National Park Service
U.S. Department of the Interior

Natural Resource Program Center

Strategic Plan for Natural Resource Inventories

FY 2008 – FY 2012

Natural Resource Report NPS/NRPC/NRR—2009/094

ON THE COVER
National Park Service staff collecting accuracy assessment data in Joshua Tree National Park as part of the vegetation inventory. Photograph by NPS vegetation ecologist Chris Lea.

Strategic Plan for Natural Resource Inventories
FY 2008 – FY 2012

Natural Resource Report NPS/NRPC/NRR—2009/094

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May 2009

U.S. Department of the Interior
National Park Service
Natural Resource Program Center
Fort Collins, Colorado

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Please cite this publication as:

National Park Service. 2009. Strategic plan for natural resource inventories: FY 2008 - FY 2012. Natural Resource Report NPS/NRPC/NRR—2009/094. National Park Service, Fort Collins, Colorado.

NPS D-2049, May 2009

Vision Statement
NPS Inventory and Monitoring Program

The Inventory and Monitoring Program will chart the course and provide the leadership and information resources needed by the National Park Service to preserve and protect the natural resources placed under its trust by the American people.

Through its accomplishments, the Program will enhance the National Park Service's stature as an international leader in natural resource management and stewardship.

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INVENTORY STRATEGIC PLAN

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Executive Summary

National Park managers across the country are confronted with increasingly complex and challenging issues that require a broad-based understanding of the status and trends of park resources as a basis for making decisions and working with other agencies and the public for the benefit of park resources. Park managers are directed by federal law and National Park Service (NPS) policies to know the status and trends in the condition of natural resources under their stewardship in order to fulfill the NPS mission of conserving parks unimpaired. The National Park Service established the Inventory and Monitoring Program (I&M) in 1992 to provide funding, technical assistance, and coordination for more than 270 parks to complete 12 basic natural resource inventories and to begin monitoring the status and trend of park natural resources. The primary purpose of natural resource inventories is to document the presence of resources in parks, and to assess and document the current condition and knowledge of natural resources in the parks. Inventories allow comparison of existing conditions to the natural or desired state of parks and establish a solid baseline for making scientifically sound management decisions and for designing long-term monitoring plans that track the health of key park resources.

The NPS I&M Program developed a strategy in 1992 for developing and delivering a minimal set of products for 12 "basic" natural resource inventories that were common to all park units containing significant natural resources. Other inventories (e.g., those that were not common to all of the parks, or that could not be undertaken efficiently at the time because of insufficient knowledge or technology) were to be deferred to a later phase of programmatic implementation or completed using funding from other sources. The initial phase of the 12 basic inventories was expected to be completed by 2001, but less than 20% of the funding needed to implement the strategy was provided. By 1999, the total annual funding for all inventory, monitoring, and research support activities combined by the I&M Program (including vegetation mapping and research support funding that had been transferred to what is now part of the U.S. Geological Survey) averaged less than $40,000 per park, and consequently progress was very slow. Beginning in FY 2000 as part of the Natural Resource Challenge, Congress greatly increased the funding for the NPS I&M Program to accelerate the development and delivery of the basic inventories and to design and implement a program for monitoring park vital signs (measures of resource condition).

With the funding increase, the NPS set ambitious goals for delivering the initial set of inventory data sets to the 270 I&M parks, and by September 30, 2008, 85.3% of the 2,767 total inventory data sets had been completed. The I&M Program continues to deliver an impressive number of high-quality data sets and other inventory products to parks each year, but because of budget shortfalls and increased costs, the delivery of the initially-defined inventory data sets and products to the 270 I&M parks will require at least another seven years at current funding levels, and even longer for some of the large Alaska parks. This strategic plan outlines the direction to be taken and the funding commitments for the inventory component of the Service-wide Inventory and Monitoring Program during the 5-year period of FY 2008-FY 2012. The plan describes the programmatic implementation policies, priorities, efficiency measures, and budgetary strategies the Program will comply with in order to address major issues and challenges likely to confront the Program.

A brief description is presented for each of the 12 basic inventories, including the objectives of the inventory, and the minimum set of products that are developed and delivered to park managers and planners so that they can effectively use and interpret the inventory products. In addition to a digital map, the minimum products for an inventory may include an explanatory report, FGDC-compliant metadata, and database or geodatabase files. Completion of inventories for parks in Alaska often require a different approach because of their large size and challenging logistical considerations (the 16 Alaska parks contain two-thirds of the total acreage in the National Park System). Inventory products are available through the Inventory Tracking application at: http://science.nature.nps.gov/im/tracking/InventorySearch.aspx. The 12 basic inventories are as follows:

- Natural Resource Bibliography
- Base Cartography Data
- Air Quality Data
- Air Quality Related Values
- Climate Inventory
- Geologic Resources Inventory
- Soils Resources Inventory
- Water Body Location and Classification
- Baseline Water Quality Data
- Vegetation Inventory
- Species Lists
- Species Occurrence and Distribution

Two of the goals of the I&M Program, namely "Integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making", and "Share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives", can only be achieved through the development of a modern information management infrastructure (e.g., staffing, hardware, software) and procedures to ensure that relevant natural resource data collected by NPS staff, cooperators, researchers and others are entered, quality-checked, analyzed, reported, archived, documented, cataloged, and made available to others for management decision-making, research, and education. The I&M Program has played the major role to date in integrating and streamlining the NPS natural resource data systems through the IRMA (Integration of Resource Management Applications) system. IRMA is using the Service Oriented Architecture (SOA) approach, which is the industry standard and Department of Interior "best practice", to modernize and integrate I&M systems and to strategically position the program for future changes in technology.

As part of the National Park Service's effort to "improve park management through greater reliance on scientific knowledge," a primary role of the I&M Program is to collect, organize, and make available natural resource data and to contribute to the Service's institutional knowledge by facilitating the transformation of data into information through analysis, synthesis, and modeling. The Program is taking steps to ensure that the many individual data sets and components developed and organized through inventory and monitoring efforts are converted into useful and readily-available *information* commensurate with the needs of policy makers, managers, planners

and other stakeholders at all levels of the organization. In just a few short years, the I&M networks have become known as a key source and supplier of reliable, organized, and retrievable information about parks that was formerly unavailable, misplaced, or lost to managers and others who needed the information for sound decisions or sound science. The 32 I&M networks and the national program office have made a sustained and substantial investment in database design, data archiving, and in reporting data and derived information.

Current needs by park managers, planners, interpreters, and other key users of basic inventory data far exceed the funding that is available. The Inventory and Monitoring Program will face five major challenges associated with natural resource inventories over the next 10-15 years:

1. Completing the Initial Phase of Basic Inventories in a Timely Manner
2. Meeting Park Needs for Continuing and Recurring Inventories
3. Adapting to Changing Needs and Priorities as a Result of Climate Change and Other Emerging Issues
4. Effective Delivery of Data and Information to Key Audiences
5. Data Integration, Analysis, and Synthesis (Decision Support)

These challenges will place increasing demands on the Program's ability to achieve its long-term goals, comply with accountability expectations, and provide critical information resources needed by parks and networks throughout the National Park System. A brief description is provided for each of the challenges, as well as actions that will be taken to address them. A set of additional I&M Program policies that will help to meet the challenges is presented.

The funding strategy during the timeframe FY 2008 – 2012 is presented for three major components of the inventory program: (1) completing of the initial phase for the 12 basic inventories; (2) providing funding for continuing and recurring inventories; and (3) operation and maintenance activities such as data management and decision support systems. To comply with the commitments made to Congress, *a minimum of 80 percent* of all funding available for inventories during FY 2008-2012 will be devoted to completing basic inventories for the 270 I&M parks in a timely manner. The actions and policies described in Chapters 4 and 5 will be implemented to accelerate the process and increase efficiency. Up to *5 percent (maximum)* of the total annual inventory budget may be allocated to address continuing and recurring inventory needs. Continuing inventories are high-priority inventories that all parks do not have in common, or that were deferred until now when improved technology, taxonomy, and knowledge allow us to more cost-effectively undertake them. Examples include inventories of submerged resources (e.g., bathymetry, underwater vegetation, benthic habitat mapping), lichens, invertebrates, fossils, and wetlands. Priority during the FY 2008- FY2012 timeframe will be given to submerged resources inventories. Finally, up to *15 percent (maximum)* of the total inventory budget may be allocated to the acquisition of Information Technology personnel and expertise required for the ongoing operation and maintenance of inventory data management and information management systems, and to fund various contractual and cooperative efforts associated with the development of IRMA and the modernization and streamlining of I&M data systems.

Chapter 1: Introduction and Background

Purpose and Need for Natural Resource Inventories

Knowing the condition of natural resources in national parks is fundamental to the Service's ability to manage park resources "unimpaired for the enjoyment of future generations." National Park managers across the country are confronted with increasingly complex and challenging issues that require a broad-based understanding of the status and trends of park resources as a basis for making decisions and working with other agencies and the public for the benefit of park resources. To fulfill the National Park Service (NPS) mission of preserving the nation's natural heritage, it is essential that park managers know the nature and condition of the existing resources placed under their stewardship.

