>					<u>5-Year Total</u>	<u>% of Total Unfunded Need</u>
			<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>		
RESEARCH	19,734.5	25%	16,462.2	17,936.0	17,302.2	12,431.8	10,256.1	74,388.2	28%
MITIGATION	29,721.4	37%	31,741.9	28,823.6	30,463.1	14,924.1	19,535.3	125,488.0	48%
MONITORING	14,887.2	19%	11,912.8	12,154.1	12,709.0	10,777.2	9,651.1	57,204.2	21%
ENFORCEMENT	14,016.5	17%	1,389.3	1,200.2	1,295.3	1,068.2	951.8	5,904.9	2%
TRAINING	1,629.0	2%	719.3	708.3	600.7	470.0	431.0	2,929.3	1%

TABLE V.5 UNFUNDED PLANNED ACTIVITIES BY RESOURCE  
SUBCATEGORY AND ACTIVITY TYPE

(\$ in Thousands)

Resource Subcategory	# of Parks w/ Resource	# of Parks w/ Project	Total Need	Total Need by Activity Type				
				Resrch	Mitig	Monit	Enfrc	Trai
Terrestrial Mammals	221	102	35,191.3	14,719.1	12,028.8	7,269.8	836.9	153.5
Manip. Landscape Vegetation	140	61	32,617.7	2,249.5	27,826.5	1,786.6	279.2	476.0
Plants - General	224	94	30,244.4	8,321.3	13,570.1	6,983.7	860.1	332.8
Forest/Woodland Vegetation	179	88	25,362.5	4,885.7	15,816.9	3,645.5	517.4	415.1
Shores/Islands	79	26	24,001.5	1,553.9	20,005.1	2,044.9	332.2	65.5
Animals - General	216	94	22,672.5	8,579.4	3,643.5	9,456.2	578.2	415.3
Soils	182	48	11,867.7	913.7	9,246.7	1,050.2	118.5	180.6
Fresh Surface Water	182	90	11,719.2	5,032.1	2,312.0	3,951.1	253.8	146.4
Freshwater Fish/Invertebrates	170	50	7,038.9	4,154.9	1,011.1	1,395.8	230.1	21.1
Geologic Features - General	202	28	6,641.2	1,217.4	2,597.9	1,547.8	165.5	118.9
Aesthetics	221	55	6,455.9	1,956.6	2,963.8	1,057.6	381.3	95.9
Marine Fish/Invertebrates	61	21	5,961.7	3,716.7	329.2	1,656.8	220.8	38.2
Grassland/Prairie Vegetation	99	40	5,916.2	1,457.4	2,645.6	1,175.3	546.2	82.4
Birds	220	60	5,853.9	2,237.4	1,059.8	2,437.5	96.4	22.8
Water/Hydrologic Features-General	197	34	5,828.6	1,660.7	1,475.5	2,613.2	31.3	48.0
Caves/Sinkholes	56	20	4,313.2	702.8	3,073.6	265.3	196.9	4.5
Air Quality - General	197	36	3,816.0	972.2	128.7	2,673.3	0.8	41.2

TABLE V.5 (cont.): UNFUNDED PLANNED ACTIVITIES BY RESOURCE  
SUBCATEGORY AND ACTIVITY TYPE

(\$ in Thousands)

Tundra/Alpine Vegetation	30	7	2,727.5	1,330.1	199.3	1,198.1	0.0	0.0
Mixed Shrubland Vegetation	96	21	2,312.5	215.5	1,862.9	129.1	0.0	105.1
Groundwater	165	34	2,089.2	917.6	140.4	822.4	0.8	19.1
Terrestrial Invertebrates	196	29	2,006.9	1,070.1	473.3	448.0	0.0	13.8
Air - Purity	197	31	1,862.5	916.3	52.7	877.4	6.1	10.1
Desert Vegetation	42	16	1,662.4	267.7	1,222.8	130.3	3.8	7.8
Freshwater Vegetation	136	14	1,331.5	838.2	261.8	230.1	0.0	1.4
Salt Surface Water	45	10	1,120.0	764.5	16.0	319.5	0.0	20.0
Air - Visibility	190	23	1,108.7	420.4	53.3	623.2	0.0	11.8
Reptiles/Amphibians	197	14	996.3	294.3	272.9	346.1	72.2	10.8
Beach/Dune Vegetation	61	10	923.0	381.5	396.0	123.0	20.0	2.5
Fossils	64	10	825.1	420.1	55.0	253.3	88.3	8.5
Mountains/Volcanoes	65	9	779.8	342.8	239.5	195.1	0.0	2.4
Geysers/Hot Springs	18	4	640.0	459.6	32.3	142.0	6.1	0.0
Marine Mammals	37	4	511.0	162.6	105.0	189.4	29.0	25.0
Saltwater Vegetation	44	4	454.0	269.0	148.0	34.5	0.0	2.5
Glaciers	23	1	170.0	114.0	0.0	47.5	0.0	8.5

