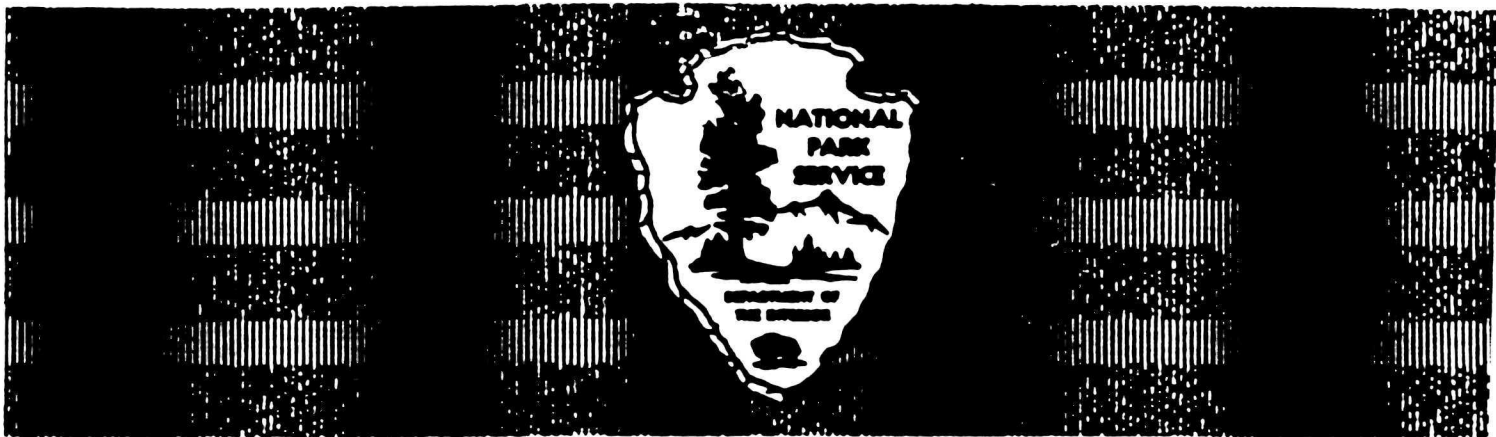


**NATIONAL
PARK
SERVICE**



**NATURAL
RESOURCES
INVENTORY
AND
MONITORING
INITIATIVE**

May, 1987

NATIONAL PARK SERVICE

NATURAL RESOURCES INVENTORY AND MONITORING INITIATIVE

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POLICY

Basic Statement

It is the policy of the National Park Service to assemble baseline inventory data describing the natural resources under its stewardship, and to monitor those resources forever - to detect or predict changes that may require intervention, and to provide reference points to which comparisons with other, more altered parts of the home of mankind may be made.

Definitions

Natural resource inventory is the process of acquiring, managing, and analyzing information on park resources, including the presence, distribution, and condition of plants, animals, soils, water, air, natural features, biotic communities, and natural processes.

Long-term monitoring is the systematic collection and analysis of those resource data at regular intervals, in perpetuity, to predict or detect natural and human-induced changes, and to provide the basis for appropriate management response.

Rationale

The National Park Service is responsible for the management of natural resources in a manner that conserves them unimpaired for future generations. It is essential, therefore, that park managers know the nature and condition of the resources under their care, have the means to detect and document changes in those resources, and understand the forces driving those changes. With parks increasingly surrounded by altered environments and experiencing externally caused impacts on park resources, and with growing awareness of the effects of human activities within the parks, natural resource baseline inventories and subsequent monitoring are an essential basis for park management. Simply put: To determine appropriate management actions, we must know what resources we hold in trust, how they change over time, and how those changes are related to human activities. Inventory and monitoring are essential to determine our fidelity to or deviation from desired resource conditions; to assess the impacts of human influence; to direct management intervention; and to measure the subsequent success or failure of that intervention.