During the last 30 years, more than a dozen major studies by both independent panels and NPS itself have reaffirmed the "importance of guiding resource management through the systematic collection of data" (GAO 1997). National Park managers are directed by federal law and National Park Service policies to know the status and trends in the condition of natural resources under their stewardship in order to fulfill the NPS mission of conserving parks unimpaired (see Summary of Laws, Policies, and Guidance and Legal and Policy Requirements below). The primary purpose of natural resource inventories is to document the presence of resources in parks, and to assess and document the current condition and knowledge of natural resources in the parks. Inventories allow comparison of existing conditions to reference conditions or the desired state of parks and establish a solid baseline for making scientifically sound management decisions and for designing long-term monitoring plans that track the health of key park resources. Beyond informing management, inventories foster education and stimulate people's innate fascination with the natural world. Parks more than ever serve as natural laboratories for scientists, important refuges of biodiversity, and tranquil oases for visitors. Natural resource inventories place park resources into a broader world view and provide ecological context.

Legal and Policy Requirements for Inventories

The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. The National Parks Omnibus Management Act of 1998 established the framework for fully integrating natural resource monitoring and other science activities into the management processes of the National Park System. The Act charges the Secretary of the Interior to *"continually improve the ability of the National Park Service to provide state-of-the-art management, protection, and interpretation of and research on the resources of the National Park System,"* and to *"assure the full and proper utilization of the results of scientific studies for park management decisions."* The Act also requires the Secretary of the Interior to develop a program of *"inventory and monitoring of National Park System resources to establish baseline information and to provide information on the long-term trends in the condition of National Park System resources"* (16 U.S.C. §5934).

Congress reinforced the message of the National Parks Omnibus Management Act of 1998 in the text of the FY 2000 Appropriations Committee report when it described its intent and expectations for the funding increases provided to the NPS I&M Program:

"The Committee applauds the Service for recognizing that the preservation of the diverse natural elements and the great scenic beauty of America's national parks and other units should be as high a priority in the Service as providing visitor services. A major part of protecting those resources is knowing what they are, where they are, how they interact with their environment and what condition they are in. This involves a serious commitment from the leadership of the National Park Service to insist that the superintendents carry out a systematic, consistent, professional inventory and monitoring program, along with other scientific activities, that is regularly updated to ensure that the Service makes sound resource decisions based on sound scientific data."

NPS Management Policies (2006) reinforce the legal requirement for park managers to use scientific and technical data and information about the condition of natural resources in their park as a basis for park management and planning:

"The Service will also strive to ensure that park resources and values are passed on to future generations in a condition that is as good as, or better than, the conditions that exist today," and

"Decision makers and planners will use the best available scientific and technical information and scholarly analysis to identify appropriate management actions for protection and use of park resources."

Section 4.2.1 of NPS Management Policies (2006) specifies that the NPS will:

- identify, acquire, and interpret needed inventory, monitoring, and research, including applicable traditional knowledge, to obtain information and data that will help park managers accomplish park management objectives provided for in law and planning documents;
- define, assemble, and synthesize comprehensive baseline inventory data describing the natural resources under NPS stewardship, and identify the processes that influence those resources;
- use qualitative and quantitative techniques to monitor key aspects of resources and processes at regular intervals;
- analyze the resulting information to detect or predict changes (including interrelationships with visitor carrying capacities) that may require management intervention and provide reference points for comparison with other environments and time frames; and
- use the resulting information to maintain—and where necessary restore—the integrity of natural systems.

Long-term I&M Programmatic Goals

To comply with legal requirements, fully implement NPS policy, and guide management activities, the Service-wide Inventory and Monitoring Program established the following five long-term programmatic goals:

1. Establish natural resource inventory and monitoring as a standard practice throughout the National Park system which transcends traditional program, activity, and funding boundaries.
2. Inventory the natural resources and park ecosystems under National Park Service stewardship to determine their nature and status.

3. Monitor park ecosystems to better understand their dynamic nature and condition to provide reference points for comparison with other, altered environments.
4. Integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision-making.
5. Share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives.

Definition of Key Terms

Official Inventory and Monitoring Park (aka "I&M Park") – Any of the 270 NPS units listed in Appendix 1 that were identified by the regional offices and the Service-wide I&M Program in FY 2000 to contain significant natural resources. These parks were listed in various strategic plans and requests for budget increases as part of the Natural Resource Challenge to complete inventories and to initiate long-term monitoring.

Basic Inventory – Any of the 12 natural resource inventories specified in Appendix I of NPS-75, *Natural Resources Inventory and Monitoring Guideline* and described in Chapter 2 of this plan. The data sets and other products from the initial phase of these 12 basic inventories were deemed to provide the minimal set of natural resource information needed by managers and planners to effectively manage and protect park resources. The need for these inventories was common across all parks in the NPS with significant natural resources.

Initial Phase of 12 Basic Inventories – The initial phase for the 12 basic inventories as described in NPS-75 (1992) was to develop and deliver the minimal set of natural resource information that all I&M parks had in common, and that could be developed efficiently based on the knowledge and technologies available in 1992. High-priority inventories that were not common across all parks, or that could not be undertaken efficiently because of the knowledge and technology available at the time, were deferred until later (see Continuing Inventory).