## VI. FIVE-YEAR ACTION PROGRAM

### A. SUMMARY OF REGIONAL ACTION PROGRAMS

#### Background

For purposes of formulating their five-year Action Programs, the Regions were told to assume the same level of funding from all sources as in Fiscal Year 1986. Because of uncertainties about the likelihood and magnitude of fee revenues, the Regions were told to assume they would not have fee revenues. Since it is now expected that the parks will have substantial fee revenues to use to expand their Action Programs, conclusions drawn from the information in this section about how successfully the Regions will address the major natural resource issues over the next five years are pessimistic. The Service-wide Action Program discusses how park fee revenues should be used as well as how the Director's discretionary portion of fee revenues should be used.

The formats of and level of detail of the Regional Action Programs varied substantially. Most of the Regions discussed their planned actions on an issue-by-issue basis; two Regions did not. Some Regions discussed only currently unfunded projects that would be funded over the next five years, others discussed both currently unfunded and on-going projects. No Regions provided specific information on how much the planned actions under each issue would improve the adequacy of data on resources and/or the condition of resources or would mitigate or prevent threats to resources. In spite of differences, however, it is possible to make some generalizations about the programs.

#### General Findings

The Regions stated or implied that within present funding, little reprogramming is possible. The Southeast Region, Pacific Northwest Region and Rocky Mountain Region state explicitly that they reviewed park base funded projects to ensure that ongoing projects are high priority. The Southwest Region indicated that it saw no outstanding areas where major adjustments can be accomplished and that the Region would attempt to redistribute personnel where they can best be used. The Pacific Northwest Region indicated that existing park base funding will remain committed to the present activities and will not be reprogrammed.

In general, without fee monies, a small portion of the projects listed as currently unfunded would be addressed in the next five years. The Midwest Region parks will be able to complete about 77 of their identified needed projects. The Southwest Region indicated that it will be extremely difficult to initiate any new activities, and that some monitoring activities might have to be discontinued without additional funding. The Pacific Northwest Region parks will accomplish 12 of the top 50 priority activities. The Alaska Region will probably be able to fund 11 of the parks' needed projects. The Rocky Mountain Region parks will be able to initiate the top 55 projects from their needs list. The Southeast Region parks will be able to accomplish nine of their top 50 needed activities completely, and will address portions of 22 others.

Additional information on the Regional Action Programs follows. Since the Regions indicated they will continue most ongoing activities, it is assumed that the activities discussed in their Action Programs will supplement existing, ongoing activities to address the issues. In some cases this summary omits information on activities that only one Region plans.

#### Regional Research Action Programs

Overall, the Regional Action Programs suggested that the Regions plan to begin few new "pure" research projects over the next five years as compared with the number of new mitigation and monitoring projects. Probably half of the research projects that the Regions included in their Action Programs were baseline data collection and resource management planning projects rather than projects designed to test hypotheses. The baseline data collection and resource management projects are discussed under the monitoring and mitigation sections of this chapter, respectively.

The Regional Action Programs suggested that more of the new research will relate to animals and plants, than to air, water, geological, or esthetic resources. A number of Regions mentioned in their Research Action Programs that they would be preparing guidelines or developing techniques of Servicewide interest. For example, the Mid-Atlantic Region plans to develop techniques to predict gypsy moth infestation. Both the Mid-Atlantic and North Atlantic Regions plan to develop techniques for management of visitor use. In the North Atlantic Region, Acadia NP and other parks plan to evaluate management techniques for local planning involvement and develop techniques for monitoring conservation easements. The Pacific Northwest Region plans to prepare a soil stabilization and revegetation handbook.

