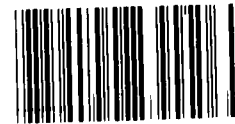


REPORT BY THE  
**Comptroller General**  
OF THE UNITED STATES

**National Park Service  
Needs A Maintenance  
Management System**

The Department of the Interior's National Park Service spends millions of dollars annually--about \$290 million in fiscal year 1983--to maintain billions of dollars worth of assets--roads, bridges, buildings, monuments, and other facilities--in the 334-unit National Park System. In 1982, the Park Service established a 5-year, \$1 billion park facility restoration and improvement program which is partially funded through the maintenance budget. However, the Service had not emphasized the need for a maintenance management system to plan, organize, direct, and review its maintenance activities and therefore could not assure that its assets received needed upkeep and that park maintenance activities were efficient.

GAO is recommending that the Service design, test, and implement a maintenance management system and provide appropriate policy, guidance, and personnel training.



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JUNE 1, 1984

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COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON D C 20548

B-209917

The Honorable Malcolm Wallop  
Chairman, Subcommittee on Public  
Lands and Reserved Water  
Committee on Energy and Natural  
Resources  
United States Senate

Dear Mr. Chairman:

As requested in your January 18, 1983, letter, this report discusses the potential for increased efficiency and effectiveness in maintaining the National Park System.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of the report until 10 days from the date of the report. At that time we will send copies to the Director, Office of Management and Budget; the Secretary of the Interior; the Director, National Park Service; and other interested parties.

Sincerely yours,

A handwritten signature in black ink that reads "Charles A. Bowsher".

Comptroller General  
of the United States



COMPTROLLER GENERAL'S  
REPORT TO THE CHAIRMAN  
SUBCOMMITTEE ON PUBLIC  
LANDS AND RESERVED WATER  
COMMITTEE ON ENERGY AND  
NATURAL RESOURCES  
UNITED STATES SENATE

NATIONAL PARK SERVICE NEEDS  
A MAINTENANCE MANAGEMENT SYSTEM

D I G E S T

The Department of the Interior's National Park Service manages the 334-unit National Park System which includes national parks, preserves, monuments, seashores, rivers, battlefields, and historic sites on over 79 million acres of developed and undeveloped land. The Service spends millions of dollars annually--about \$290 million in fiscal year 1983--to maintain facilities valued in billions of dollars, including buildings, roads, bridges, monuments, hiking trails, and utility systems.

GAO reported in 1980 that facilities in many park system units did not meet health and safety standards and that the Service had a construction backlog of health and safety deficiencies estimated at \$1.6 billion. As a result, Interior in fiscal year 1982 established a 5-year, \$1 billion Park Restoration and Improvement Program for park facilities. This program is partially funded--about \$70 million annually--through the maintenance budget. (See pp. 1 to 4.)

In 1983, GAO visited nine National Park System units, including urban and rural parks of different sizes, geographical locations, and types (i.e., national parks, historic sites, and a national seashore). GAO found that attention had not always been given to systematically maintaining facilities. Without proper maintenance, facilities may not operate properly and can deteriorate more rapidly, resulting in higher future costs for rehabilitation and reconstruction. The Service had not emphasized the need for a Service-wide maintenance management system, and therefore had not provided adequate maintenance policy, guidance, and training. (See pp. 4, 8, and 21.)

A Service-wide maintenance management system designed around the seven important elements shown in the table on page ii would help

insure that facilities receive proper maintenance and provide information necessary to determine appropriate maintenance funding levels. The Deputy Director, National Park Service, agreed that the Service needs to improve its maintenance management. (See pp. 10, 11, and 24.)

GAO made this review at the request of the Chairman, Subcommittee on Public Lands and Reserved Water, Senate Committee on Energy and Natural Resources. (See p. 1.)

IMPORTANT ELEMENTS OF A  
MAINTENANCE MANAGEMENT SYSTEM

GAO's research revealed that a maintenance management system generally includes seven important elements which are closely tied to the basic management principles of planning, organizing, directing, and reviewing. These elements are shown in the following table.

Maintenance management system elements	Description of elements
Workload inventory of assets	Detailed information that quantifies for all assets (buildings, roads, utility systems, grounds, etc.) that must be maintained, the characteristics affecting the type of maintenance work performed. For example, square feet of interior painted wall, feet of 12" storm drain, or miles of paved road.
Maintenance tasks	A set of tasks that describe the maintenance work in the park.
Work standards	Frequency of maintenance; measurable quality standard to which assets should be maintained; methods for accomplishing work; required labor, equipment, and material resources; and expected worker production for each maintenance task.
Work program and performance budget	Annual work plan identifying maintenance needs (calculated using inventory, tasks, and standards) and financial resources to be devoted to each maintenance task.
Work schedules	A plan which identifies and prioritizes tasks to be done in a specific time period (generally biweekly) and specifies required labor resources.
Work orders	Specific job authorization and record of work accomplished. They can be used to record actual labor and material costs.
Reports	Reports and special analyses which compare planned versus actual accomplishments and costs. They are used to evaluate maintenance operations.

A maintenance management system does not assure efficient and effective maintenance management. However, it establishes the framework for efficient and effective maintenance management given the resources--funding, personnel, and training--to properly implement it. (See pp. 9 to 11.)

ELEMENTS MISSING AT PARKS VISITED  
RESULTED IN MAINTENANCE MANAGEMENT  
PROBLEMS

Of the nine park units GAO visited, four had none of the important elements in place; two had only work scheduling; and one had work scheduling and workload inventories. As a result, park superintendents at these seven units were not

- determining funding needed to properly maintain park assets and requesting such funding during the budget process,
- properly accounting for maintenance resources, and
- assessing the efficiency and effectiveness of their maintenance activities.

At six of these seven park units, important maintenance tasks were not being accomplished. For example, according to a 1982 Federal Highway Administration survey, Mount Rainier National Park's 121 miles of roads had not been properly maintained which had reduced their normal 20-year life by 50 percent. At Gettysburg National Military Park, park records showed that most of the park's 1,300 memorials, monuments, and markers had received very little or no maintenance since they were established 60 to 80 years ago and that they were now reaching a point of serious deterioration.

Two of the nine park units--Harpers Ferry National Historical Park and Blue Ridge Parkway--had several of the important elements in place. GAO found the fewest maintenance problems at these units, although Harpers Ferry had assets not receiving needed maintenance. Further, neither Harpers Ferry nor Blue Ridge was linking maintenance funding requests to park maintenance needs. The

superintendents told GAO that using the elements that were in place had improved their maintenance operations.

Park superintendents at the other seven park units agreed that they did not have the necessary information on their maintenance operations and did not know if their maintenance activities were efficient and effective. The superintendents at Harpers Ferry and Blue Ridge had the necessary information but agreed that improvements were still needed to achieve efficient and effective maintenance. (See pp. 11 to 17.)

#### BENEFITS OF A MAINTENANCE MANAGEMENT SYSTEM

GAO visited three park organizations--Canada's national park agency and city park departments in Tampa, Florida, and Seattle, Washington--which had maintenance management systems. Before implementing their systems, these organizations had experienced maintenance management problems similar to those GAO found at the Park Service units it visited. All three reported increased productivity, reduced costs, or both, by improving their maintenance management. (See pp. 17 and 18.)

--Parks Canada is spending about \$3 million (Canadian) to develop and implement a maintenance management system for its 103 national and historical parks, sites, and canals. Positive results have already been reported at parks where the system has been implemented. For example, at Fortress of Louisbourg National Historic Park, Nova Scotia, about \$85,000 in recurring annual benefits were identified in the first year by (1) reducing labor hours through improved work methods and uniform application of standards and (2) improving controls over materials and utility costs. Parks Canada officials expect the system to provide a yearly payback in reduced costs or increased productivity of 10 to 15 percent of its maintenance budget, which in fiscal year 1983 was about \$43 million. (See pp. 18 to 20.)

--In 1981 the Tampa Parks Department developed and implemented a maintenance management system at a cost of about \$75,000. The department's director attributed a reduction



from 502 to 312 workers to the maintenance management system through better work methods, work scheduling, and specific performance standards and guidelines. The department also reported other benefits, including assurance that all assets were receiving needed maintenance. (See p. 20.)

--Starting in 1975, the Seattle Department of Parks and Recreation developed and implemented a maintenance management system. Through 1982 the department spent about \$880,000 to develop, implement, and operate the system. Although the department had not quantified the resulting savings, department officials reported that the system (1) helped assure that all assets were properly maintained, (2) improved accountability for maintenance resources, and (3) linked budget requests to asset maintenance. (See pp. 20 and 21.)

The Park Service estimated the cost of developing and implementing a system would be less than \$10 million. GAO believes that the cost of such a system could be justified by (1) the large annual Park Service maintenance budget, (2) the Service's current maintenance problems, and (3) the potential to recapture the development and implementation costs through reduced maintenance costs, increased productivity, and other benefits. Experts say that the initial development and training costs are usually recaptured during the first 18 months a system is in effect. The park organizations in Canada, Tampa, and Seattle experienced benefits from their maintenance management systems. Officials at the three organizations believed the benefits of their systems outweighed the costs. (See p. 24.)

#### SERVICE INITIATIVES TO IMPROVE MAINTENANCE MANAGEMENT

The Service has taken some initial steps toward improving maintenance management. Four Service-wide inspection programs--covering buildings; water supply and sewage systems; roads, bridges, and tunnels; and dams--were initiated between 1975 and 1982 to inventory, inspect, and report the condition of the various structures and systems. The Chief of the Service's Engineering and Safety Services Division told GAO that these inventory and inspection programs are essential to establishing a Service-wide maintenance management

system. The Service's Deputy Director said the Service was also considering a pilot test of a maintenance management system, although the scope of such a test had not been determined. (See pp. 23 and 24.)

Park managers at three of the parks GAO visited--Blue Ridge, Harpers Ferry, and North Cascades National Park--were proceeding on their own to establish maintenance management systems and were experiencing fewer maintenance management problems as a result. (See p. 23.)

#### RECOMMENDATIONS TO THE SECRETARY OF THE INTERIOR

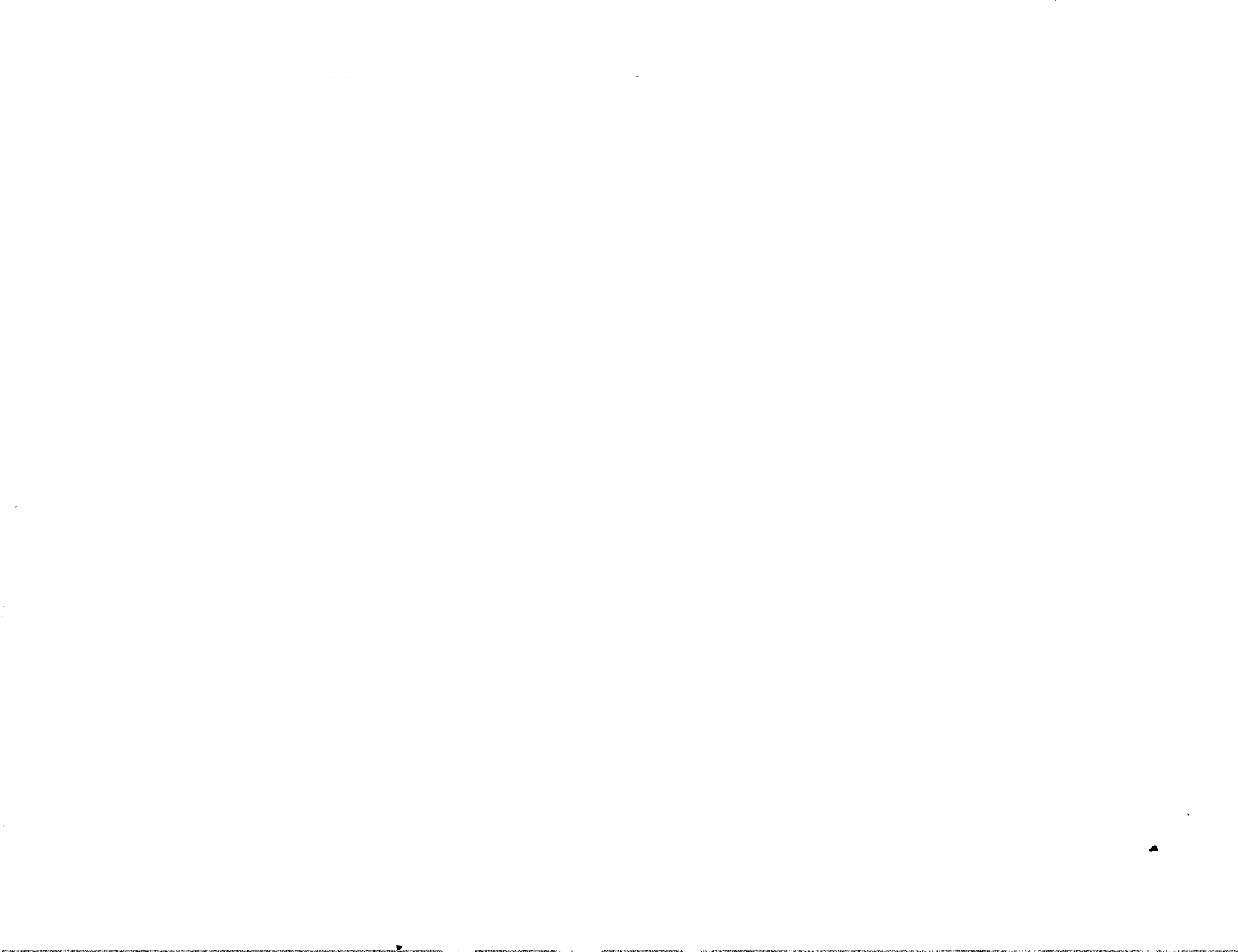
GAO recommends that the Secretary of the Interior direct the Director, National Park Service, to design, test, and implement a maintenance management system and provide appropriate policy, guidance, and personnel training. (See pp. 25 and 26.)