Continuing Inventory – Continuing inventories are high-priority Basic Inventories that were either (1) deferred until after the initial phase (i.e., until now) when improved technology, taxonomy, and knowledge would make it more cost-effective to undertake the inventory, or (2) identified by some parks as a high-priority need, but that were not common across all I&M parks. Examples include inventories of submerged resources (e.g., bathymetry, underwater vegetation, benthic habitat mapping), lichens, invertebrates, fossils, and wetlands.

Recurring Inventory – Basic inventories that need to be repeated or updated at future intervals because of changes in resource status, so that they continue to provide useful and reliable information to parks. An example would be the need to update the vegetation map for a park every 10-20 years or so.

GPRA Complete – The term "GPRA" refers to the Government Performance and Results Act of 1993. A park inventory will be considered to be "GPRA Complete" when the minimal set of products identified in Appendix I of NPS-75, *Natural Resources Inventory and Monitoring Guideline* (NPS 1992) have been developed and delivered to the park. (See Initial Phase Complete).

Initial Phase Complete – Experience showed that certain minimum products described in NPS-75 such as a "digital map," were not useful to parks without certain additional supporting products. A park inventory is "Initial Phase Complete" when the minimum supporting products deemed necessary for park managers and planners to effectively use and interpret the digital map have been delivered to the park. The minimum additional products will include as appropriate an explanatory report, FGDC-compliant metadata, and database or geodatabase files.

Program and Budget History

The design and implementation of the I&M Program during the first ten years of 1992 – 2001 were structured around recommendations provided by the Hester Task Force. This task force, established by Associate Director for Natural Resources Dr. Eugene Hester in 1989, was charged with developing a strategic program for inventorying and monitoring of natural resources that would meet the needs of park managers for the scientific information needed for resource protection and decision-making.

The strategy and recommendations developed by the Hester Task Force were described in the report NPS-75, *Natural Resources Inventory and Monitoring Guideline*, published in 1992. For the first ten years of the I&M Program, NPS-75 (NPS 1992) outlined a 3-phase approach for biological, chemical, and geophysical resource inventory and monitoring, in which Phase I was Inventory, Phase II Monitoring, and Phase III Integration. Phase I of the recommended program described the initial work to develop and deliver the minimal products for a set of "basic" natural resource inventories that were common to all park units containing significant natural resources. Phase I inventories were expected to be completed in about 10 years at the planned funding level of $26.6 Million by the year 2000. Other inventories (e.g., those that were not common to all of the parks, or that could not be undertaken efficiently at the time because of insufficient knowledge or technology) were to be deferred to a later phase of programmatic implementation or completed using funding from other sources. Phase II of the recommended program focused on establishment of a network of 10-12 prototype monitoring programs from which the Service could gain experience and expertise in park-wide monitoring of ecological "vital signs." Phase III involved the analysis, synthesis, and modeling of I&M data and the development of decision support systems to assist park managers and planners with management decision-making.

The budget history for the period 1992-2002 described in NPS-75 is summarized in Figure 1. In 1993 and 1994, more than $2 Million in I&M project funding as well as a number of GIS and other positions for vegetation mapping and the research component for vital signs monitoring was transferred to the newly-created National Biological Survey, which has since been merged into the U.S. Geological Survey (USGS). Congress appropriated only a portion of the funding requested by the NPS and USGS to carry out vegetation mapping and to implement the other recommendations in NPS-75, and by 1999, the total annual funding for all inventory, monitoring, and research support activities by the NPS and USGS combined averaged less than $40,000 per park.

Funding for inventories increased dramatically as a result of the Natural Resource Challenge. In FY 2000, Congress provided $7.3 million for inventories, and in FY 2002, Congress provided an additional $2 Million to accelerate the geology and soils inventories. To more efficiently conduct inventory and monitoring and to facilitate collaboration, information sharing, and economies of scale, the NPS organized the more than 270 parks with significant natural resources into 32 I &

M networks linked by geography and shared natural resource characteristics. As a result of the network approach and the budget increases in the first two years of the Challenge, the Service was able to greatly accelerate the development of datasets for all 12 basic inventories. However, based on experience gained during the first years of the program as the basic data sets called for in NPS-75 were delivered to parks, it also became clear that park managers and planners required additional products beyond a "digital map" (e.g., a report, databases, metadata) for certain inventories such as vegetation, geology, and soils, to effectively use and interpret the map.