Lava Beds NM and Great Basin NP plan to develop techniques for removing algae from cave resources. Yosemite NP will continue to develop models of fuel accumulation, lightning strike detection, and fire behavior. The Western Regional Office will work with the NPS Air Quality Division to develop and refine modeling techniques to predict air pollution concentrations from proposed new sources and plans to work to improve the resource management planning process and to continue to develop population management guidelines and a revegetation policy.

In general, the Regional Action Programs suggest that most new research activities will be park-by-park projects, rather than multiple park projects. Few of the Regions indicated that they are planning inter-Regional or interagency cooperative research efforts.

Many of the research projects that the Regions listed in their Action Programs focus on threatened, endangered, declining, rare, or other sensitive species. For example, Voyageurs NP plans to study declining native wildlife; the National Capital Region plans to study the location and probable habitat for rare and endangered species; several parks in the Pacific Northwest Region plan to survey potentially endangered owls; parks in the Rocky Mountain Region plan to initiate wolf, grizzly, peregrine falcon, bald eagle, and rare, threatened and endangered plant studies; the Southeast Region is planning a multi-park Florida panther study; and parks in the Western Region plan to study bighorn sheep, the desert tortoise, the Brazilian freetail bat, the mountain beaver, and endangered ferns. Many of the causes of problems for rare, threatened, or endangered species are the issues identified as of broad Servicewide importance.

#### Regional Mitigation Action Programs

The Regions indicated that the structure and specifics of their mitigation programs over the next five years depend upon the success of their monitoring programs in clarifying problems and the success of their research programs in developing and identifying mitigation techniques. The mitigation projects that the Regions plan to initiate include: projects to revegetate and rehabilitate sites within parks that have been damaged by visitors, exotics, or abandoned mines; projects to develop fire, water, vegetation, or recreation management plans; efforts to work with other local, State, or Federal agencies to insure that they consider park concerns in planning; projects to develop and maintain native plant nurseries; efforts to manage, using a variety of techniques, threatened or endangered species and to reintroduce extirpated species.

#### Regional Monitoring Action Programs

The Regional Monitoring Action Programs indicate that more than half of new monitoring efforts will be baseline data collection projects. Some of the Regions will implement comprehensive baseline data and monitoring programs. For example, the National Capital Region plans to make a Regional effort to collect baseline data on vegetation patterns; the location of and probable habitat for rare and endangered species; significant and conspicuous native and exotic vegetation; wildlife habitats; the presence, absence, and abundance of wildlife, including rare and endangered species; soils surveys; water quality and quantity information; zoning of adjacent lands; park zones; park resources; topography; and physical facilities that may affect park resources.

The types of monitoring activities that the Regions described in their action programs include projects to detect whether the condition of resources are changing; projects to determine the extent to which an identified threat is changing the condition of resources; projects to determine the success of mitigation efforts to prevent further changes in a resource or improve the condition of a resource; and monitoring to identify changes in the incidence of threat sources.

A few new baseline inventory or long-term monitoring activities are cooperative efforts with other agencies. Among these are: a cooperative water resource monitoring program by the University of Pittsburgh and Johnstown Flood NM and a cooperative bay water quality monitoring program by Assateague Island NS and the Environmental Protection Agency.



The Alaska Region is studying and surveying (in cooperation with the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service) populations of fish and wildlife used for subsistence by local rural residents in parks, preserves and monuments and by sport hunters and fishermen in preserves. The Mid-Atlantic Region plans to develop methods of monitoring wildlife populations and a long-term environmental monitoring system to document the impacts of gypsy moth.

Many of the Regions stated that they or their parks plan to develop geographic information systems, including Voyageurs NP, the Alaska Region, the National Capital Region, the North Atlantic Region, Pacific Northwest Region, Southeast Region, and Santa Monica Mountains NRA.

Many of the projects are to monitor or collect baseline data on threatened, endangered, or other sensitive species. For example, the North Atlantic Regional Office will establish monitoring programs to assess the status of rare plants and habitats in various parks and collect baseline data on threatened and-endangered wildlife habitats. Acadia NP, Cape Cod NS, Fire Island NS, and Gateway NRA will implement programs to monitor colonial nesting bird species.

In the Southeast Region, the Regional Office plans to develop a water quality monitoring standard. The Western Region will develop prescribed fire monitoring guidelines.