#### AGENCY COMMENTS

Interior said that it fully concurred that the Service needs a maintenance management system. It said that this report represents a valuable and helpful effort to identify weaknesses in the Service's maintenance process and provides sound and supportable recommendations. According to Interior, the Service has initiated or is planning actions to implement the recommendations. For example, the Service has initiated two pilot programs utilizing the expertise of two consulting firms considered experts in the field of maintenance management. In addition, Parks Canada has consulted extensively with the Service on the benefits, problems, and procedures pertaining to Parks Canada's maintenance management system. Also, during the week of February 6-10, 1984, representatives of Parks Canada participated in a training/workshop session held for key Service personnel from the Service's eastern regions. (See pp. 26 and 27.)

C o n t e n t s

	<u>Page</u>
DIGEST	i
CHAPTER	
1	INTRODUCTION 1
	Maintenance policies and procedures 1
	Funding for maintenance 2
	Objectives, scope, and methodology 4
2	THE SERVICE SHOULD IMPROVE ITS MANAGEMENT OF MAINTENANCE ACTIVITIES 8
	Elements of an effective maintenance management system 9
	Elements missing at parks visited resulted in maintenance management problems 11
	Park organizations benefit from maintenance management systems 17
	Service emphasis should be given to maintenance management 21
	Conclusions 24
	Recommendations to the Secretary of the Interior 25
	Agency comments and our evaluation 26
APPENDIX	
I	Examples of documents used in Parks Canada's maintenance management system 28
II	Letter dated March 2, 1984, from the Assistant Secretary for Fish and Wildlife and Parks, Department of the Interior 42
III	Letter dated February 28, 1984, from the Assistant Deputy Minister, Parks Canada 49
IV	Letter dated February 15, 1984, from the Director, City of Tampa Parks Department 51



## CHAPTER 1

### INTRODUCTION

The Department of the Interior's National Park Service is responsible for managing the 334-unit National Park System. The system includes national parks, preserves, monuments, seashores, rivers, battlefields, and historic sites on over 79 million acres of developed and undeveloped land.<sup>1</sup> Maintenance of these vast and unique properties is a complex process which cost about \$290 million in fiscal year 1983. The Service is responsible for maintaining about 7,700 miles of roads; 11,600 miles of trails; thousands of buildings; hundreds of monuments; and hundreds of water, wastewater, and electrical systems. Because of their historical significance, many of the structures require special maintenance techniques.

In three previous reports,<sup>2</sup> two requested by the Chairman, Subcommittee on Public Lands and Reserved Water, Senate Committee on Energy and Natural Resources, and one by the Ranking Minority Member, Senate Committee on Energy and Natural Resources, we discussed health and safety problems relating to park facilities and the Service's efforts to correct them. In our October 1980 report we stated that the Service had a construction backlog to correct health and safety deficiencies estimated at \$1.6 billion and that, as a result, Interior had established a 5-year, \$1 billion (including new construction) Park Restoration and Improvement Program to restore and rehabilitate park facilities. In December 1982 we reported that the Service was making progress in improving deficient facilities. This report, also at the Chairman's request, discusses our review of whether parks assure that their facilities and utility systems receive essential maintenance and that the maintenance is managed efficiently and effectively.

### MAINTENANCE POLICIES AND PROCEDURES

The objective of the Service's maintenance program, as stated in its annual budget justification, is:

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<sup>1</sup>In this report we often refer to the various units in the National Park System as parks.

<sup>2</sup>Facilities in Many National Parks and Forests Do Not Meet Health and Safety Standards (CED-80-115, Oct. 10, 1980).

The National Park Service Has Improved Facilities at 12 Park Service Areas (GAO/RCED-83-65, Dec. 17, 1982).

National Parks' Health and Safety Problems Given Priority; Cost Estimates and Safety Management Could Be Improved (GAO/RCED-83-59, Apr. 25, 1983).

"To conduct a professional program of preventative and rehabilitative maintenance, and to provide for a safe, sanitary, and aesthetically pleasing environment for park visitors and employees."

To achieve this objective, park superintendents and maintenance personnel manage their maintenance programs, with oversight and assistance provided by regional offices. The Engineering and Safety Services Division in Washington, D.C., is responsible for providing overall policy and program direction. The Division's Park Support Office, located in Denver, provides direct maintenance assistance to park superintendents and regions. However, most decisions of how, when, and what to maintain and how to manage maintenance are left to the park superintendents and maintenance personnel.

#### FUNDING FOR MAINTENANCE

The Service spends a large portion of its budget on maintenance. As shown in the following table, funding for park maintenance has been increasing and for fiscal year 1983 was 54 percent of the total funds allocated to manage park operations (excluding construction projects).

Funding for Maintenance  
(amounts in thousands)

Fiscal year	Park maintenance			Cultural resources management <sup>d</sup>	Total maintenance	Total park management	Maintenance as percent of total park management
	Operational <sup>a</sup>	Cyclic <sup>b</sup>	Repair and rehabilitation <sup>c</sup>				
1981	161,844	13,934	16,300	26,988	219,066	441,479	49.6
1982	152,887	33,800	23,757	30,164	240,608	469,809	51.2
1983	197,474	20,585	32,000	43,257	293,316	542,723	54.0
1984 est.	178,213	20,585	32,000	44,081	274,879	523,045	52.6
1985 est.	189,324	24,242	32,000	45,563	291,129	548,667	53.1

<sup>a</sup>Operational maintenance involves those routine activities necessary for the park's daily functions. Typical examples include janitorial and custodial services, trees and grounds maintenance, repair of buildings and equipment, and operation of water and wastewater treatment systems.

<sup>b</sup>Cyclic maintenance involves maintenance activities done on a fixed periodic basis when the work is predictable and the cycle is longer than once a year. Typical examples include road resealing, reroofing of buildings, and sign replacement and repair.

<sup>c</sup>Repair and rehabilitation projects are designed to correct health and safety deficiencies that do not require major rehabilitation or reconstruction. Typical examples include campground and trail rehabilitation, road overlay and/or reconditioning, sewer and waterline replacement, and rewiring of buildings.

<sup>d</sup>Cultural resources management includes a broad range of activities to inventory, evaluate, preserve, and maintain historic and prehistoric sites, structures, and collections.

The Service also spends millions of dollars each year to construct new or reconstruct existing facilities and utility systems. In fiscal year 1983, for example, the Service obligated about \$189 million for its construction program. According to the Chief, Engineering and Safety Services Division, much of the construction funding each year is for facilities that have deteriorated to the point where operational and cyclic maintenance are not cost effective.

In fiscal year 1982, the Secretary of the Interior initiated the Park Restoration and Improvement Program to restore and rehabilitate park facilities, to eliminate health and safety deficiencies, and to improve maintenance and preservation programs.

The Service plans to spend about \$1 billion for this program between fiscal years 1982 and 1986. Total maintenance funding as shown in the table on page 3 includes about \$70 million annually for fiscal years 1982 through 1985 for this program. The Service's construction budget also contains funding for this program.

At the park level, operational maintenance and some cultural resources management funds are spent at the superintendent's discretion. Cyclic and repair and rehabilitation projects are funded on a project-by-project basis and are usually administered by the regional offices. These projects may require technical design and specifications and are accomplished by park personnel or by contract. The remaining cultural resources management funds are administered by the regional offices or Service headquarters and fund the work of cultural specialists who are either Service employees or under contract.

In fiscal year 1983, about 4,800 full-time-equivalent staff positions,<sup>3</sup> or about 38 percent of all park positions, were dedicated to maintenance.

#### OBJECTIVES, SCOPE, AND METHODOLOGY

In response to the Chairman's request, we evaluated whether nine parks managed maintenance activities to assure that park facilities and utility systems received essential maintenance and that the maintenance was managed efficiently and effectively. We focused on regular maintenance activities, including operational and cyclic maintenance performed on real property such as roads, buildings, monuments, and hiking trails. (See footnotes a and b on p. 3 for examples of operational and cyclic maintenance activities). We did not evaluate how major rehabilitation and construction projects were managed. Further, we did not review maintenance of personal property items such as vehicles and equipment and we did not include water and wastewater treatment systems because those systems are regulated by state or federal agencies.

We selected the nine parks to (1) include both urban and rural parks of different sizes, (2) provide broad geographical coverage, and (3) include a variety of park types such as national parks, national recreation areas, historic sites, and national seashores. We coordinated our site selections with the Subcommittee's office and the Service's Engineering and Safety Services Division to assure that our selections represented the types and scope of maintenance activities found in the National Park System.

---

<sup>3</sup>Full-time equivalents are a way of expressing part-time and seasonal positions in "equivalent" units of full-time work. For example, a seasonal position for 50 percent of the year is represented by .5 FTE.



We made our review at Service headquarters in Washington, D.C., and the following regional offices and their respective parks.

<u>Regional office and park</u>	<u>Location</u>
National Capital Harpers Ferry National Historical Park	Washington, D.C. Maryland-W. Virginia
North Atlantic Gateway National Recreation Area	Boston, Mass. New York-New Jersey
Mid-Atlantic Gettysburg National Military Park	Philadelphia, Pa. Pennsylvania
Pacific Northwest North Cascades National Park Mount Rainier National Park	Seattle, Wash. Washington Washington
Southeast Blue Ridge Parkway Cumberland Island National Seashore	Atlanta, Ga. N. Carolina-Virginia Georgia
Western Grand Canyon National Park Yosemite National Park	San Francisco, Cal. Arizona California

To evaluate the adequacy of the parks' maintenance activities, we compared their activities with a maintenance management system containing the elements characteristic of a good system. (These elements are discussed on pp. 9 to 11.) To identify such elements, we contacted professional associations, including the National Recreation and Park Association; researched appropriate recreation and maintenance periodicals and publications; and interviewed recognized experts in the fields of maintenance and park management, including representatives of Roy Jorgensen Associates, Inc., an engineering and management consulting firm which had been involved with over 200 maintenance management systems in the United States and Canada. The maintenance management system against which we compared the parks' maintenance activities, although not the only system used to manage maintenance, contains these elements and represents a process that is closely tied to the basic principles of management and is widely accepted by professional associations. We judged a park as having an element in place if the element was used consistently in managing the park's maintenance activities.