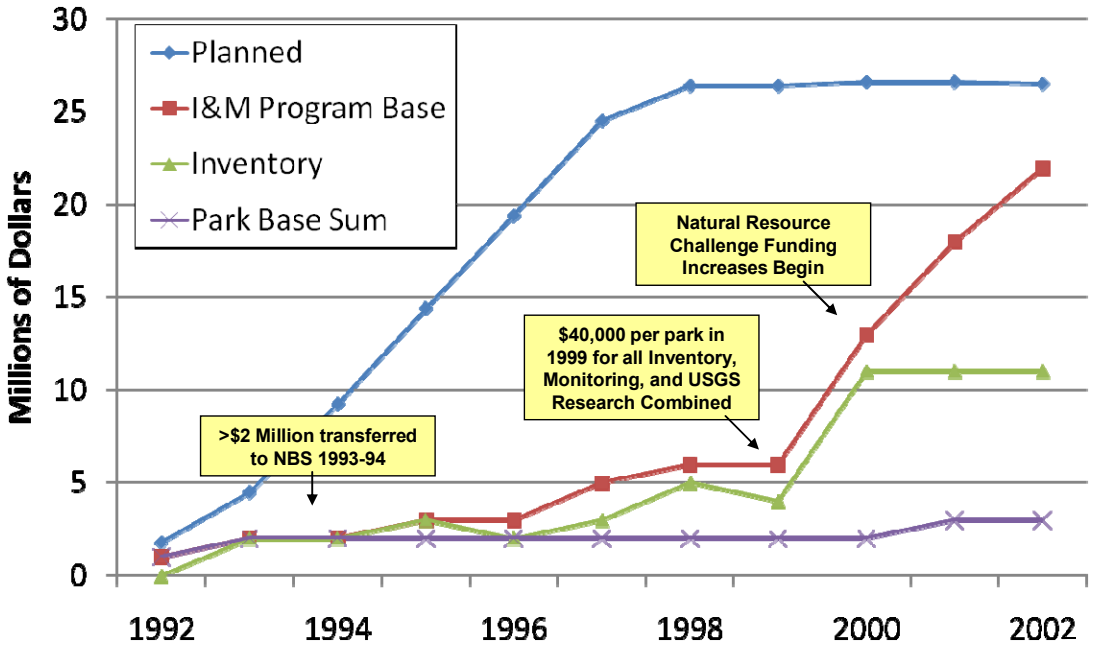

Figure 1. Budget history for the first 10 years of the I&M Program, showing the funding levels needed to implement the strategy outlined in NPS-75 (Planned), versus actual funding appropriated (total I&M funding includes I&M Program Base plus transfers to park base, plus the more than $2 Million transferred to the National Biological Survey [now part of USGS] to support vegetation mapping and vital signs monitoring design). As part of the Natural Resource Challenge, Congress provided $7.3 Million in inventory funding in FY 2000 and $2 Million in FY 2002, plus additional increases for vital signs monitoring by the 32 I&M networks.

As part of the Government Performance and Results Act (GPRA) of 1993, the NPS set ambitious goals for delivering the initial set of inventory data sets to the 270 I&M parks (Table 1), and by September 30, 2008, 85.3% of the 2,767 total inventory data sets had been completed. In FY 2002 and 2003, OMB (Office of Management and Budget) used the progress on natural resource inventories and vital signs monitoring to measure the performance of "NPS Natural Resource Stewardship" using OMB's Program Assessment and Rating Tool (PART), and the NPS received one of the highest scores in the federal government, which led to further funding increases through the Natural Resource Challenge. The GPRA inventory goal set for FY 2008 was exceeded in spite of an increase in the number of parks and a decrease in budgets due to rescissions, across-the-board cuts, assessments, and more than a 75% decrease in project funding from the USGS for vegetation mapping (i.e., erosion of the funding that was transferred from the NPS in 1993-1994 to what is now the USGS). The budget strategies in NPS-75 (1992) and in documents for the Natural Resource Challenge assumed that additional funding from park base

accounts, NRPP project funds, partnerships with USGS and other agencies, and the interagency fire program would allow inventories to be completed more quickly. In recent years, however, parks have lost natural resource positions and funding, and have not been able to contribute as much as was planned. Partner agencies have also had budget shortfalls that reduce their ability to work with the NPS to meet common needs.

The I&M Program continues to deliver an impressive number of high-quality data sets and other inventory products to the I&M parks each year (see Table 1 and Chapter 2), but because of budget shortfalls, increased costs, and other factors, the delivery of the initially-defined inventory data sets and products to the current list of 270 parks will require at least another seven years at current funding levels, and even longer for some of the large Alaska parks.

Table 1. Number of I&M parks that had received the minimal set of inventory products identified in NPS-75 (1992) each year. (But see the definition of "Initial Phase Complete" above). Percent GPRA Complete values are based on the baseline of 2,767 total data sets to be delivered to the 270 I&M parks during the initial phase of natural resource inventory development.