Inventory and monitoring are fundamental elements of a National Park Service program that includes 1) scientific investigation to understand the ecological, ecosystem, and anthropogenic processes that underly park resources; and 2) the management of those resources and regulation of visitor activities based on the information acquired. These interdependent activities are all necessary for the protection of park resources.

In a very real sense, Inventory and Monitoring may be the most important legacy the Park Service can provide American conservation. Probably no ecosystem on earth remains totally unaffected by modern human activities. However, in a world in which wild places have become few and precious,

knowledge of the composition and functioning of relatively unaltered wild systems has likewise become invaluable. The information collected in this program must underly any fundamental knowledge of those systems.

BACKGROUND

It is presently the policy of NPS "to provide accurate scientific data upon which all aspects of planning, development and management of the units of the System may be based" (Management Policies of the NPS IV-2, 1978). The extent to which natural resource inventory and long-term monitoring have been accomplished varies greatly throughout the Service. Few parks, other than some International Biosphere Reserves and National Acid Precipitation and Assessment (NAPA) sites, have many of the elements of a comprehensive I&M program. Most parks, however, have some of those elements.

The Forest and Rangeland Renewable Resources Planning Acts (RPA) of 1974 and 1976 express Congressional insistence upon inventory and monitoring of natural resources on all public lands in the United States.

The National Environmental Policy Act (NEPA) contains explicit requirements of sufficient knowledge of resources (i.e., baseline inventory) to determine effects of management actions.

NPS has been criticized by the General Accounting Office in its February, 1987 report to Congress entitled "Parks and Recreation: Limited Progress Made in Documenting and Mitigating Threats to the Parks" for lack of followup of the 1980 State of the Parks report. The principal reason for this failure was lack of fundamental resource data (inventory) and any measure of change (monitoring).

Inventory and monitoring require effective policy guidance, oversight and support, and a comprehensive Servicewide system to assure their successful accomplishment in all park units. Such a system should include a Servicewide recognition of inventory and monitoring activities as fundamental, high-priority management responsibilities at each level of the agency. Successful execution of that responsibility depends upon its being fully accepted and integrated into management decisions at all levels of the National Park Service. Long-term monitoring needs must, at the earliest possible time, be base-funded and closely tracked at all organizational levels to assure the continuity upon which they depend. The program cannot succeed over the long term--forever, in the context of the Park Service mandate--unless it is fully institutionalized at the level of park operations. It is unlikely this program can succeed without commitment of new funding--not redirection from other essential resource programs--and additional staff. Falling neatly between traditional Park Service research and resource management responsibilities, I&M will require the explicit cooperation of both of those functional areas at the field level, and the formal support of administration at every level.

Implementation of the Biological Diversity MBO will require that Inventory and Monitoring be in place, as it will be the critical source of data for setting parameters of any biological diversity programs, and for evaluating their ultimate success. In turn, models of biological diversity may guide selection of appropriate natural resource elements and processes to monitor.

The Natural Resources Assessment Action Program (NRAAP) depends ultimately, for its soundness and effectiveness, on a foundation of systematic

Service-wide inventory and monitoring - which must, therefore, be in the highest priority ranks of NRAAP, at its outset and thereafter.

It is the responsibility of WASO Natural Resources, as staff to the Director, to develop policy and guidelines, to assess and give counsel on multi-regional concerns, and to monitor the effectiveness of executing inventory and monitoring Service-wide. Line responsibility, including review of proposed policy and guidelines, direct participation in priority setting, and direction of field implementation, is the responsibility of the Director, Regional Directors, and park superintendents.

No universally appropriate "off the shelf" procedures are available for direct implementation, nor is it likely that one set of procedures will be appropriate, in kind, in depth, or in technical approach, to all park units. Although the advice, counsel, and cooperation of other natural resources agencies, universities, conservation organizations, and scholarly associations is highly desirable, the Park Service must carry a large measure of responsibility for directing this new field of endeavor.

PROGRAM DESCRIPTION

The Inventory and Monitoring Program design will be site specific, including the selection of elements for I&M. Elements for I&M should include biotic and abiotic resources and the process by which they interact.