To observe maintenance management systems in operation and determine their benefits, we visited three park organizations outside the National Park Service that had implemented systems and had reported measurable benefits. Those organizations and the locations we visited are as follows:

<u>Park organization</u>	<u>Location</u>
Parks Canada-Western Region Banff National Park	Calgary, Alberta Banff, Alberta
Parks Canada-Atlantic Region Fortress of Louisbourg National Historic Park	Halifax, Nova Scotia Louisbourg, Nova Scotia
Seattle Department of Parks and Recreation	Seattle, Washington
Tampa Parks Department	Tampa, Florida

At all parks visited, we obtained information on how maintenance work was planned, organized, directed, and reviewed. We reviewed pertinent records and documents; observed maintenance operations; and interviewed park superintendents, maintenance managers, supervisors, and selected maintenance foremen and workers. We documented how park personnel identified and assigned priorities for maintenance work, prepared work programs and budgets, scheduled and directed the work, and evaluated the efficiency and effectiveness of the maintenance activities. We did not review the quality of the maintenance or the way maintenance personnel were organized. At Parks Canada and the Seattle and Tampa parks departments, we could not verify the situation prior to their implementing maintenance management systems because documentation was not available. However, we corroborated the reported benefits at these park organizations by observing maintenance system operations, interviewing maintenance workers, and reviewing records and documents.

At the Service's regional offices, we discussed with regional maintenance personnel their oversight role in park maintenance activities. At Parks Canada's regional offices, we interviewed Parks Canada regional and headquarters personnel, including the project manager for the maintenance management system.

To identify the Service's policies and procedures on maintenance operations, we reviewed the Service's Management Policies Manual, guidelines, and directives and interviewed Service headquarters officials, including the Service's Deputy Director and the Chief, Engineering and Safety Services Division.

At the conclusion of our review, we sent copies of our draft report to the Department of the Interior for its comments. We also sent copies of sections of our draft report pertaining to Parks Canada and the Seattle and Tampa parks departments to those agencies to verify the accuracy of our comments concerning their maintenance management systems. Interior's, Parks Canada's, and Tampa's written comments appear as appendixes II, III, and IV, respectively, and their suggested changes have been incorporated in the report. The Seattle Department of Parks and Recreation informed us by telephone that it agreed with our draft.

We made our review in accordance with generally accepted government auditing standards during the period February 1983 through August 1983. Interior's Office of the Inspector General had not done any overall reviews of the Service's maintenance management activities nor did it have any ongoing or planned reviews.

## CHAPTER 2

### THE SERVICE SHOULD IMPROVE

#### ITS MANAGEMENT OF MAINTENANCE ACTIVITIES

The Service has billions of dollars worth of facilities requiring maintenance in its 334-unit park system. Without proper maintenance, park facilities do not operate properly and can deteriorate more rapidly, resulting in higher future costs for rehabilitation and reconstruction. Because the Service had not emphasized maintenance management, it had no systematic approach to planning, organizing, directing, and reviewing maintenance activities and, therefore, the Service did not know if proper maintenance was being done and whether the maintenance was done efficiently and effectively.

We reported in 1980 that facilities in many park units did not meet health and safety standards and that the Service had a construction backlog of health and safety deficiencies estimated at \$1.6 billion. The Service responded with a \$1 billion multi-year Park Restoration and Improvement Program. However, unless the Service improves its management of maintenance activities, newly restored facilities may be subjected to unnecessary deterioration.

At the nine parks we visited, we found that park managers had assets that were not receiving needed maintenance (seven parks), had not done preventative servicing and inspections (six parks), were not properly accounting for maintenance resources (seven parks), and were not systematically evaluating whether their maintenance programs were efficient and effective (seven parks). Further, none of the nine parks' managers were determining the funding they needed to properly maintain park assets. None of the nine parks we visited had maintenance systems containing all of the important elements (see p. 10) of an effective maintenance management system.

The experiences of other park organizations, including Parks Canada, indicate that implementing a maintenance management system can provide significant benefits, including cost savings through improving maintenance practices, greater assurance that assets are properly maintained, improved accountability for maintenance resources, and cost and workload information to assess program efficiency and effectiveness. The Service's lack of emphasis on maintenance management was the primary reason that a maintenance management system was not in place. The Service needs to establish a maintenance management system in its parks and provide appropriate policy, guidance, and training to assure the system's successful implementation.

ELEMENTS OF AN EFFECTIVE  
MAINTENANCE MANAGEMENT SYSTEM

Maintenance management systems are widely accepted as a tool to help managers achieve efficient and effective maintenance operations. A maintenance management system helps managers plan, organize, direct, and review maintenance work by providing them with information about their organization's maintenance needs, required resources, and costs.

Organizations in both the United States and Canada have recognized the importance of maintenance management systems. Among the organizations involved in developing or disseminating information on maintenance management systems and their benefits are the National Association of County Engineers, the American Association of State Highway and Transportation Officials, and the Federal Highway Administration. Numerous city, county, and state agencies have implemented such systems in their transportation, water, sewer, public works, and parks and recreation departments.

Maintenance management systems advocated by these organizations include elements similar to those listed in the following table. This maintenance management system is closely tied to the basic management principles of planning, organizing, directing, and reviewing.

Management principles	Maintenance management system elements	Description of elements
Planning and organizing	Workload inventory of assets	Detailed information that quantifies, for all assets (buildings, roads, utility systems, grounds, etc.) that must be maintained, the characteristics affecting the type of maintenance work performed. For example, square feet of interior painted wall, feet of 12" storm drain, or miles of paved road.
	Maintenance tasks	A set of tasks that describe the maintenance work in the park.
	Work standards	Frequency of maintenance; measurable quality standard to which assets should be maintained; methods for accomplishing work; required labor, equipment, and material resources; and expected worker production for each maintenance task.
	Work program and performance budget	Annual work plan identifying maintenance needs (calculated using inventory, tasks, and standards) and financial resources to be devoted to each maintenance task.
Directing	Work schedules	A plan which identifies and prioritizes tasks to be done in a specific time period (generally biweekly) and specifies required labor resources.
	Work orders	Specific job authorization and record of work accomplished. They can be used to record actual labor and material costs.
Reviewing	Reports	Reports and special analyses which compare planned versus actual accomplishments and costs. They are used to evaluate maintenance operations.

Workload inventories, maintenance tasks, and work standards can enable a manager to more effectively plan and organize a park's maintenance work. These elements together provide a manager with the information necessary to determine park maintenance needs and resources required to accomplish the work. Annual work programs and performance budgets identify planned maintenance

tasks and required labor and financial resources, linking a park's annual maintenance needs to the maintenance budget.

Managers use schedules and work orders to direct the work and provide information for the reporting and evaluation process. Maintenance work schedules are used to ensure that (1) the workload is spread evenly throughout the year, (2) seasonal work is undertaken at the appropriate time of the year, (3) maintenance jobs are accomplished in order of priority, and (4) equipment and supplies are available when needed. Work orders are used to authorize and control specific maintenance jobs and record the work accomplished. Work orders can also be used to record the actual labor and material costs. Reports or analyses are developed to show planned versus actual accomplishments, resource utilization, and costs for each maintenance function. This information provides park managers with a basis to objectively evaluate the maintenance operations' efficiency and effectiveness.

A maintenance management system does not assure efficient and effective maintenance management. However, it establishes the framework for efficient and effective maintenance management given the resources--funding, personnel, and training--to properly implement it. Likewise, the absence of a maintenance management system does not necessarily mean that maintenance will not be properly managed at every Service location.

For additional information and examples of the maintenance management system elements, see appendix I.

#### ELEMENTS MISSING AT PARKS VISITED RESULTED IN MAINTENANCE MANAGEMENT PROBLEMS

None of the nine parks we visited had in place all the important elements of an effective maintenance management system. Instead, managers at most of the parks relied primarily on the knowledge and experience of maintenance personnel to identify and accomplish necessary maintenance and did not have any way of evaluating the efficiency and effectiveness of maintenance activities. As a result, managers at these parks experienced maintenance management problems, including assets not maintained properly, funding requests not linked to maintenance needs, poor accountability for maintenance resources, and inadequate assurance of efficient and effective operations. Most park superintendents said that shortages of funds, inadequate data on costs, or insufficient expertise to develop a management system were the primary causes of these problems.

The following table shows which of the elements of an effective maintenance management system were in place at the nine parks we visited. The types of maintenance management problems we found at these parks attributable to the lack of important management elements are shown in the table on page 13. A discussion of the elements and the problems found when the elements were not in place follows the tables.

Elements of a Maintenance Management System  
In Place at Nine Parks

Management principle	System element	Blue Ridge Parkway	Cumberland Island	Gateway	Gettysburg	Grand Canyon	Harpers Ferry	Mount Rainier	North Cascades	Yosemite	Total	
											Yes	No
Planning and organizing	Workload inventories	x					x		x		3	6
	Maintenance tasks	x					x				2	7
	Work standards						x				1	8
	Work program and performance budget										0	9 <sup>a</sup>
Directing	Work schedules	x						x	x	x	4	5
	Work orders	x									1	8
Reviewing	Reports	x					x				2	7

<sup>a</sup>Although the nine parks had processes to plan maintenance work and develop budgets, these processes were not based on inventories of assets, maintenance tasks, and standard maintenance frequencies and costs.



Maintenance Management Problems In Nine Parks

Management principle	Maintenance problem	Blue Ridge Parkway	Cumberland Island	Gateway	Gettysburg	Grand Canyon	Harpers Ferry	Mount Rainier	North Cascades	Yosemite
Planning and organizing	Assets not receiving needed maintenance		x	x	x	x	x	x		x
	Preventative servicing and inspections not done		x	x	x	x		x		x
	Appropriate funding for maintenance not determined	x	x	x	x	x	x	x	x	x
Directing	Poor accountability for maintenance resources		x	x	x	x		x	x	x
Reviewing	No systematic evaluation to insure efficiency and effectiveness		x	x	x	x		x	x	x

## Planning and organizing maintenance work

Most of the nine parks did not have workload inventories, maintenance tasks, or standards. (See p. 12.) As a result, funding for maintenance was not linked to the maintenance needs of specific assets. Instead, maintenance personnel responded to breakdowns as they occurred, or they relied primarily on their knowledge and experience to identify maintenance tasks and determine the resources needed to get them done. Seven of the nine parks had assets that did not receive inspections, preventative servicing, or needed maintenance. These parks' managers were aware of these problems. For example,

--Mount Rainier National Park has 121 miles of roads to maintain. According to a 1982 Federal Highway Administration road survey, these roads had not been properly maintained, reducing their normal 20-year life to 10 years. The survey report attributed this neglect to the park's lack of a maintenance management system, inadequate funding, and a shortage of personnel.

--Gettysburg National Military Park has over 1,300 memorials, monuments, and markers. Park records showed that most of these structures had received very little or no maintenance since they were established 60 to 80 years ago and that they were reaching a point of serious deterioration. The maintenance supervisor and the cultural resource specialist at Gettysburg described the maintenance program as crisis- or breakdown-oriented, providing primarily emergency repairs.

Three of the nine parks--Blue Ridge, Harpers Ferry, and North Cascades--had one or more of the three planning and organizing elements--workload inventories, maintenance tasks, and work standards. The parks' managers told us that these elements improved their maintenance planning and budgeting process. For example, Harpers Ferry National Historical Park had developed workload inventories, tasks, and standards at the time of our visit. The park had done detailed analyses of maintenance tasks and expected results as part of its compliance with the Office of Management and Budget's Circular A-76.<sup>4</sup> The superintendent told us that during the analyses, he realized that the information could be used for managing maintenance. Because of the park's maintenance problems such as assets not receiving needed maintenance, he was still improving the park's maintenance management system. He said that maintenance planning had improved and that he had recently implemented an inspection and

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<sup>4</sup>The Office of Management and Budget's Circular A-76 requires federal agencies to review their operations and to contract activities and services to private industry when cost effective to do so. The Park Service has targeted maintenance as a primary area for review.

servicing program to better assure that assets receive needed maintenance. In addition, he had made other changes to improve maintenance practices. For example, he

- adjusted the frequency standards for residential trash collections;
- consolidated the number of trips made to obtain maintenance supplies; and
- required janitorial staff to clean artifacts on exhibit, which previously had not been identified as a maintenance task.