#### Regional Enforcement Action Programs

Overall, enforcement is an area in which most Regions are likely to continue to spend at least the same level of funds over the next five years. Although few additional, unfunded needs were identified, this is partly because enforcement is an area, like training, which is often planned and budgeted outside of the park resource management plan. Statistics collected separately from this study show that natural resource violations were up almost 22 percent in 1986 from 1985 levels, and have gone up each year since 1982, undoubtedly reflecting a need for additional enforcement actions.

One area in which at least half the regions planned additional enforcement activities is the area of preventing visitor impacts to natural resources. The Mid-Atlantic Region will expand its efforts in urban parks to enforce regulations pertaining to feeding and harassing wildlife. The North Atlantic Region is considering visitor use restrictions to protect rare habitats and declining species, should current research projects indicate that they are necessary. The Southwest Region plans to strengthen the ties between natural resource management and law enforcement to deal with the problem of removal of natural features, especially cactus. The Western Region will increase the emphasis on protection of fragile and irreplaceable cave resources in its enforcement program.

Other actions are planned to better deal with consumptive use of park resources. Mid-Atlantic Region is seeking changes in the State of West Virginia and Office of Surface Mining procedures for issuing coal prospecting permits on private lands within the boundaries of New River Gorge National River. The Western Region will increase its enforcement efforts to remove trespass cattle from five parks, and administer leases in Great Basin NP and permits to packers and concessioners in Yosemite NP.

Several regions plan additional efforts to deal with boundary encroachment. Suburban parks in Mid-Atlantic Region will use the example of the Richmond Land Protection Working Group to develop, in concert with local zoning boards and developers, criteria and standards for adjacent land use. This effort will be augmented by increased boundary monitoring and use of existing building and zoning codes to enforce compliance on lands contiguous with parks. In the National Capital Region, enforcement of boundaries and easement rights will continue at current levels. In the Western Region, Whiskeytown-Shasta-Trinity NRA will emphasize boundary surveillance during the next five years.

#### Regional Staffing Action Programs

Assuming existing funding levels, none of the Regions were able to make plans to increase the overall level of resource management staffing. The Southwest Region stated that the Region's staffing in the areas of research and resources management would stay the same or decline over the next five years. However, most indicated that they need additional staff. The Regions which indicated the greatest staffing needs in their Action Programs were the Alaska Region, the North Atlantic Region, and the Western Region. Since the Regions were not asked by the Assessment forms specifically about the size of their staffing needs, other Regions may have similar needs, but not have indicated them.

The Alaska Region indicated that it needed 40 additional full time equivalents (FTE's) for natural resource management activities, including 18 additional scientists, 12 additional natural resource managers and 14 positions in the Subsistence Division. The North Atlantic Region indicated that it needed additional FTE's to implement resource monitoring programs, manage programs for rare habitats and declining species, support research initiatives such as exotic plant management, develop water resources programs, address coastal issues, and use geographic information systems. The Region needs several scientists--a wildlife biologist, a coastal geomorphologist, and water-oriented scientists.

Both the Rocky Mountain Region and North Atlantic Region indicated that they could use additional graduates of the Natural Resources Management Specialist Trainee Program.

### Regional Training Action Programs

Most of the Regions indicated that they will be relying on Servicewide training courses to meet most of their training needs. (Currently more than 40 percent of the total natural resources training is funded from Servicewide sources. Another 30 percent is from park base funds.) For example, the National Capital Region is planning to send employees to Servicewide courses in basic wildlife management, cultural resources management, geographic information systems, and water resources management.

The training activities that the Regions are planning or report that they need are about evenly split among courses that teach park staffs to identify, inventory, or monitor problems; courses that teach park staffs to mitigate resource problems; and broad survey courses.

A few of the training efforts are cooperative efforts with other agencies. They include additional interagency firefighter training courses and joint training with local fire departments, which the National Capital Region recommends; joint Forest Service/Cooperative Park Study Unit training sessions on vegetation transect monitoring, prescribed burn planning, hazard tree management, and cave inventorying, which the Pacific Northwest Region is arranging; and a joint workshop between the Forest Service and the Pacific Northwest Region on wilderness management.