1. Biotic Elements. The basic biotic element is the species. I&M should include a combination of some measures of diversity, such as presence/absence of species, distribution, and population dynamics information on selected species. Criteria for selection of species for population dynamics monitoring include, for example: 1) a representative array of ecological roles and trophic levels; 2) legal status (e.g., endangered); 3) park endemics; 4) park aliens; 5) species legally or illegally taken from park populations; 6) species which characterize entire communities; 7) species subject to insularity; 8) heroic species; 9) elements described in enabling legislation.
2. Abiotic Elements. A wide variety of abiotic factors are appropriate for park I&M. They include, but are not limited to: 1) geologic features; 2) soils; 3) atmospheric and precipitation chemistry; 4) weather; 5) hydrologic and oceanographic conditions; 6) elements described in enabling legislation; 7) environmental factors central to ecosystem welfare.
3. Processes. Processes which mediate dynamics of biotic and abiotic elements must not be overlooked. Among the most important are fire, erosion, human use, and natural catastrophic events.

Preliminary list of candidate elements and processes for initial inventory:

1. Presence of multicellular animal and plant taxa.
2. Distribution and status of vertebrate animal and key vascular plant species/populations.
3. Surficial geology.
4. Distribution of soil taxa.
5. Human occupation/disturbance history (retrospective).
6. Fire and other natural events history (retrospective).
7. Precipitation chemistry.
8. Atmospheric chemistry.
9. Weather (retrospective, from established stations).
10. Hydrological data (principal watersheds).

11. Other biotic elements (e.g., rates of decomposition, rates of growth, length of needle retention, other ecosystem processes).

ELEMENTS AND PROCESSES SELECTED FOR INVENTORY OR MONITORING MUST BE UNAMBIGUOUSLY DEFINABLE, IDENTIFIABLE, AND MEASURABLE.

IMPLEMENTATION

To implement a Servicewide Inventory and Monitoring (I&M) program, the following steps will be taken:

1. The office of the Associate Director, Natural Resources, will:
 - a. Systematically assess existing NPS I&M activities:
 - b. Promulgate recommended I&M guidelines and standards;
 - c. Recommend stages of implementation of I&M in the parks - including a description of the minimum level to be accomplished by 1988.
2. From the list of parks nominated by the Regional Directors - parks with strong I&M programs on which to build, or having critical needs for major I&M efforts - the Director will select 12 pilot areas Servicewide.
3. The Associate Director, Natural Resources, will draw on professionals from within and outside the Service To:
 - a. Provide technical guidance in the development and promulgation of I&M guidelines and standards. This broad and substantial charge includes determining the degree of specificity for guidelines.
 - b. Counsel the Directorate on the steps toward Servicewide implementation of I&M.
 - c. Review progress and quality control in the pilot parks and Servicewide I&M program.
 - d. Guide development of technical workshops to be conducted in pilot parks, and at Mather and/or Albright Training Centers, for responsible staff Servicewide.
 - e. Recommend protocols for data management.

The Associate Director, Natural Resources, will keep the Directorate regularly apprised of progress in these undertakings.

4. The Regional Directors will revise their respective parks' Resource Management Plans by incorporating, high in priority, steps toward the development of a sound inventory and monitoring program. These may be refined with guidance of the technical advisors at the park level, and through the Associate Director, Natural Resources.
5. The Regional Directors will provide the Director with annual reports describing the current status of each park's natural resources, and its inventory and monitoring program. Such reports will explicitly describe the information already collected, and that which is known still to be needed. (These may be in the form of NRAAP, at the discretion of the Associate Director.)

APPENDIX 1.