Most park superintendents said that shortages of money and personnel were the primary reasons certain maintenance was not accomplished. However, the nine park superintendents did not know how much money they needed for maintenance. They planned maintenance work based on the funding they expected to receive, which was usually similar to the amount they received the previous year. The parks did not systematically assess maintenance needs and costs using standards for maintenance frequency, methods, quality, and costs and, therefore, did not know how their actual funding compared with the funds they needed. Because this approach was used Service-wide, neither the Service nor the Congress knew the appropriate funding level for the Service's maintenance program and how that level compared with the actual funding level. For example, in fiscal year 1983, Yosemite National Park received about \$6.5 million for maintenance. The park had a planning process to identify facilities and systems needing maintenance and to allocate maintenance funds to those maintenance jobs. However, this maintenance process was not based on an inventory of park assets and documented maintenance needs using standards for maintenance frequency, methods, quality, and costs. The park's chief of maintenance said that he and his maintenance personnel tried to address the most important maintenance needs with the funding received each year but that they did not have a good assessment of either existing facility conditions or the resources needed to provide essential maintenance to park assets.

According to the Service's Deputy Director, the Service's Basic Operations Program is a recent attempt to systematically define park funding requirements. For maintenance, this program is supposed to identify the minimum funding needs for each of several cost centers, including picnic areas, public buildings, roads and bridges, and improved grounds. However, the Basic Operations Program does not directly link funding requests to the maintenance needs of park assets because it does not establish maintenance requirements for each type of asset using standards for maintenance frequency, methods, quality, and costs.

### Directing maintenance work

Seven of the nine parks had poor accountability for their maintenance resources--most maintenance tasks were done without orders or records authorizing the work, certifying completion, or identifying the incurred costs. As a result, we could not determine where maintenance funds were spent and what was accomplished. Further, these seven parks did not have any records of where maintenance personnel actually spent their time and most parks did not maintain historical records on the maintenance of park assets. However, these parks usually could account for maintenance resources devoted to cyclic maintenance projects and other funds allocated by their regional offices for specific projects.

Most park superintendents said that they did not have information on the cost of maintaining specific assets. For example, in fiscal year 1983, Grand Canyon National Park had a \$3.4-million maintenance budget, about \$650,000 of which was devoted to some of the park's 473 buildings. Park officials did not consistently document which buildings received maintenance or which maintenance tasks were done, and they did not determine or record how much labor was involved or how much the maintenance cost. The park superintendent said that he could not determine, except for large maintenance jobs, if only priority work was being accomplished, if important inspections and servicing work had actually been done, or if maintenance personnel were being kept productive.

One park, Blue Ridge Parkway, developed a maintenance scheduling system in 1980 with the help of a consultant. This computerized system was used to set priorities, order and schedule maintenance tasks, and track work completed and labor hours used. The Parkway's chief of maintenance told us that the system, although not a complete maintenance management system, was an important part of his management oversight to assure that maintenance tasks were not forgotten and that priority work was done before other work.

### Reviewing maintenance work

Seven of the nine parks did not have enough information to objectively evaluate their maintenance operations. Park managers' evaluations were limited primarily to observing completed maintenance tasks and were focused on the quality of the work done. The parks' managers were not assessing the overall efficiency and effectiveness of their parks' maintenance operations. For example, in fiscal year 1983, Gateway National Recreation Area received about \$4.7 million for maintenance. Although that was about 51 percent of the park's total budget, there was no record that the maintenance program had been objectively evaluated. The park's assistant superintendent for the Breezy Point/Jamaica Bay area told us that although he believed the potential existed to improve his maintenance program, without good cost and workload information he could not identify where the improvements

could be made. He added that the park did not have the resources to develop this information.

Two parks, Blue Ridge Parkway and Harpers Ferry, had developed cost and workload information on several of their maintenance activities. Although these parks' managers had not reported complete information about maintenance activities, they had used the information to make improvements in some areas. For example, the superintendent at Blue Ridge Parkway said that Parkway officials had improved the efficiency of roadside mowing by standardizing mowing frequency and work methods. The officials also had identified inefficient storage and handling practices for supplies and materials. Harpers Ferry officials had reduced maintenance costs by adjusting the frequency of trash collections in residential areas; assigning a janitor, instead of a skilled electrician, to change lightbulbs; and contracting out rock deliveries instead of having park personnel haul the rocks to the park.

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Seven of nine park superintendents agreed with our assessment that they did not have the necessary information for managing their maintenance activities. They agreed that improvements could be made if maintenance standards, costs, and workload information were available. They said that although a maintenance management system would have helped them manage maintenance, they had not had the resources or the expertise to develop such systems. The superintendents at the other two parks--Harpers Ferry and Blue Ridge--had the necessary maintenance information but agreed that improvements were still needed to achieve efficient and effective maintenance management.

PARK ORGANIZATIONS BENEFIT FROM  
MAINTENANCE MANAGEMENT SYSTEMS

A maintenance management system provides park managers with the tools to achieve maintenance program objectives in an efficient and effective manner. Specifically, a system helps managers define and prioritize maintenance needs, properly allocate resources, identify and control the impact of budget changes on maintenance operations, and hold maintenance personnel accountable for program results through objective evaluations.

We could not quantify the potential benefits from implementing an adequate maintenance management system at the nine Park Service units we visited because none had such a system and most did not have adequate workload and cost data. Accordingly, to observe maintenance management systems in operation and document the benefits that could be achieved, we visited three park organizations--Parks Canada, the Tampa Parks Department, and the Seattle Department of Parks and Recreation--that had implemented such systems and had reported substantial benefits. Before implementing their systems, these organizations had experienced maintenance management problems similar to those we found at the

Park Service units we visited. After they implemented maintenance management systems, the organizations reported significant improvements in their maintenance operations.

### Parks Canada

Parks Canada (the Canadian counterpart of the National Park Service) is spending about \$3 million<sup>5</sup> to design, test, and implement a maintenance management system which contains the important elements of an effective system. Canada's 103 national and historic parks, sites, and canals cover 50,000 square miles and contain about 4,000 buildings, 625 utility systems, 300 bridges, and 3,000 kilometers of roads. In fiscal year 1983,<sup>6</sup> the parks had maintenance budgets totaling about \$43 million. Similar to the U.S. park system, Parks Canada has great variety in its parks, from large natural environments to small historic sites.

Parks Canada officials at the headquarters, regional, and park levels told us that they expect that the maintenance management system will improve efficiency and effectiveness at every location. They expect that, when fully implemented, the system will provide a yearly payback in reduced costs or increased productivity of 10 to 15 percent of the maintenance budget. (In fiscal year 1983, this would have amounted to about \$4 million to \$6 million.) They also said that the system will substantially improve accountability for maintenance by (1) requiring that all maintenance work be authorized using work orders, (2) establishing records of labor hours for each maintenance task, (3) providing comparisons of actual accomplishments and established standards, and (4) providing regional personnel with information to assist them in their evaluations of park maintenance operations.

Parks Canada's project manager for the maintenance management system told us that successfully implementing a maintenance management system requires two primary ingredients--strong support from top agency management and comprehensive training for all involved personnel, from superintendents to maintenance workers. He said that Parks Canada's top managers strongly endorsed the system and required that it be used for all park maintenance operations. He added that when the system is implemented in a park, a consultant and regional office personnel stay onsite for up to several weeks to conduct training, get the system working, and resolve any problems as they arise.

To observe the system in operation, we visited two parks--Fortress of Louisbourg National Historic Park, Nova Scotia, and Banff National Park, Alberta. Our visits were helpful to our

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<sup>5</sup>All references to costs or savings by Parks Canada are expressed in Canadian dollars.

<sup>6</sup>For Parks Canada, the fiscal year is April 1 to March 31.

understanding of the maintenance management system. By meeting with regional office and park officials and observing the system at the two parks, we gained considerable insight into how the system works and how it can be used to improve maintenance operations. Parks Canada officials have expressed a willingness to demonstrate their system to Park Service officials.

The Fortress of Louisbourg National Historic Park, situated on 14,720 acres, contains the ruins and partial reproduction of an 18th century French fortress and naval base. Maintenance personnel are responsible for maintaining roads, utility systems, grounds, and 153 buildings, 78 of which, according to Parks Canada, are reproductions of historic structures. For fiscal year 1983, the maintenance budget was about \$1.3 million.

For fiscal year 1982, the first year of operating under the maintenance management system, Fortress officials reported \$85,000 in recurring annual benefits. The vehicle shop saved \$19,000 by reallocating one staff-year to a maintenance shop in need of additional staff. Managers discovered the extra staff-year because the system showed that, using existing maintenance standards, there was insufficient work to keep the shop personnel busy. The utility shop reported \$15,500 in recurring annual benefits because the overall cost for replacement parts was reduced when assets were serviced according to the maintenance standards instead of waiting for breakdowns to occur. Other reported savings resulted from preventative maintenance inspections and servicing which reduced funds spent on asset repairs, scheduled monitoring of energy use to minimize wasted energy, and overall better management of maintenance operations.

In addition to reporting specific dollar savings, Fortress managers reported other benefits from the maintenance management system, including (1) assurance that workers completed both desirable and unpleasant jobs, (2) increasingly cost-conscious supervisors who worked to decrease costs while keeping quality high, and (3) improved information to document workers' accomplishments and evaluate their performance.

Banff National Park, Canada's first national park, is located in the Canadian Rocky Mountains. In addition to preserving the wilderness and scenic beauty of this 1.6-million-acre park, park personnel are responsible for maintaining 500 buildings, 18 campgrounds, and 22 water and sewer systems. The fiscal year 1983 maintenance budget was about \$4.9 million.

Banff began implementing the maintenance management system in 1982. Although the system was not fully implemented and officials had not quantified savings achieved, they had reported specific benefits, including (1) better control over supplies, resulting in a significant reduction in losses, (2) the ability to identify whether all assets are receiving needed maintenance, (3) the ability to identify inefficient scheduling and work methods and take corrective action, and (4) better information for developing, analyzing, and defending budget requests. For

example, officials determined that the cost of renovating a house was much too high, according to the general works manager. He said that the system provided detailed information which helped managers to identify the reasons for the high costs and take steps to reduce the cost of future renovations. In addition, the utility supervisor said that the system provided specific cost and workload data which helped him support his budget request by showing that his area was understaffed in relation to the workload.

Appendix I contains additional information on Parks Canada's maintenance management system.

#### Tampa Parks Department

The Tampa Parks Department maintains 100 park and recreation areas and facilities totaling more than 1,500 acres. The fiscal year 1983 maintenance budget was about \$6.7 million. In 1981 the department spent \$75,000 to develop and implement a maintenance management system with the help of a consultant. The system has the important management elements discussed in this report. The department's management analyst said that the department developed a maintenance management system because of increasing budget constraints and the resulting need to establish better control over maintenance costs.

Prior to the maintenance management system, the department was given additional maintenance responsibilities which, along with regular park maintenance, had taken 502 workers to accomplish. According to the department's director, with the maintenance management system in operation, 312 workers were able to do all the work through better work methods, work scheduling, and specific performance standards and guidelines. Further, the department reported about \$27,000 in recurring annual benefits the first year due to improved methods to control unwanted vegetation in downtown areas.

The department's management analyst cited other benefits from the maintenance management system, including (1) increased cooperation among field supervisors in planning work, using equipment, and ordering supplies, (2) the ability to identify and respond to the impact of budget changes on maintenance operations, (3) better accountability for maintenance resources, (4) a corresponding reduction in the loss of supplies and wasted labor, and (5) assurance that all assets were receiving needed maintenance.

#### Seattle Department of Parks and Recreation

The Seattle Department of Parks and Recreation maintains over 5,000 acres of parks; playfields; and facilities, including pools, community centers, and museums. In 1983 the maintenance budget was about \$14 million. A 1975 audit of the grounds maintenance division by city council auditors revealed that



although the parks' overall conditions were good, specific maintenance management problems existed, including (1) the inability to track accomplishments or maintenance costs by activity, (2) the inability to substantiate and defend budget requests, (3) too much reliance on field personnel to identify, plan, prioritize, and evaluate maintenance activities, and (4) inconsistent quality of maintenance among specific parks or geographic areas. The auditors recommended that the department develop and implement a maintenance management system for the grounds maintenance division.

Between 1975 and 1982 the department spent about \$880,000 in consulting fees, personnel, and computer costs to develop, implement, and operate a maintenance management system having the important management elements discussed in this report. Department officials reported that their system helped assure that all assets were properly maintained. In addition, they said that the system provided information to help identify maintenance activities that took too long due to park design problems. Using this information, some parks were redesigned to reduce maintenance costs. Officials cited other benefits including (1) better accountability for maintenance resources, (2) better support for budget requests because the budget is directly linked to asset maintenance needs, and (3) the ability to evaluate maintenance operations and minimize geographical differences in the quality of maintenance.