Fiscal Year:	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Natural Resource Bibliography	257	263	270	270	270	270	270	270
Base Cartography Data	248	260	270	270	270	270	270	270
Air Quality Data	250	250	250	270	270	270	270	270
Air Quality Related Values	0	0	0	48	100	150	175	210
Climate Inventory	0	197	270	270	270	270	270	270
Geologic Resources Inventory	2	14	17	52	68	92	117	138
Soil Resources Inventory	37	57	57	59	70	100	141	171
Water Body Location/Classification	0	220	270	270	270	270	270	270
Baseline Water Quality Data	225	270	270	270	270	270	270	270
Vegetation Inventory	22	27	36	51	62	80	127	155
Species Lists	210	270	270	270	270	270	270	270
Species Occurrence & Distribution	0	0	0	3	44	100	200	270
Grand Total	1,251	1,828	1,982	2,103	2,234	2,412	2,650	2,834
Completed before 2001	473	473	473	473	473	473	473	473
GPRA Actual	778	1,355	1,509	1,630	1,761	1,939	2,177	2,361
GPRA Target	768	1,121	1,498	1,637	1,771	1,942	2,145	2,338
Percent GPRA Complete			54.5%	58.9%	63.6%	70.1%	78.7%	85.3%

Purpose of this Strategic Plan

This strategic plan outlines the direction to be taken and the funding commitments for the inventory component of the Service-wide Inventory and Monitoring Program during the five-year period of FY 2008-FY 2012. The plan describes the programmatic implementation policies, priorities, efficiency measures, and budgetary strategies the Program will comply with in order to address major issues and challenges likely to confront the Program.

Chapter 2: Description, Products, and Status of the 12 Basic Natural Resource Inventories

This chapter provides a brief description of the initial phase of each of the 12 basic inventories, including the objectives of the inventory and the minimum set of products and services that are provided to parks. Additional details for each inventory are available on the internet at (http://science.nature.nps.gov/im/inventory/). Products are available through the Inventory Tracking application: (http://science.nature.nps.gov/im/tracking/InventorySearch.aspx).

1. Natural Resource Bibliography

The first critical step to inventory the natural resources in national parks is to discover, compile, and organize existing records, reports, maps, manuscripts, gray literature, and other historical scientific information and to make them more available to park staff and cooperators. In many cases, a substantial amount of relevant, historical information about park resources which could be used to guide park management actions already existed but was poorly documented and widely distributed throughout the park, or was stored at universities or the offices of cooperating agencies.

Objectives of the Inventory

At a very minimum, every park unit should have a basic compilation of all of the natural resource studies that have previously been completed within the park boundaries. Therefore, this inventory focuses on compilation of historical scientific material currently stored in parks, regional offices, the Denver Service Center, universities, and other repositories including rare event records, maps, photographs, manuscripts, gray literature, etc. The documents and associated metadata records are incorporated into a comprehensive, centralized database which can be accessed and utilized by park managers and decision-makers, and which will be made available to the general public after data have been quality-checked and sensitive data have been protected.

Inventory Products and Services

Bibliographies developed for parks include all descriptive documents and scientific studies pertaining to park natural resources, including extended searches for published and unpublished documents outside the park. To make park-related natural resource information more readily available and easy to locate, the Service-wide I&M Program developed the automated, Internet-based Natural Resource Bibliography known as NatureBib, and provided funding to parks and cooperators to populate the database. NatureBib is used primarily to catalog and manage reports, articles, conference proceedings, theses and dissertations, gray literature, and other documents that contain information on park natural resources.

NatureBib is an excellent tool for capturing references that may not be easily located via commercial on-line reference services (e.g., BIOSIS, JStor) or via public or academic libraries. In addition, NatureBib allows the uploading of full-text versions of documents and publications, so that users can view or download documents resulting from their searches. The online application is currently being improved and merged with the NPS Data Store as part of the IRMA project (Integrated Resource Management Applications) to make it more useful and accessible to park staff, the scientific community, and the general public.

2. Base Cartography Data

An efficient and cost-effective way for park managers and planners to utilize complex natural resource information is through spatial displays and analyses. For example, by incorporating relatively basic information about vegetation communities and topography into a spatial analysis, managers can locate potential habitats for endangered species or predict the likely course of a wildfire. All parks urgently need access to and support from a geographic information system to facilitate decision-making and resource protection. Cartographic information from this inventory provides geographic information systems (GIS) data layers to National Park Service resource management staff, collaborators, and research partners. The inventory acquires, processes, and distributes GIS data that complement other inventory projects, as well as many GIS mapping and analysis projects throughout the Park Service.