Some courses are applicable to two or three Regions. These include a course in gypsy moth management that the Mid-Atlantic Region plans to hold and a course in human impacts to coastal features that the North Atlantic Region is trying to arrange.

The Regional Action Programs indicated that the training activities that the Regions plan to initiate are targeted to resource managers. Few of the courses appeared to be aimed at park managers, interpreters, enforcement, or maintenance personnel. The exceptions are the wildlife law violations training that the Mid-Atlantic Region is arranging, the course on issues in resource management that the Mid-Atlantic Region plans to hold for superintendents and chief rangers, and the training session on boundary and easement responsibilities that the National Capital Region plans to add to an existing law enforcement course.

A number of the new training activities that the Regions are planning relate to Servicewide issues. A number of the Regions plan to train park staffs in inventory and long-term monitoring techniques and protocols. The Alaska Region plans to train park staffs in state-of-the-art wildlife survey methods; the Midwest Region plans to hold a course in water quality monitoring; the National Capital Region plans to expand its training program in resource basic inventories; the North Atlantic Region plans to hold a course in quality control for long- and short-term monitoring programs on a variety of Regional natural resource management issues and may hold training in wildlife censusing, radio telemetry, and wildlife immobilization techniques; and the Pacific Northwest Region is trying to arrange a workshop on cave inventorying.

Several Regions plan to train employees in new Servicewide technologies and methodologies such as using geographic information systems and computer systems.

## B. SERVICEWIDE ACTION PROGRAM

### Background

This natural resources assessment has found that, overall, much more needs to be done to improve the condition of natural resources, especially those in "poor" condition and/or severely threatened (see previous chapters for specific categories). There is also a need, documented by almost all Regions, for additional information on resources to support management decisions and actions.

Over the last five years, the National Park Service has taken a number of steps to improve natural resources management. However, this assessment indicates that to succeed in protecting the National Park System's natural resources in an increasingly complex and threatening environment, the Service must:

- focus funds on the most important resource protection issues and projects,
- adequately staff parks with resource management specialists and upgrade the natural resource expertise of other park staff, and
- improve park information bases and disseminate research information within and outside the Service.

The Servicewide Action Program proposed below to address these needs is divided into six functional areas (Research, Mitigation, Monitoring, Enforcement, Staffing and Training). Under each area, the program describes the park, Regional, and Washington Office roles.

This Action Program calls for parks to apply a substantial portion of their fee revenues to meeting natural resources management needs. The Service expects to collect roughly an additional \$50 million to \$60 million per year. After collection costs, estimated to be approximately \$10 million, about one-third of the funds or about \$13 - \$16 million should be available to the parks for natural resources research and management.

Unfortunately, the projected fee revenues in some parks do not "match" the amounts of unfunded needs (some exceed and some are less). This suggests that some reallocation of existing base funding among the parks by the Regional Directors may be appropriate and should be carefully reviewed and considered depending on relative priorities Regionwide.

Two of the three largest categories of unmet needs (mitigation and monitoring), and to some extent research, are activities ordinarily appropriately undertaken at the park level. The assessment suggests that with existing base funds, increased fee revenues, and redistribution of base funds, it will be possible to make some progress in meeting documented natural resources preservation and protection needs in the next five years.

While the fee revenues can be a great boon to resources management, to be really effective, they must be applied to the highest priority needs, including baseline inventory and long-term monitoring projects. The assessment shows a great need for baseline and long-term monitoring data. Inventory and monitoring often have taken a "back seat" to projects that address short-run resource management crises. The influx of fee revenues gives us an opportunity to allocate funds to the activities of the highest priority over the long run.

Although additional fee revenues will go far to meet a number of resource management funding needs, they will not fully address staffing and training needs. With the increase in funding available at the park level to meet resource needs, it is critical that there be an increase in professional staff who can competently manage park natural resource management planning and conduct high priority research, mitigation and monitoring projects.

Some essential natural resources management activities wholly or partially handled at the Regional or Washington Office level may not be assisted by fee funding (only ten per cent of fee revenues will be available to the Director for Regional and Washington level needs), but possibly may be accomplished by redirecting the uses of existing appropriations. For example, most of the Regional base funding is used for research and has been funding park specific, short-term research on resource management problems. This kind of research could now be increasingly funded at the park level (where the expertise is available, or where it can be contracted) so that Regional science monies can be directed at research on major Regionwide issues or long-term basic research to further our fundamental understanding of ecological processes. Regional funding probably will continue to be necessary to support research on issues of critical significance to a single park but beyond that park's capability to fund or to direct.