#### SERVICE EMPHASIS SHOULD BE GIVEN TO MAINTENANCE MANAGEMENT

The Service has billions of dollars in assets that must be maintained properly to prevent or minimize deterioration. The Service has emphasized and the Congress has supported funding for maintenance through the \$1 billion (including new construction) multiyear Park Restoration and Improvement Program to restore and rehabilitate park facilities and systems that have deteriorated or that do not meet health and safety standards. However, the Service had not emphasized the need for a good maintenance management system to protect the public's investment and effectively and efficiently maintain park assets. The Service had not provided park personnel adequate maintenance policy, guidance, and training to assure that parks had effective maintenance programs.

Recent steps to develop Service-wide inventories of park assets, efforts by some parks to establish their own maintenance management systems, and a proposed pilot test of a maintenance management system show that the Service has begun to recognize and address its maintenance management problems. However, we believe that to efficiently and effectively manage its maintenance activities, the Service needs a management system. We believe that the cost to develop and implement such a system, although not yet determined, could be justified by the potential benefits.

## Need for adequate maintenance policy, guidance, and training

The Service had not emphasized maintenance management. Although the Service had provided some maintenance policy and guidance to parks in the past, at the time of our review the Service was not providing maintenance policy or guidance to maintenance managers, except for limited guidance on trails and historic structures. Also, the Service had no formal training curriculum for maintenance managers. Training is an important part of developing and implementing an effective maintenance management system.

The policy and guidance provided by the Service varied widely in the past. In the mid-1960's, the Service used maintenance manuals that outlined park policies and procedures for all maintenance activities. In 1969 the Service adopted activity standards that described the conditions that would exist if the jobs were done satisfactorily but left the specific work methods to the park personnel's discretion. The activity standards were rescinded in 1980 in favor of other management processes, including a management-by-objective process under which managers set their own objectives and then worked to achieve them. None of the Service's past approaches incorporated all elements of the maintenance management system discussed in this report.

The Chief of the Service's Engineering and Safety Services Division attributed the general lack of emphasis on maintenance management to (1) the Service's emphasis in the 1960's and 1970's on land acquisition and construction of new facilities rather than on maintenance and repairs, (2) the Service's highly decentralized organization which allows superintendents a great deal of autonomy, and (3) the abolishment in the mid-1960's of a headquarters maintenance division as part of an effort to relocate maintenance specialists to the field. He told us that reestablishing a headquarters maintenance organization--the Engineering and Safety Services Division--and upgrading its role in 1980 showed that the Service recognized the need for improved guidance and direction over maintenance operations. He said that his objective was to develop a more coordinated and systematic approach to maintenance in the parks. He agreed that Service policy and guidance on maintenance were needed but said that it should be developed in conjunction with a Service-wide maintenance management system.

Another reason for the Service's maintenance management problems was the lack of a formal training curriculum for maintenance managers. Although maintenance personnel had available to them Service, Office of Personnel Management, and nongovernment training courses, the maintenance managers at the nine parks we visited said that they had not received training to help them manage maintenance activities and improve the efficiency and effectiveness of their operations. The Chief of the Service's Training Division confirmed that management training was not routinely provided to maintenance managers nor was it part of a

formalized curriculum. He said that his office had also identified the need for a training curriculum for maintenance managers but that he needed a clear policy statement explaining the purpose, objectives, and mission of maintenance and how it relates to the overall Service mission before he could develop such a training curriculum.

We believe that training of maintenance personnel is an important part of effectively developing and implementing a maintenance management system. Confusion and resistance to the new system can occur if maintenance managers and workers do not fully understand the system and the new methods and procedures for doing the work. Officials at the three park organizations we visited reported that training helped the maintenance personnel understand and accept the systems and their individual roles and responsibilities.

#### Efforts within the Service to improve maintenance management

The Service, recognizing its maintenance management problem, has taken some initial steps toward improving maintenance management. Service-wide inspection programs, efforts by individual park managers, and a proposed pilot maintenance management system all address parts of the problem.

The Service, between 1975 and 1982, initiated four Service-wide inspection programs--the road, bridge, and tunnel program; the comprehensive building inspection program; the safety, maintenance, and operations of dams program; and the environmental health inspection program covering water supply and sewage systems.<sup>7</sup> These programs are to inventory, inspect, and report the condition of the various park structures and systems. The Chief, Engineering and Safety Services Division, told us that these inventory and inspection programs are essential to a maintenance management system because they document the number and condition of many of the Service's assets. He said that the Service had not done this before. Preliminary results from the inspections indicate that park facilities and systems may be deteriorating at an accelerated rate. The Chief attributed this problem primarily to the lack of a systematic approach to maintenance management.

Officials at three of the parks we visited had established or were planning to establish maintenance management systems on their own. Blue Ridge and Harpers Ferry had most of the seven system elements in place, and North Cascades was proceeding with system development based on information we provided during our review. These three parks had fewer maintenance management problems than the other six parks we visited.

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<sup>7</sup>In our April 1983 report, we said that these four programs had not been completed and that the Service had taken or initiated actions to improve these programs.

When our fieldwork was completed in August 1983, the Service was considering a pilot test of a maintenance management system. According to the Deputy Director, the Service was concerned that facilities newly restored by the Park Restoration and Improvement Program could deteriorate rapidly unless improvements were made in the Service's ability to manage maintenance. She said that the Service wanted to avoid any future need for a high cost restoration and improvement program by improving the way in which parks manage their maintenance programs. As of August 1983, the scope of the pilot test had not been determined.

#### Cost of a maintenance management system

We do not know how much it would cost to develop, test, and implement a maintenance management system in the Service. However, Parks Canada provided us with some of its cost data relating to the establishment of its maintenance management system. According to Parks Canada officials, Parks Canada is receiving \$1.6 million over a 5-year period in addition to its regular maintenance budget to establish its maintenance management system. When the system is fully implemented, Parks Canada expects a yearly benefit in reduced costs or increased productivity of 10 to 15 percent of the maintenance budget. For fiscal year 1983, that would have amounted to savings or benefits of about \$4 million to \$6 million.

Because the cost of developing and implementing a maintenance management system depends on several factors, including the number of parks, the nature of their facilities, and the number of personnel involved, it was not possible for us to develop an estimate of what a Park Service system would cost without doing a preliminary cost study. This would have been outside the scope of our review. However, the Chief of the Service's Engineering and Safety Services Division told us that based on his experience and what it cost Parks Canada, he would estimate that the cost would not be more than \$10 million.

We believe that the cost of such a system could be justified by (1) the large annual Park Service maintenance budget, (2) the Service's current maintenance problems, and (3) the potential to recapture the development and implementation costs through reduced maintenance costs, increased productivity, and other nonmeasurable benefits. Experts in the field say that the initial development and training costs are usually recaptured during the first 18 months a system is in effect. The three park organizations we visited had experienced similar benefits from their systems. Officials at the three organizations believed the benefits outweighed the costs.

#### CONCLUSIONS

The Service has billions of dollars in assets that should be properly maintained. The Service has not had a systematic Service-wide approach to maintaining its assets and does not know if proper maintenance has been done and whether maintenance has

been done efficiently. Recent inspections indicate that park facilities may be deteriorating at an accelerated rate. Further, the Service is now in a \$1 billion multiyear Park Restoration and Improvement Program to restore and rehabilitate park facilities. Unless the Service improves its management of maintenance activities, newly restored facilities and systems also may be subjected to accelerated deterioration.

The Service needs a more effective way to plan, organize, direct, and review maintenance work. Maintenance management systems have been proven effective in numerous organizations, including Parks Canada. Before implementing its system, Parks Canada experienced maintenance problems similar to those we found at the Park Service. Parks Canada officials have expressed a willingness to show Park Service officials how their system works.

The Service's lack of emphasis on maintenance management was the primary reason that a maintenance management system was not in place. The Service needs to establish policy and guidance for park managers and maintenance personnel specifying the systems and processes that should be in place to efficiently and effectively plan, organize, direct, and review maintenance operations. Further, the Service needs to develop a training curriculum for maintenance personnel to assure that managerial skills are developed and improved.

The Service, recognizing its maintenance management problem, has taken some initial steps toward improving maintenance management. Service-wide inspection programs, a proposed pilot maintenance management system, and efforts by individual park managers all address parts of the maintenance management problem. However, a Service-wide maintenance management system is needed. The cost of developing and implementing such a system, although not known at this time, could be offset through reduced maintenance costs, increased productivity, and other nonmeasurable benefits.

#### RECOMMENDATIONS TO THE SECRETARY OF THE INTERIOR

We recommend that the Secretary of the Interior direct the National Park Service Director to take the following actions:

- Develop overall Service policy on the purpose, goals, and objectives of park maintenance programs.
- Design, test, and implement in the National Park System a maintenance management system which includes the key management elements discussed in this report. To help in designing a system, Service officials may want to obtain information from organizations, such as Parks Canada, which have maintenance management systems in operation.

- Develop Service guidelines on the system and processes needed to properly manage maintenance in the parks.
- Develop a training program which focuses on planning, organizing, directing, and reviewing activities associated with a maintenance management system and assure that maintenance managers and other appropriate park and regional personnel receive the training.

#### AGENCY COMMENTS AND OUR EVALUATION

Interior said that it fully concurred that a maintenance management system is needed for the Service. (See app. II.) It said that our report represents a valuable and helpful effort to identify weaknesses in the Service's maintenance process and presents sound and supportable recommendations. According to Interior, the Service has already initiated actions to develop and implement a maintenance management system.

On the first recommendation, Interior said that draft Service-wide policy and objectives had been developed which, although not yet incorporated and distributed through a maintenance management guideline, would form the basis for further Service-wide development, implementation, and training.

On the second recommendation, Interior said the Service was developing and testing a Service-wide maintenance management system through two pilot test contracts. One of the tests is to take place in a large rural, natural setting, national park; the other in a large urban parkway. Interior said that Parks Canada has consulted extensively with the Service on the benefits, problems, and procedures pertaining to Parks Canada's maintenance management system. Interior also said that the Service had initiated training/workshop sessions. The first session, conducted in February 1984, for key personnel from its eastern regions, included representatives from Parks Canada. Interior said that from the test contracts and as a result of the training/workshops, a Service-wide system would be implemented in a phased program using the expertise of private sector consultants and the Service's Engineering and Safety Services Division personnel.

Agreeing with the Engineering and Safety Services Division Chief's estimated implementation cost of less than \$10 million, Interior added that no specific funds or staff had been budgeted as will be required during the implementation period. It said that additional staffing was being considered for the Engineering and Safety Services Division to assist in the administration, implementation, and Service-wide training necessary to effectively put a maintenance management system in place. According to Interior, the funding and staffing that is obtained will be highly cost effective. It said that short-term paybacks are likely in the form of more efficient and effective use of personnel and other resources.

On our third recommendation, Interior said that the Service had begun the process of developing guidelines pertaining to managing an efficient maintenance program in the parks. It said that guidelines would incorporate the elements of a maintenance management system, including all the elements described in our report. Interior added that the guidelines would not be finalized until preliminary results of the two pilot tests are available.

On our last recommendation, Interior said that the Service had recently been evaluating its maintenance training requirements. Interior said that major issues centered around adequate funding, the proper allocation of available funding, appropriate types and mixture of types of training, and appropriate locations and training sources. It added that training to implement the basic system, follow-up training, and training for park and region headquarters managers are envisioned.

We believe that the actions the Service has initiated or plans to initiate should help provide (1) the type of maintenance management system needed to ensure that facilities receive proper maintenance and (2) the information necessary to determine appropriate maintenance management.

EXAMPLES OF DOCUMENTS USED  
IN PARKS CANADA'S MAINTENANCE  
MANAGEMENT SYSTEM

Parks Canada developed a maintenance management system for its 103 national and historic parks, sites, and canals because of maintenance problems similar to the problems that exist in the National Park Service. These problems included (1) inconsistent frequency and quality of maintenance, (2) poor justifications for budget requests, (3) inadequate records of maintenance costs, and (4) a lack of assurance that maintenance programs were efficient and effective.