Objectives of the Inventory

Basic to the implementation of a park-based GIS is the acquisition of the digital cartographic data layers upon which spatial data applications and analyses are based. Base cartographic inventory products are used by the National Park Service and others for many different applications, ranging from making maps, to spatial data verification, to designing monitoring sampling frameworks. For example, digital raster graphics and digital orthophotos provide credible, high-resolution spatial information that can be used to verify the spatial accuracy of cartographic products. The thematic information content in existing digital line graph products and elevation data sets are very useful for analysis to ensure the range of landscape conditions is reflected in monitoring sampling designs. These cartographic products are also essential for completion of several other natural resource inventories included in the I&M program, such as vegetation and soils mapping. The primary objective of this inventory is to acquire the suite of cartographic data products parks require in order to prepare map products and to undertake a wide variety of geo-spatial analyses and support activities associated with the use of those products by parks.

Inventory Products and Services

This inventory delivers six customized products to the I&M parks:

1. Digital Elevation Models (DEM) - digital files consisting of terrain elevations for ground positions at regularly spaced horizontal intervals.
2. Digital Line Graphs (DLG) - digital representations of cartographic information. DLGs of map features are digital vectors converted from maps and related sources.
3. Digital Raster Graphics (DRG) - scanned images of a U.S. Geological Survey standard series topographic map, including all map collar information.
4. Digital Orthophoto Quarter Quadrangles (DOQQ) - A digital orthophoto quadrangle is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed.
5. National Elevation Dataset (NED) - designed to provide national elevation data in a seamless form with a consistent datum, elevation unit, and projection.
6. National Agricultural Imagery Program (NAIP) imagery – geo-referenced imagery acquired during the agricultural growing seasons in the continental U.S.

The final products, when completed, will be kept up-to-date, in a seamless format, and ready for use in NPS standard software packages (e.g., ESRI GIS). Some additional derived products are

included, such as hillshade, aspect, and slope grids which are created from elevation data. The NPS Data Store is the primary distribution point for base cartography data. The very dynamic nature of these data needs to be reflected in an ongoing, recurring inventory effort. Alternative, more contemporary, data sources will be considered as they become available. This is evidenced by inclusion of NED and NAIP data products; both are examples of nationwide efforts that produce consistent, up-to-date information at little cost to the NPS.

3. Air Quality Data

The quality of air in national parks can significantly affect park resources such as vegetation, soils, water, and buildings and monuments, as well as park visitors. Visibility, for example, has a strong impact on a visitor's experience and the perception of a national park. In some instances, air pollutants such as ozone, sulfur dioxide, or particulate matter can reach concentrations that injure plants or cause adverse health effects for persons visiting or working in parks. The Environmental Protection Agency (EPA) has defined a number of air pollutants known to cause adverse effects and has set standards for unacceptable concentrations. Other potentially hazardous or troublesome air pollutants have also been recognized by EPA, including mercury and acidic deposition; however, no direct standards have been set. Particles that cause haze and poor visibility are regulated by standards and rules designed to bring visibility in protected natural areas back to natural conditions. Degradation of air quality and visibility constitutes another major problem confronting many park units. However, a large number of parks do not currently have permanent air quality monitoring stations located within their boundaries. Therefore, those parks have to rely upon obtaining air quality information from stations located adjacent to, but outside of, the park's boundaries. The NPS Air Quality Division has implemented monitoring efforts in many Class I units but considerably more needs to be done in all units if the Service is to be in a position to effectively detect and respond to threats to park air resources.

Objectives of the Inventory

The Air Quality Inventory focuses on indicator pollutants regulated under the Clean Air Act. Air quality assessments require monitoring to determine current conditions in relation to standards or limits that are designed to protect human health and sensitive vegetation. Trends and spatial variability are important for assessing the potential impact of air quality on natural resources. The primary inventory objective is to provide parks with actual-measured or estimated concentrations of indicator air pollutants such as ozone, wet deposition species (NO3, SO4, NH4, etc), dry deposition species (NO3, SO4, HNO3, NH4, SO2), and visibility (extinction for 20% cleanest days and 20% worst days for visibility).

Inventory Products and Services

Statistical summaries have been prepared from data collected by the national air monitoring networks during five-year periods of observation. These data were entered into a geographic information system (GIS) database where inverse distance-weighted and kriging techniques were applied to create gridded air quality estimates for the contiguous 48 states. The result is a series of GIS maps that portray the spatial concentrations of air pollutants over the U.S. The maps and estimated pollutant values at park locations are presented in the Internet-based application called Air Atlas (http://www2.nature.nps.gov/air/maps/AirAtlas/index.cfm). The Air Atlas GIS viewer and five-year average estimated values are available to park managers and planners and to the

general public on the Internet and from the NPS Data Store. The initial Air Quality Inventory using the GIS interpolation method was completed for the period 1995-1999 and posted to the web as Air Atlas. Two updates have been completed since then for the periods 1999-2003 and 2001-2005. An update for 2003-2007 is in progress. Air quality maps and estimate tables for 270 natural resource parks are complete.