The actions being proposed at the Washington Office level assume some redirection of program activities and funding sources, and/or that a portion of fee revenues be available to the Director for allocation. The following initiatives will be undertaken through this means: improve Regional and Servicewide training, establish a Servicewide research program, expand geographic information systems capability, expand Servicewide inventory and data bases, create a cohesive Servicewide science and natural resources publication program, and better disseminate research and natural resources information within and outside the Service.

There are opportunities to make great strides in improving natural resources in the National Park Service by acquiring more basic data for decision making, upgrading resource condition, alleviating threats, and improving management. In addition to the other elements of the Servicewide Action Program, the Service will update this Assessment in three to five years to monitor the improvements in the Service's natural resource management programs.



## Research Action Program

The assessment showed that research is one of the major needs if parks are to make progress in dealing with the needs documented in their resource management plans. Approximately 30 percent of the planned unfunded activities have research as a component. Currently, about 25 percent of funds Service-wide go to research, which loosely defined as both the pursuit of new knowledge and the collection of existing information into alternative plans for dealing with resource problems.

Park Role: Parks will continue to fund individual research projects that are park-specific and relatively short-term. This type of more-focused research has traditionally represented a relatively small proportion of the Service's total research agenda. With the availability of fee revenues, the parks will be able to address as much as the top third of their unmet research needs that fall into this park-specific category, thereby reducing the need to rely on Regional funding for these projects. However, considering that few parks have scientists on their staff, the parks will continue to rely on the Regional Chief Scientists for assistance in research design and oversight.

Regional Role: If parks spend more park fee revenues on park-specific projects, which have usually consumed most of Regional research funds, Regional research funds can be directed to a greater extent to address issues of a multi-park and/or multi-Regional nature. The Regions will be encouraged to use existing and establish additional Cooperative Park Study Units where necessary to carry out research on specialized topics. Use of these Cooperative Units across Regional boundaries, to help address the types of multi-Regional issues identified in the assessment also will be encouraged. The regions will continue to assist parks in research design, research contracting, and quality control.

Washington Office Role: The Washington Office will take on responsibility for conducting studies of Systemwide importance, such as studies of the effects of external activities on park resources, the increasing insularization of parks, and management options for reducing impacts from adjacent development. In addition, the Service's integrated pest management program will be expanded to support research on biological controls of exotic plants and animals, one of the most widespread single issues facing the Service today.

The Washington Office will develop guidance for the Regions on how to establish and more effectively use Cooperative Park Study Units in support of the research program.

To ensure that the parks and Regions have access to important research and other natural resources information that will help them address the major Servicewide natural resource issues, the Washington Office will initiate a cohesive Servicewide publications program and will create and maintain a computerized Servicewide natural resource bibliographic data base of publications.

Finally, the Washington Office will complete a comprehensive review of the NPS research program to suggest improvements in the way research is prioritized and carried out at the park, Regional, and Washington Office levels and to suggest further Servicewide research initiatives.

### Mitigation Action Program

Mitigation projects, directed at the restoration and recovery of park resources, represent the bulk (almost 50 percent) of the Service's unfunded natural resource projects. The assessment has documented an extensive list of mitigation needs, including resources in every resource category throughout the System.

Park Role: Most mitigation projects are funded and carried out at the park level. As a result of this assessment of the condition of resources and resource threats, all parks have had a recent, thorough look at the condition of their resources and are in a position to apply their increased fee revenues to their highest priority projects.

Currently, about 40 percent of the park natural resource base funds are applied to mitigation projects. However, because of the large backlog of mitigation needs that has been documented, only the application of a large portion of the fee revenues over the next five years (in addition to base funds) will allow the parks to make any measurable progress toward mitigation. In many cases, research and data collection must precede certain mitigation activities. Individual park mitigation needs are documented in the park resource management plan. The parks will update these plans regularly and ensure that park base and fee revenues are directed at the most important needs.

Regional Role: The Regions will review park resource management plans and ensure their quality and compliance with Servicewide guidelines. The regions will ensure that park funds (base and fee revenues) are allocated to the most important mitigation needs, as documented in the park plans and the assessment. Regions also will fund mitigation projects that are particularly complex, and/or are multi-park in nature and will assist in addressing threats outside park boundaries through cooperative activities with State agencies and other Federal land managers.