The system Parks Canada developed contains the seven important elements we identified for an effective maintenance management system, including workload inventories of assets, maintenance tasks, work standards, work programs and performance budgets, work schedules, work orders, and reports of planned versus actual accomplishments and costs. These elements enable Parks Canada's superintendents and maintenance managers to identify the parks' maintenance needs, properly allocate resources, authorize and control specific maintenance jobs, and track both production and costs.

The following documents are examples of those Parks Canada uses to support its maintenance management system. We have added a brief description to indicate how each document is used.



ASSET INVENTORY SYSTEM  
BUILDING RECORD

2  
82 12 11

Description	Qty	Description	Qty	Heating - Air Conditioning				Constr Type WOOD FRAME				AZA 13 9140 1/10/03			
Water Closet	1	Detector (fire)	2	code	Description	Fuel	Rating	Qty	Foundation CONCRETE FOOTING		C R P				
Urinal		Alarm		A	AIRCO	2	10000 BTU	1	Floor Area 137.86		Storey 2		Name - Location KLUANE P.P		
Bath Tub	1	Extinguisher	3				2.6 AMPS		Type	Water	Sewage	Elect	Phase SUMMER		
Shower	1	Hose Cabinet					115 VOLT		Nil			V 120 / 240	HOUSE # HD4		
Lavatory	1	Sprinkler					60 CYCLES		Own			A 100	HAINES JUNCTION, YUKON		
Sink-Kitchen	1	Emerg Light							Util			V G	CH X		
Sink-Slop	1			H/W Tank Size	Fuel		Rating	Qty	non pres			Circuits 14	Yr Const MET A 17 Rem 20 YEAR		
FRIDGE	1			40 GALLONS	1	UPPER 2000 WATT		1	Roof Area	Material		code	Orig	50,000	
STOVE	1			JOHN WOOD	1	LOWER 3000 WATT			110.53			A	Adit		
						120 VOLT			2.92	BACKDOOR		A	Rep	161,000	

No.	Description	Area	Walls			Ceilings			Floors			Windows			Shut	Doors	Lighting						
			Loc	Mat	Fin	Area	Mat	Fin	Area	Mat	Fin	Area	Type	Qty				Lites	Glass Area	Type	Qty	Type	Qty
1	BASEMENT (CONCRETE) (OPEN STUD) (GYPROC) (WOOD)	55.81	1	C	1	42.67	D	1	51.65	C	2	55.8	C	3	1	0.32					2	1	3
2	BEDROOM MASTER	17.19	1	G	4	37.56	H	4	17.19	C	2	17.19	C	1	1	0.32		A	1	2	2	1	
3	LANDING	1.88	1	G	2	27.31	G	2	3.90	J	4	1.80	B	1	4	0.15		A	1	2	1	1	
4	KITCHEN (HARDBOARD F.F.) (WALL PAPER)	12.62	1	G	2	7.73	G	2	13.58	J	4	12.62	B	2	2	0.36		A	1	2	2	1	
5	LIVING ROOM	20.61	1	G	2	45.38	G	2	20.61	I	4	20.61	B	3	4	0.23		A	1				
6	PORCH (GYPROC)	3.33	1	G	2	16.95	G	2	3.33	I	4	3.33						A	1	2	1	1	
7	CLOSET (GYPROC)	0.66	1	G	2	7.94	G	2	0.66	J	4	0.66						A	1	2	1	1	
8	HALLWAY	2.07	1	G	2	14.11	G	2	2.07	I	4	2.07						A	2	2	1	1	
9	BEDROOM # 1 (GYPROC) (WALL PAPER)	12.02	1	G	2	31.50	G	2	12.02	I	4	12.02	B	2	4	0.21		A	2	2	1	1	
			1	L	4	9.11																	

ROOFING MATERIAL	AIR CONDITIONING	MATERIALS	FINISHES	DOOR	SHUTTERS	Disposal
Asphalt shingles A	Central 1	Brick	Natural, unfinished 1	Wood A	Window, permanent 1	Notes <u>THIS HOUSE HAS STORM WINDOWS</u>
Built-up B	Room/Window unit 2	Stone	Paint, varnish 2	Metal B	seasonal 2	
Wood, shingle C	Other 0	Concrete	Stain, oil 3	Overhead C	Door, permanent 3	
Wood, shake D	FUELS	Wood	Factory finish 4	Glass D	seasonal 4	
Metal E	Electricity 1	Plaster	Other 0	Screen E	Other 0	
Other Z	Oil 2	Ceramic, terazzo	WINDOWS	Other Z		
HEATING	Natural gas 3	Hardboard	Case ment A	LIGHTING		
Central, hot air B	Propane 4	Acoustic	Double hung B	Fluorescent 1		
Central, hot water C	Wood 5	Carpet, fabric	Pivoted C	Incandescent 2		
Central, steam D	Coal 6	Vinyl, plastic	Fixed D	Mercury 3		
Room, stove/oven E	Solar 7	Metal	Other 0	Other 0		
Room, fireplace F	Other 0	Wallpaper				
Room, portable G	WALL, FLOOR, CEILING	Other Z				
Room unit H	LOCATION Outside 0					
Room, baseboard I	Inside 1					
Other Z						

GAO NOTE: Building records are part of a park's workload inventory which is used to provide detailed information on each park asset that must be maintained.

PARKS CANADA  
MAINTENANCE INVENTORY SUMMARY

ASSET		INTERIOR SURFACES			EXTERIOR WALLS			
No.	Description	Square meters painted surfaces	Square meters non-painted surfaces	Total square meters	Square meters painted metal surfaces	Square meters other painted surfaces	Square meters non-painted surfaces	Total square surfaces
140007	Eastgate House	250	105	355	-	-	100	100
140008	Recreation Centre	350	40	390	-	150	-	150
140071	Exhibit Building	140	50	190	-	10	105	115
	<b>Total</b>	740	195	935	-	160	205	365

GAO NOTE: Maintenance inventory summaries summarize specific information on the assets so that maintenance managers can identify the total amounts of similar types of maintenance to be done.

PARKS CANADA  
MAINTENANCE TASK LIST

CODE	DESCRIPTION	INVENTORY UNIT	WORK UNIT
	<b>ROADS - BITUMINOUS SURFACES</b>		
100	SPOT PATCHING - the repair of small areas of road surface, parking lots, etc., using premixed asphaltic materials. Includes patching of potholes, depressions, bumps, pavement edge defects, etc.	Lane kilometers of paved surface	Cubic meters of asphalt
102	JOINT AND CRACK FILLING - the preparation and sealing of cracks and joints in paved surfaces.	Lane kilometers of paved surface	Liters of sealant
	<b>GROUNDS</b>		
200	MOWING TURF AREAS - the mowing of grass areas in townsites, campgrounds, entrances, and nursery. Includes raking, disposal of cuttings, etc.	Square meters turf areas	Square meters turf areas
206	CEMETARY MAINTENANCE - all work associated with the maintenance of cemeteries including the digging and backfilling of graves, etc.	square meters	person hours
	<b>TRAILS</b>		
251	ROUTINE TRAIL MAINTENANCE - the routine maintenance of trails including the cutting of brush, repair of bridges, removal of deadfall, cleaning up around camping sites and wardens' cabins, moving of privies, etc.	Kilometers of trail	Kilometers of trail
	<b>BUILDING/STRUCTURES</b>		
500	INSPECTION - the routine inspection of such building items as interior painting, exterior painting, foundations, interior walls, exterior walls, roofs, floors, ceilings, windows, doors, and building signs.	Square meters gross floor (exterior)	Square meters gross floor (exterior)
501	INTERIOR PAINTING - the routine staining or painting of such items as walls, ceilings, floors, trim, window and door frames, doors, cupboards, vanities, and stairs. Includes the initial preparation prior to painting.	Square meters painted	Square meters final coat
	<b>ADMINISTRATION</b>		
900	SUPERVISION - all time spent by supervisors and foremen in supervisory and administrative duties. Includes inspecting and estimating projects, etc.	No. supervisors No. foremen	person hours

GAO NOTE: A maintenance task is an identifiable maintenance operation performed on an asset. Maintenance tasks are mutually exclusive and together describe all the maintenance work in a park.

**LEVEL OF MAINTENANCE**  
*for*  
**BUILDING STRUCTURES**

TASKS INCLUDED:  
500,501,502,503,504,505,  
506,507,508,509,510,511

**OBJECTIVE**

The major objectives for BUILDING STRUCTURES are:

- \* To preserve the capital investment in the structure.
- \* To provide an aesthetically pleasing appearance to building structures.
- \* To eliminate hazards to users of the building.

**QUALITY STANDARD**

The level-of-maintenance for BUILDING STRUCTURES shall be in accordance with the following:

**INSPECTION**

- \* Routine inspections shall be carried out to identify structural deficiencies and initiate corrective action.

**PAINTING**

- \* Building components listed below shall be free of unsightly stains, peeled or blistered paint.

**FOUNDATIONS**

- \* Foundations shall:
  - provide safe transfer of building loads to the sub-soil.
  - have no settlement that damages the building structure or foundation.
  - be in durable condition, free from cracked, spalled or otherwise unsound materials.
  - be waterproof as required to provide dry basements and crawl spaces.
  - have subsurface drainage tile operating in accordance with design requirements.
  - have finished grades sloping away from foundation walls.
  - have runoff from downspouts diverted away from foundation walls.
  - have runoff from roofs and adjacent paved areas controlled to meet design or other requirements.

GAO NOTE: Work standards describe the quality to which assets should be maintained.

## MAINTENANCE CATEGORIES

### BUILDINGS

#### CATEGORY

- 1 PUBLIC USE
  - Information
  - Entrance
  - Interpretive/Theatre (indoor/outdoor)
  - Museum/Exhibit
  - Swimming Pool
  - Recreation (shelter, golf course, beach)
  - Kitchen Shelter
  - Toilet (modern/chemical/dry)
  - Wash (bathhouse/laundry)
  - Hostel
  - Hut
  - Grounds (woodbins, etc.)
- 2 ADMINISTRATION
  - Office
  - Trailer (office)
  - Community Hall
- 3 RESIDENTIAL
  - Staff Housing
  - Trailer (residential)
  - Bunkhouse
  - Dormitory
  - Duplex
  - Single/Multiple Family
- 4 INDUSTRIAL/UTILITY
  - Equipment/Material (storage/repair)
  - Trade Office/Shop
  - Works Compound (garage, stores, shops)
  - Flora Nursery
  - Powerhouse/Transformer Station
  - Heating Plant
  - Water Supply
  - Waste Disposal
  - Incinerator

GAO NOTE: Maintenance categories help to establish maintenance priorities and levels of maintenance.

**LEVEL OF MAINTENANCE  
for**

INTERIOR PAINTING

TASK	501
------	-----

**QUANTITY STANDARD**

CATEGORIES	STANDARD
1 Public Use	every 2 years for swimming pool building; every 4 years other
2 Administration	every 4 years
3 Residential	every 4 years
4 Indust/Util.	every 6 years
5 Special Use	every 5 years; except never for barns
6 Other	every 8 years

**DETAIL**

Above frequencies apply to:

- walls
- ceilings
- floors
- trim
- windows
- doors
- cupboards/vanities
- piping

GAO NOTE: Quantity standards identify how often a maintenance task should be done for assets in each maintenance category.

**METHOD STANDARD**

TASK	501
METHOD	1

TASK	TASK DESCRIPTION
501	INTERIOR PAINTING - the routine staining or painting of such items as walls, ceilings, floors, trim, window and door frames, doors, cupboards, vanities, and stairs. Includes initial preparation. For campground kitchens see "Exterior Painting".

METHOD	METHOD DESCRIPTION
1	Brush and roller; spot prime and two coats

CREW SIZE	EQUIPMENT	ACCOMPLISH
1 - Lead Hand Painter 1 - Helper 2	ladder/scaffold brushes, rollers drop sheets paint, solvent 1-Van	40 m <sup>2</sup> painted (area of final coat only)
		PRODUCTIVITY
		0.4 (1 square meter painted in .4 person hours)

**RECOMMENDED PROCEDURE**

Note: minor wall, floor and ceiling repairs done prior to painting.