A Step-Down Plan Detailing Implementation Processes

- I. Define NPS I&M standards.
 - A. Declare I&M standards.
 - 1. Define uses and values of I&M.
 - 2. Define levels of accuracy and precision required to address management concerns.
 - B. Assess status of I&M in parks as measured by these standards.
- II. Develop I&M protocols with pilot park programs.
 - A. Select natural resource elements for inventory and for monitoring.
 - 1. Review literature for potential elements.
 - 2. Establish and apply criteria for element selection.
 - B. Develop or adapt I&M methodologies appropriate for selected elements and specific park units.
 - 1. Review literature and specific park units.
 - 2. Design data acquisition system (sampling methods).
 - 3. Design data administration and management system.
 - a. GIS.
 - b. Additional hardware/software data management systems.
 - c. Analysis.
 - d. Archives.
 - e. Synthesis.
 - 4. Design reporting system.
 - 5. Design management response system.
 - C. Test element selection and I&M methodologies.
 - 1. Select pilot parks.
 - 2. Support appropriate minimum increments toward meeting standard in each natural area.

3. Establish criteria to evaluate pilot program.
 4. Fund and conduct pilot program.
- III. Provide long-term funding.
- A. Determine total I&M costs.
 - B. Evaluate ONPS funds for reallocation.
 - C. Obtain new funding as required.
- IV. Provide trained personnel to conduct I&M.
- A. Determine appropriate dedicated staffing.
 - B. Select personnel.
 - B. Train personnel.
- V. Expand program Servicewide.
- A. Revise park resources management plans to incorporate I&M programs.
 - B. Assign responsibilities for park I&M programs.
 - C. Establish accountability for knowledge of park resource conditions.
 - d. Provide Servicewide oversight and evaluation with Technical Advisory Committee.

Note: The above plan does not imply chronological order. Several parts can and should be conducted on a simultaneous or overlapping basis.

APPENDIX 2.

An Ecosystem Monitoring Advisory Process

Several action items must be dealt with promptly, under the leadership of the Associate Director, Natural Resources (see "Implementation," page 7).

The Associate Director, Natural Resources, will draw on scientists and other people with technical skills to provide technical advice regarding such matters as data acquisition, data management, quality control, selection of sampling elements, etc. The advice of NPS managers and administrative staff, at any of the three levels, should be sought. Matters of organization, budget, and operations would be reviewed by the Directorate.

The critical center of activity for I&M in the next year will be the Associate Director's office. The advisory process will need to begin to work out the many details of this program before even the pilot parks can begin work. Many of the points raised by the Regional Directors and WASO are technical (e.g., inventory versus "type" inventory, integration of biotic and abiotic measures, and a hundred more).

Proposed candidate pilot parks:

Great Smoky Mountains 2210
Glacier M 2110
Channel Islands M 2620
Sequoia and Kings Canyon M 2610
Yellowstone M 3110
Olympic M 2410
Acadia 2110
Everglades 4110
Glacier Bay M 2410
North Cascades M 2410
Shenandoah 2210
Big Bend 3210
Haleakala M 4220
Isle Royale 2110
Alaska Arctic Areas M 1210
Alaska Subarctic Areas M 1310
Atlantic Barrier Islands 2310, 2320, 2210

ADDITIONAL NOTES:

Restrict this I&M program to natural resources. The program is sufficiently complex and fragile as it is without the additional burden of cultural resources and sociological issues.

Select first-round pilot parks from those with necessary staff, administrative support, and at least rudimentary programs already in place. Try to achieve as broad an ecosystem representation as possible (desert, temperate hardwood, temperate conifer, subtropical moist, island, alpine, arctic, etc.).

At the same time, require (and support) actions by which all areas having significant natural resource components take the appropriate "next (or first) step" toward meeting the criteria.

There is no consensus about the nature of "objects" amenable to inventory and monitoring, per se. One supportable position is that all such objects must be low level, objective units, unambiguous, and measurable on absolute scales. Thus "state of health" or "vegetation type" are not directly measurable subjects because they are high level, subjective units not directly measurable in a repeatable fashion (i.e., different workers will produce different measures of the same subject). However, these high-order subjects may be inferred by skilled ecologists from objective measures. System well-being, for example, requires the combination of proper objective monitoring, and an ecology research/resource management program capable of deriving higher-order meaning from the units measured, sorted, and analyzed. This dispute should properly be resolved by the technical committee.