The Regional Chief Scientists and staff specialists will play an important role in helping parks design mitigation projects and rank all projects that are submitted for Servicewide funding. This assessment process and periodic Regional updates will help focus Servicewide funding support requests on the most significant or pervasive (multi-park or multi-Region) types of mitigation activities.

Washington Office Role: The Washington Office will continue to develop internal natural resource management policies and work to establish cooperative agreements with other agencies to mitigate threats to park resources. The NPS Air Quality, Water Resources, and Vegetation and Wildlife Divisions will use the new Servicewide threats data base to review and analyze further what the Service should do to address resource threats. The Washington Office will make a continuing effort to use the Department's threat resolution process to minimize impacts from threat sources occurring wholly or in part on other Department of the Interior lands. It is expected that, over the next five years, use of fee revenues to address park-specific mitigation activities will mean that a smaller proportion of Servicewide funding sources will be needed for mitigation and will free additional Servicewide funds for research on more effective mitigation techniques.

### Monitoring Action Program

One of the most significant findings of the assessment was that basic information on natural resources is, in most cases, marginally adequate or inadequate to support park management actions. Virtually every Region identified a need for improved park baseline inventory and monitoring information. The Service's inventory and monitoring needs are so extensive that current base funding cannot adequately address them. A major Servicewide effort, involving both requested increases to base funding, and targeting a portion of increased park fee revenues to baseline data collection and monitoring projects is required and already has begun.

Park Role: Inventory and monitoring of resources is a fundamental park responsibility. Over the next five years, parks will establish or enhance existing comprehensive inventory and monitoring programs to collect and assess data on the occurrence and condition of park resources. They will base this effort on the new guidelines of the Servicewide inventory and monitoring initiative. Parks are also responsible for monitoring the short- and long-term results of mitigation projects.

Regional Role: Regions will provide technical assistance and oversight to parks in the design and implementation of park inventory and monitoring programs. With the development of Servicewide inventory and monitoring guidelines, Regions also will be responsible for ensuring that park programs are being carried out in a comprehensive and consistent fashion. Regions will set priorities for and coordinate the development of park geographic information systems for managing park inventory and monitoring data. In addition, Regions will coordinate and oversee the collection of park data for inclusion in the Servicewide inventory data bases on threatened and endangered species (TEX), exotic and pest species (TEX), park flora species (NPFLORA), and (potentially) park fauna species (NPFLORA).

Washington Office Role: The Washington Office will continue to implement a major Servicewide inventory and monitoring program. The Service's FY 1988 budget includes an increase of \$660,000 for baseline inventory and monitoring. Since this increase will not meet the documented need fully, it is estimated that at least 20 percent of available park fee revenues should be directed at needs relating to inventory and monitoring.

The objective will be to develop inventory and monitoring programs for at least 20 parks a year over the five years beginning in FY 1989, focusing initially on the larger natural resource units. Servicewide standards and guidelines for inventory and monitoring are being developed in FY 1988 by technical specialists in the NPS Natural Resources Divisions, working with the Regions and parks. In FY 1988, the Washington Office will also conduct an assessment of the status of park inventory and monitoring programs, as measured against the Servicewide guidelines.



Certain Servicewide monitoring programs will continue to be managed at the Washington Office level (e.g., air quality monitoring) to provide technical expertise and ensure quality control, although parks will continue to have the responsibility for certain operational activities. The Service will continue encourage the use of remote sensing and geographic information systems technologies for park inventory and monitoring, by expanding the capabilities of and support provided by the Geographic Information Systems Division. Finally, the Service will update the assessment data on resource threats periodically to insure that resource threats periodically to insure that appropriate attention is focused on threats requiring specialized or priority attention.

#### Enforcement Action Program

Regions and parks indicated that, with some exceptions, enforcement activities could continue at an adequate level without requiring additional funds. Enforcement needs documented in natural resource management plans represent only two percent of the total unmet needs. However, statistics collected separately from this Assessment show that natural resource violations are rising significantly and in fact, went up nearly 22 percent in 1986 over 1985.