1. Mix paint.
2. Wash walls, kitchen cupboards, etc.; dry.
3. Cover furniture.
4. Spot prime.
5. Apply one coat of primer.
6. Apply one coat high quality enamel or latex (ceilings).
7. Clean up work site; arrange furniture, etc.
8. Clean up brushes, rollers, trays, etc.

**GAO NOTE:** Method standards identify the resources required and the recommended procedure for accomplishing the maintenance task.

PARKS  
CANADA

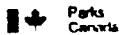
MAINTENANCE WORK PROGRAM AND PERFORMANCE BUDGET WORKSHEET			
FISCAL YEAR 1983-1984	PARK Fortress of Louisbourg	RESPONSIBILITY 225	DATE March 3, 1983
		COMPILED BY	PAGE 35

FUNCTION	CAT.	INVENTORY		LEVEL MAINT.	WORK PROGRAM		ACCOMP. RATE	CREW DAYS	CREW SIZE	STAFF DAYS	RESOURCES				TOTAL COST	
		QTY	MEASURE		QTY	MEASURE					LABOR	EQUIP	MATERIAL	OTHER		
BUILDING STRUCTURES																
500 INSPECTION		9,435	square meters gross floor	times per year 2	10,690	square meters	1,000	16.7	1	16.7	\$1,530	\$ 970			\$2,500	
501 INTERIOR PAINTING	2	23630	square meters	0.25	5,907	square meters	40	148	2	296	\$21,608	\$7,690	\$7,400		\$36,698	
FUNCTION TOTAL																

GAO NOTE: The work program defines the annual maintenance workload of the park. The performance budget is developed by applying unit resource costs to the work program.



BI-WEEKLY SCHEDULE



TRADE Roads PERIOD FROM June 15 to June 28 SUPERVISOR/FOREMAN R.J. Scott

WORK DESCRIPTION AND LOCATION	CREW SIZE	EST. CREW DAYS	EST. PERS. DAYS	CREW LEADER AND PERSON DAY ASSIGNMENTS													
				MON	TUES	WED	THUR	FRI	SAT	SUN	MON	TUES	WED	THUR	FRI	SAT	SUN
901 LEAVE	-	-	15	2	2	2	2	2				1	1	1	1	1	
100 Patching - linlock, #6	6-7	6	38		6	6	7	7					6	6			
105 Grading	1	3	3	1	1	1											
107 Dust Control - <sup>Red</sup> Road	3	1	3									3					
141 Sign Mutec	2	3	6	2								2			2		
426 Water - Reservoir Repair	3	2	6											3	3		
602 Gravel Stockpile	2-5	-	14	2									2	2	5	3	
603 Firewood	2-3	2	5	2								3					
121 Culvert Cleaning	2																
120 Ditch Cleaning	6																
901 leave - Trains - Film			1/2														
TOTAL PERSON DAYS			90	9	9	9	9	9				9	9	9	9	9	

MMS-SCH 1

GAO NOTE: Biweekly work schedules are used to identify and prioritize the maintenance tasks to be done and specify the labor resources required during the period.

NO. 74131		AS - 2		NO. 100	
Location Inform. Center		Task 507		FIELD STANDARD NO.	
EQUIPMENT COMPLETION 80/7/1		FINANCIAL CODE		STANDING WORK ORDER YLS (NO)	
WORK ORDER DESCRIPTION: Repair leak in roof.					

COST ESTIMATE				SPECIAL NOTES	
LABOUR	HOURS	RATE			
Carpenter	4	9.20	36.80		
laborer	4	6.00	24.00		
EQUIPMENT	HOURS	RATE			
pickup	4	3.10	12.40		
MATERIAL	UNIT	COST/UNIT			
wooden shakes	4		10.00		
			83.20	Authorized by _____ Date _____	
				Checked by _____ Date _____	

GAO NOTE: Work orders authorize all maintenance tasks, including routine and emergency repairs.

TASK NO.	DISCRIPTION	WORK ORDER REPORT CARD														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
32	ARMIST Patching															
	Smith	8	4					6								18
	Halmer	8	4					6								18
	Luker	8	4					6								18
	Grant	8	4					6								18
32	TOTAL		16					24								72
4855	TOTAL	8	4					6								18
8	TOTAL		4					6								18
4	TOTAL		2					3								9
M3	DIFFERENCE															

GAO NOTE: Work order report cards are used to report all work accomplished for a maintenance task and the actual labor, equipment, and materials used. Although the form provides space for the recording of material costs, in most cases Parks Canada is using requisition forms, which are part of its finance system, to capture material costs.



**PREVENTIVE MAINTENANCE ORDER CARD**

LOCATION/EQUIPMENT Waterton Lakes Compound Chlorinator Building Golf Course Treatment Facility Overflow Campground Treatment Facility Townsite Chlorinator Building	PL-111 CARD NUMBER PLUMBER <input checked="" type="checkbox"/> TRADE Annual FREQUENCY 45 WEEK														
FUNCTION/COMPONENT 425 Water Supply System - 6. Mechanical Treatment.															
TASK DESCRIPTION  1. Clean deposits from orifices, valves and strainers. 2. Clean other parts 3. Check safety equipment. 4. Replace fatigued flexible metal connections. 5. Replace worn feeder parts. 6. Inspect and repair water injector. 7. Check supply of essential replacement parts.															
CONTINUED OVER <input type="checkbox"/>															
MANUFACTURER'S SPEC REF.															
SPECIAL TOOLS & EQUIPMENT															
SPECIAL MATERIAL															
TEST SHEETS/RECORDS REQUIRED															
ACTION REQUIRED REPAIR <input type="checkbox"/> DATA UPDATE <input type="checkbox"/>	16.0      14.4 - 17.6 PLANNED HOURS      RANGE      ACTUAL HOURS														
TASK DONE	<table border="1" style="width:100%; text-align: center;"> <tr> <td>Mon.</td><td>Tues.</td><td>Wed.</td><td>Thur.</td><td>Fr.</td><td>Sat.</td><td>Sun.</td> </tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table>	Mon.	Tues.	Wed.	Thur.	Fr.	Sat.	Sun.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mon.	Tues.	Wed.	Thur.	Fr.	Sat.	Sun.									
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>									
EQUIPMENT HOURS NO.	<table border="1" style="width:100%; text-align: center;"> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>									
ACTUAL HOURS	<table border="1" style="width:100%; text-align: center;"> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>									
DONE BY	_____														
DATE ISSUED	DATE COMPLETED														
		FOREMAN	SUPERVISOR												

GAO NOTE: Preventive maintenance order cards authorize preventive inspections and servicing of assets.

**MAINTENANCE PERFORMANCE REPORT**

PARK WATERTON LAKES NATIONAL PARK CUMULATIVE FROM APRIL 1, 1980 TO MARCH 31, 1981 PAGE 1 OF 8

FUNCTION		WORK PROGRAM				LABOUR ANALYSIS						MATERIAL COST		
CODE	DESCRIPTION	MEASURE	PLANNED FOR YEAR	ACHIEVED YTD	%	PLANNED FOR YEAR	HOURS USED YTD	%	PRODUCTIVITY		% BY FUNC	PLAN \$	YTD \$	%
									PLAN	ACT.				
100	ASPHALT PATCHING	m <sup>3</sup> asphalt	485	165	34	5,480	1501	27	11.3	9.09	1.95	14,150	10,310	72.8
101	LONG PATCHING	m <sup>3</sup> asphalt	121	205	170	304	251	83	2.6	1.22	.30	4,380	19,709	449%
102	JOINT AND CRACK FILLING	litres seal	3,231	-	-	440	-	-	0.14	-	-	390	-	-
103	SEAL COATING	m <sup>2</sup> sealed	118,944	16,209	13	1,584	192	12	.013	.0118	.25	15,020	7,519	50%
105	BLADING	pass km	216	47	21	48	41	85	0.21	.07	.05	-	-	-
106	GRAVEL PATCHING	m <sup>3</sup> gravel	986	458	46	680	536	79	0.69	1.17	70	450	-	-
107	DUST CONTROL	m <sup>2</sup> treated	77,012	-	-	120	-	-	.002	-	-	1,000	-	-
109	REGRAVELLING	m <sup>2</sup> regrav	31,588	-	-	112	368	328	.003	-	.45	90	-	-
109	GRAVEL SHOULDER MAINTENANCE	km shoulder	-	-	-	-	24	-	-	-	.05	-	-	-
						8,768	2,913					35,480	37,598	105.9%
110	BASE AND SUBGRADE REPAIR	m <sup>2</sup> repaired	165	77	47	352	151	43	2.12	.02	.20	80	-	-
111	STREET CLEANING	km cleaned	48	48	100	48	155	322	1.0	3.23	.20	-	-	-
112	FLUSHING	km flushed	-	-	-	-	-	-	1.0	-	-	-	-	-
113	ROAD CLEANING	person hrs	-	32	-	-	32	-	-	1	.05	-	-	-
114	PAVEMENT MARKINGS	km line	147	32	21	64	24	37.5	0.43	.75	.05	10,430	3,373	32.3
115	SPECIAL MARKINGS	person hrs	80	83	104	80	83	103	-	1	.10	410	361	88
						544	455					10,920	27,347	24.9%
120	DITCH CLEANING	m cleaned	1,800	-	-	144	40	27	.018	-	.05	-	-	-
121	CULVERT CLEANING	# culverts	43	43	100	96	119	123	2.3	2.77	.15	-	16	-
122	CULVERT REPAIR/REPLACEMENT	# culverts	1.3	2	153	22	149	206	56	14.5	.20	260	-	-
						312	308					260	16	06%
						9,624	3,676					46,660	41,348	88.6%

GAO NOTE: Maintenance performance reports are used to analyze the work planned for the year with work actually accomplished.



## United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

MAR 2 1984

Mr. J. Dexter Peach  
Director  
Resources, Community and  
Economic Development Division  
U.S. General Accounting Office  
Washington, D.C. 20549

Dear Mr. Peach:

We have reviewed the draft audit report, "The National Park Service Needs a Maintenance Management System" and its findings and recommendations. Our comments on the specific recommendations are enclosed.

We fully concur with the General Accounting Office (GAO) that a maintenance management system is needed for the National Park Service (NPS). We would like to point out, however, that a formal system is currently being developed within the National Park Service and that efforts have been underway for some time to implement such a system.

Two pilot programs have been initiated utilizing the expertise of two consulting firms considered experts in the field of Maintenance Management. In addition, Parks Canada has consulted extensively with NPS on the benefits, problems and procedures pertaining to their parks maintenance management system. During the week of February 6-10, 1984, representatives of Parks Canada participated in a training/workshop session held for key NPS personnel from the Service's eastern regions.

Through this interaction with Parks Canada both governments have gained useful knowledge. NPS has gained a better understanding of the procedures and elements to insure a workable maintenance management system and Parks Canada was provided with useful information about the NPS inventory/evaluation procedures used for Service buildings, roads, employee quarters, and water systems.

[GAO COMMENT: Although some Service personnel have been promoting the maintenance management system concept for some time, actual measurable progress toward system implementation did not begin until the latter part of calendar year 1983 at which time the pilot test programs were initiated, as was coordination with Parks Canada. These are positive steps, as are the other steps being taken by the Service to develop and implement the maintenance management system. See pp. 26 and 27 for our evaluation of Interior's specific comments.]

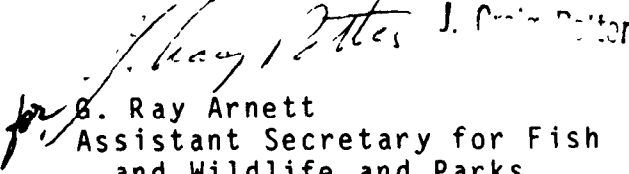
Additional meetings and training sessions are planned utilizing Parks Canada resources to further refine and implement a maintenance management system for NPS.

In addition to our specific comments regarding the GAO recommendations (see enclosures), we would like to clarify the following point in the draft report.

Reference is made on page 2 of the report that park Superintendents and maintenance personnel manage their maintenance programs, with oversight and assistance provided by regional offices and the Service's Denver Service Center. Although the Denver Service Center (DSC) is footnoted in the report to clarify that DSC provides technical design, engineering, and project support for park construction activities, we feel reference to DSC in this context of managing maintenance activities is inappropriate. Denver Service Center's primary functions are not related to preventive maintenance or to Maintenance Management. Primary assistance to park Superintendents and regions for maintenance, is handled by the Washington Office, Engineering and Safety Services Division, Park Support Office which is located in Denver at the Denver Service Center.