Park Role: Over 90 percent of the Service's enforcement funding comes from park base funds. All natural resources enforcement actions, with the exception of U.S. Park Police actions in the National Capital Region and the large urban parks, are the responsibility of the parks. Overall, while the level of activity and funding for enforcement is not expected to change significantly over the next five years, parks will direct special attention to those areas, such as hunting and fishing, poaching, illegal collection, and vandalism, which were identified as significant issues in the assessment and in which enforcement plays an integral part.

Regional Role: The Regions will continue to oversee park enforcement operations and assist the parks in finding funds to cover major, emergency law enforcement needs. Regions also will continue to play a large role in the support and direction of training programs for law enforcement. Several Regions specified that they would begin special courses or add certain subjects in natural resources to existing law enforcement curricula to strengthen enforcement efforts.

Washington Office Role: The Washington Office will continue to provide indirect support to park natural resources enforcement efforts through an expanded natural resources staffing and training program (see below). The Washington Office also will seek to strengthen the ties between resource management planning and enforcement operations.

#### Staffing Action Program

The assessment suggests that the parks and Regions need additional qualified natural resources personnel. This need will be accentuated when additional park fee revenues are available for natural resource management projects.

Park Role: The parks will provide the staff resources necessary to plan and implement natural resources management programs--including natural resources specialists, resource management rangers, research scientists, maintenance personnel and others. Mitigation activities, which constitute the bulk of park resource management activities, are particularly labor-intensive. Resource specialists and research scientists will determine the appropriate mitigation strategies, and resource specialists, rangers, maintenance staffs and others will carry out these strategies.

Currently, the Service has a total of only about 300 FTE's assigned to natural resource specialist positions. Given current natural resources FTE levels, the Service will not be able to continue ongoing natural resource management projects and also complete additional high priority unfunded projects to be undertaken by fee revenues.

Regional Role: The Regions will provide oversight, technical and scientific guidance, regional research personnel, and some research personnel duty-stationed in parks that lack adequate in-house staff resources or where projects are of a multipark, Regionwide, or Servicewide nature. Slightly over ten percent of the total natural resource expenditure on personnel support come from Regional base funds.

Washington Office Role: The assessment has suggested a particular need for additional qualified natural resources specialists, which currently comprise less than 20 percent of the total Servicewide natural resources work force, and less than two percent of the Service's total FTE's. The Washington Office will attempt to meet this need by seeking additional FTE's and through enhanced training efforts (see following section).

#### Training Action Program

All of the Service's natural resource personnel, both full-time and collateral duty, must be prepared through training to deal with the complex natural resources issues facing the parks today. The assessment indicates that the Service should expand the Servicewide natural resource training program so that it trains more individuals, more frequently, on a greater variety of natural resource issues.

Park Role: Parks currently support 30 percent of the Service's natural resources training program, providing in-park training for full-time and collateral duty natural resources staff and contributing to training costs for staff attending Regional or Servicewide training courses.

Regional Role: Regions currently support less than ten percent of the Service's natural resources training program. Several Regions reported in the assessment that they would expand their natural resources training programs. The goal will be to complement and fill gaps in the Servicewide training offerings, to provide some types of widely and/or frequently needed training that can most effectively be provided at the Regional level and to provide courses on special "localized" topics e.g., prairie restoration and coastal resources. In addition, Regional natural resources skills development programs are being started to provide direction to the Regional natural resources training program, and to increase knowledge of natural resources on the part of collateral duty personnel.

Washington Office Role: The objective of the Washington Office's Servicewide Training Program will be to provide additional qualified natural resources specialists for the parks, primarily through the Servicewide Natural Resources Specialist Trainee Program. A second objective will be to increase the overall number of natural resource training opportunities available so that both full-time and collateral duty personnel can expect to receive some level of training roughly every two to three years.

The Trainee Program should be increased to support a new 20-person class every 18 months rather than every 24. Over five years, this program will produce 60 qualified natural resources specialists. The Servicewide natural resources training program should be doubled to provide about 20 courses each year, training a total of approximately 500 individuals. In particular, Servicewide (and Regional) natural resources training programs will address the natural resource management issues identified in the assessment. These programs will include courses on basic vegetation and wildlife management, pest and exotic species management, air and water quality, water rights, inventory and monitoring, historic landscape restoration, grazing management, and natural resources protection and law.