[GAO COMMENT: We have revised p. 2 to reflect this comment.]

Sincerely,

  
G. Ray Arnett  
Assistant Secretary for Fish  
and Wildlife and Parks

Enclosures

Department of the Interior Responses to  
General Accounting Office Recommendations  
To Draft Report, "The National Park Service Needs a  
Maintenance Management System"

GAO Recommendation

--Develop overall Service policy on the purpose, goals, and objectives of park maintenance programs.

DOI Response

As stated in the GAO Report the Service has been exploring the development and implementation of a Maintenance Management System for some time. As a result, the following draft Servicewide policy and objectives have been developed and, although not yet incorporated and distributed through a Maintenance Management Guideline, it will form the basis for further Servicewide development, implementation and training.

National Park Service  
MAINTENANCE ACTIVITIES  
Policy Statement

There is a maintenance responsibility for every asset that is owned by the National Park Service. The costs of operation and the useful life of the facilities and equipment are directly related to the type and level of maintenance provided. Therefore, it is the policy of the National Park Service to conduct a professional program of preventative and rehabilitative maintenance and preservation to protect the physical integrity of facilities so as to provide a safe, sanitary, and aesthetically pleasing environment for park visitors and employees in an efficient, economical manner and to preserve or maintain facilities in their as-constructed (or reconstructed) condition to the greatest extent possible.

This is to be achieved by applying the concepts and philosophies of the National Park Service Maintenance Management System throughout all units of the Service.

The basic premise for the NPS Maintenance Management System is that a park's maintenance workload is:

- definable in terms of distinct functions;
- performed on a quantifiable set of facilities;
- amenable to standardization in terms of Service frequencies and production rates;
- quantifiable in work terms; financial terms and in terms of physical resources inputs;
- scheduled;
- controllable both in work as well as financial terms.



The primary objectives of the NPS Maintenance Management System are:

- a) To preserve through cost effective means the investment made in roads, bridges, buildings, utilities and other facilities or appurtenances of the National Park Service.
- b) To provide adequate levels of safety, comfort and convenience for visitors and employees consistently and uniformly throughout the National Park Service.
- c) To ensure economy and efficiency in the expenditures of resources.

[GAO COMMENT: See agency comments and our evaluation on p. 26.]

### GAO Recommendation

--Design, test, and implement in the National Park System a maintenance management system which includes the key management elements discussed in this report. To help in designing a system, Service officials may want to obtain information from organizations, such as Parks Canada, which have maintenance management systems in operation.

### DOI Response

The National Park Service currently has well underway the development and testing of a Servicewide Maintenance Management System. Two contracts have been awarded for the purpose of testing a system in a large rural, natural setting, national park; the other in a large urban parkway. Further, the first of two scheduled training/workshop sessions has been conducted to inform and instruct key park personnel from NPS eastern regions. The program conducted February 6-10, 1984 included on the program, representatives from Parks Canada, for the purpose of explaining their system and outlining their procedures, experiences and problems associated with the implementation of a maintenance management system. The response from park Superintendents and park Chiefs of Maintenance, was enthusiastically accepted. This was due to informed instructors and especially to the participation, endorsement and representation from Parks Canada.

The second training/workshop is scheduled March 19-23, 1984.

The two pilot contracts concentrate on developing a programmatic Maintenance Management System which includes the key elements as discussed by the report. The systems include the following elements and specific functions which are associated with each element:

## MAINTENANCE MANAGEMENT

## PLANNING

1. Define significant work activities
2. Inventory features to be maintained
3. Establish service levels - (cost effective levels)
4. Develop annual work programs
5. Develop performance standards
6. Prepare annual maintenance budget

## ORGANIZING

1. Level workload over the year
2. Evaluate in-house /vs/ contract
3. Develop an annual work calendar
4. Determine resource needs by type and category

## DIRECTING

1. Select activities from work program
2. Determine specific locations
3. Assign crews and equipment
4. Be prepared to perform emergency work

## CONTROLLING

1. Determine work accomplished
2. Determine resources used
3. Determine costs
4. Compare - actual /vs/ planned
5. Analyze differences
6. Take corrective actions or adjust plan
7. Replan and work calendar - as necessary

From these pilot contracts and as a result of the training/workshops, a Servicewide system will be implemented in a phased program utilizing the expertise of private sector consultants and NPS Engineering and Safety Services Division personnel.

As stated in the GAO Report, estimates for the costs of implementing should be less than \$10 million. To date no specific funds or staff have been budgeted as will be required during the implementation period. Additional staffing is being considered for the division to assist in the administration, implementation and Servicewide training necessary to effectively implant a Maintenance Management System. Funding and staffing obtained for this development and implementation period will be highly cost effective. Short term paybacks are likely in the form of more efficient and effective utilization of FTE's and resources.

[GAO COMMENT: See agency comments and our evaluation on p. 26.]

GAO Recommendations

--Develop Service guidelines on the system and processes needed to properly manage maintenance in the parks.

DOI Response

The National Park Service has begun the process of developing guidelines pertaining to managing an efficient maintenance program in the parks. The guidelines will incorporate the concepts of a maintenance management system including all elements as described in the report. Finalization of the guidelines will not occur until preliminary results of the 2 pilot studies being conducted at the present time are available. The results of these pilots will be utilized in preparing the guidelines to: (1) insure applicability to NPS; (2) correct scheduling of sequences; and (3) to provide in-house documentation of a maintenance management system's results.

The guidelines, when completed, will include the following at the minimum:

1. State commitment of Management to the system.
2. Define maintenance activities and establish work units appropriate to measure quantities of work for each activity.
3. Define the process to inventory those facility features which influence the quantities required of various maintenance activities.
4. Define the process to develop performance standards for each activity, defining proper crew size, equipment, materials and expected average daily accomplishment.
5. Provide guidance to establish average annual quantity planning values for each activity which reflect a desired level of service.
6. Define procedures for work reporting and performance evaluation.
7. Implement a work reporting and evaluation system.
8. Define the process to develop a maintenance work program (by activity) for each field operations area or unit on the basis of the facility inventory, quantity planning values and performance standards.
9. Define procedures for review, evaluation and approval of budgets.
10. Define techniques and procedures for work authorization and scheduling.

[GAO COMMENT: See agency comments and our evaluation on p. 27.]

GAO Recommendation

- Develop a training program which focuses on planning, organizing, directing, and reviewing activities associated with a maintenance management system and assure that maintenance managers and other appropriate park and regional personnel receive the training.

DOI Response

The National Park Service has recently been evaluating their maintenance training requirements. Major issues center around adequate funding and the proper allocation of available funding; appropriate types and mixture of types of training (i.e., skills training vs management and supervisory training); and appropriate locations (i.e., park, region) and training sources.

The Service's two concerns in FY 84 for Maintenance Management deal with the Maintenance Management System concept and basic implementation procedures. Follow-up courses are being planned to carry this concept into the actual management of a Maintenance Management System. The primary source of Maintenance Management System training of park personnel will occur as each park Maintenance Management System is developed. Follow-on training will, of course, be planned for new employees and as refresher training. A primary training request now anticipated as a result of information obtained from Parks Canada is that for park and region headquarters managers to obtain an understanding and assure a commitment to the system.

These needs are anticipated and the Service plans to develop and provide training opportunities concurrent with system implementations.

[GAO COMMENT: See agency comments and our evaluation on p. 27.]

Summary

In summary, it is believed that this GAO report represents a valuable and helpful effort to identify weaknesses in the NPS maintenance process and has provided sound and supportable recommendations. Discussions between GAO staff and NPS officials have helped to evaluate existing Maintenance Management System successes, especially that of Parks Canada. This process has therefore already been of immense help in focusing the Service options and priorities with regard to efficient and rapid development of an NPS Maintenance Management System.

*Mary Lou Grier*



Assistant Deputy Minister  
Parks Canada

Sous-ministre adjoint  
Parcs Canada

Ottawa, Ontario  
K1A 1G2

FEB 28 1984

Mr. J. Dexter Peach  
Director  
Resources, Community  
and Economic Development  
United States General Accounting Office  
Washington, D.C.  
20548

Dear Mr. Peach:

Thank you for the opportunity of commenting on the portion of your draft report "The National Parks Service Needs a Maintenance Management System" which deals with Parks Canada's Maintenance Management System (MMS).

In general, I feel that the comments made by your study team accurately reflect the situation relating to our MMS. There are however three minor points which you may wish to consider.

1. Page 18 - The cost cited for implementation of MMS - \$1.6 million - includes only goods and services such as consultants and in-house travel and printing. Salaries at the Headquarters and Regional levels will amount to approximately \$1 million. No estimate has been made of the salary costs at the park level as MMS is considered to be an integral part of the ongoing management and additional costs will vary widely from location to location. The above figures also do not include the cost of implementing our Asset Inventory and Evaluation Systems. The total cost of these systems is approximately \$500 thousand for goods and services and salaries, however, only one half of these expenditures can be said to relate directly to support of MMS.

[GAO COMMENT: On the basis of the above comment and a telephone discussion with Parks Canada, we have changed the cost estimate on p. 18 of Parks Canada's implementation of its maintenance management system from about \$1.6 million to \$3 million.]

2. Page 19 - Fortress of Louisbourg National Historic Park

.1 There are actually 78 reproductions of historic buildings together with 75 contemporary buildings in the park.

../2

.2 The 1983/84 fiscal year budget was \$1.3 million.

[GAO COMMENT: We have made changes to p. 19 to reflect comments 2.1 and 2.2.]

3. Appendix I - Work Order Report Card

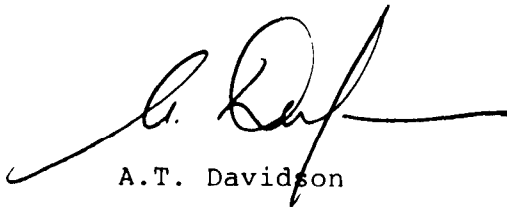
Although the form provides space for the recording of material costs, in most cases we are using requisition forms which are part of our finance system to capture material costs. This is done to reduce the paper burden and to ensure consistency between the two systems.

[GAO COMMENT: We have clarified Parks Canada's use of this form on p. 39.)

We found the process of reviewing our MMS with your staff extremely valuable, particularly as providing some of the requested information has enabled us to strengthen our system. I would appreciate obtaining a copy of the final report when it is available.

If you require any further information regarding our system please feel free to contact R.H. Smillie, Director of Engineering and Architecture or B.F. Dewis, Project Manager, MMS at 613-997-0507.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'A.T. Davidson', with a long horizontal flourish extending to the right.

A.T. Davidson

[GAO NOTE: Page references in this letter have been changed to correspond to page numbers in the final report.]

# CITY OF TAMPA

Bob Martinez, Mayor

OFFICE of DIRECTOR of PARKS

Ross J Ferlita, Director

February 15, 1984

J. Dexter Peach, Director  
U. S. General Accounting Office  
441 G St., N.W. Room 4073C  
Washington, D. C. 20548

Dear Mr. Peach:

This letter is in response to the proposed report to the Chairman, Subcommittee on Public Lands and Reserved Water, Senate Committee on Energy and Natural Resources, entitled "The National Park Service Needs a Maintenance Management System."

I should like to suggest the replacement of paragraph #2 to read as follows:

"Prior to the management system, the department was given additional maintenance responsibilities which, along with regular park maintenance, had taken 502 workers to accomplish. With the Maintenance Management System in operation, 312 workers were able to do all the work through better work methods, work scheduling, and specific performance standards and guidelines. Further, the department reported about \$27,000 in recurring annual benefits the first year due to improved methods to control unwanted vegetation in downtown areas."

[GAO COMMENT: We have revised the paragraph on p. 20 to incorporate the City of Tampa Parks Department's comments.]

Should you have any questions or comments, please feel free to call on me.

Sincerely,

*Ross J. Ferlita*  
Ross J. Ferlita, Director  
City of Tampa Parks Department

RJF/db

Attachment

Lowry Park • 7525 North Boulevard • Tampa, Florida 33604 • 813/935-3121

[GAO NOTE: The attachment to this letter which contained the section of our draft report sent to the Tampa Parks Department for comment is not reproduced in this report.]

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