4. Air Quality Related Values

The Clean Air Act amendments require that Federal land managers identify air quality related values (AQRVs) for public lands that may be subjected to emissions from new point sources of air pollution. Air quality related values (AQRVs) are resources sensitive to air quality and include a wide array of vegetation, soils, water, fish and wildlife, and visibility. Park managers and planners, as well as state, local, and federal air quality agencies, require information on AQRVs and pollutant effects to ensure that air quality management strategies provide resources the highest level of protection. Effective strategies manage air pollutant emissions so that critical loads for AQRVs are not exceeded. These AQRVs usually include sensitive plant and animal species, sensitive lakes and soils, and levels of visibility. The list of AQRVs for each park is needed by States and power plant applicants who are required to demonstrate that their additional emissions will not have an "adverse effect" on air quality related values in Class I areas. The NPS has 48 Class I areas that require this level of protection. All other NPS units are considered to be Class II areas.

Objectives of the Inventory

The primary objective for this inventory effort is to develop AQRV lists for all resource parks, not just the Class I area parks. The minimum product identified in 1992 by NPS-75 was a list of AQRVs for each park, including: (1) species of flora and fauna potentially sensitive to air pollution and acid deposition (including invertebrate species), (2) sensitive ecosystems and ecosystem processes, (3) sensitive soils and surface waters, and (4) scenic vistas. To make these lists more useful to parks, locations of AQRVs and thresholds of sensitivity are also needed. The Air Resources Division and I&M Program are partnering with other federal and university scientists to provide selected parks with information on the types and amounts of airborne pollutants that cause harmful changes to them (i.e., critical loads). Critical loads developed for the most sensitive AQRVs will provide the basis for management goals and desired future conditions that, when attained, are expected to provide protection for most AQRVs. Inventories for air quality related values are somewhat dependent upon completion of inventories for vegetation, water resources, and vertebrates and vascular plants.

Inventory Products and Services

Information on AQRVs is available through the Internet-based application ARIS (Air Resources Information System): http://www2.nature.nps.gov/air/Permits/ARIS/networks/index.cfm. Ozone-sensitive plant species are listed for each park, and are categorized as being at low, medium, or high risk for foliar injury. ARIS is organized by park and by I&M network, with special emphasis on the 48 NPS Class I air quality areas that are afforded the highest protection under the Clean Air Act. AQRVs are described qualitatively and, where possible, quantitatively. Sensitive categories of AQRVs (e.g., vegetation, soils, water) have been identified in tables for each park and network. Maps of park resources sensitive to nitrogen, sulfur, and mercury atmospheric deposition will be available in 2009-2011. Risks and thresholds for effects to resources are being

identified through park studies on vegetation, soils, lakes, and streams. More extensive AQRV information is available for Class I air quality parks at http://www2.nature.nps.gov/air/Permits/ARIS/.

5. Climate Inventory

Information on current and historical climate is critical to interpreting ecological changes and to managing national parks. Most ecological processes and many species strongly respond to climate variability. Weather profoundly influences everyday park operations such as fire management, search and rescue, monitoring of air resources, and maintenance of park infrastructure. Climate data are used in numerous vegetation monitoring studies and are essential for gaining a better understanding of the current and potential distribution of native, threatened and endangered, and non-native plant species in parks. In addition, current and historical data on climate are fundamental to interpreting past ecosystem changes and to predicting future changes.

Objectives of the Inventory

The primary objective of this inventory is to describe the climatic setting for a given park by compiling basic data for parks on key climatic parameters (e.g., annual precipitation, relative humidity, prevailing wind speed and direction, temperature variability), and to improve accessibility by parks to current weather and climate data.

Inventory Products and Services

Climate inventory and monitoring needs are being addressed through the NPClime project, which is an integrated, on-line system for discovery, acquisition, analysis, and reporting of climate data. NPClime is a highly collaborative project between the NPS I&M Program and the National Weather Service's Western Regional Climate Center (WRCC). NPClime relies and builds on the capabilities of the Applied Climate Information System (ACIS), which is a co-operative system supported by National Oceanic and Atmospheric Administration (NOAA) regional climate centers.

One of the products of this inventory was the production of 32 I&M network-specific reports that identified potential sources of climate data and an evaluation of data availability and adequacy for each park. The reports delivered to each I&M network included information on regional climate drivers, monitoring station locations, data provenance, measurements, periods of record, and other station metadata.

The I&M Program has also provided parks and networks with on-line, intranet access to climate data and analyses through the NPClime application. NPClime provides services for station discovery, data query and selection, and data delivery for one or many stations in a single download. Current activities are focused on enhancing features and robustness of the entire system, adding analysis and reporting tools, and refining derived products such as data summaries and (especially) graphics. Climate data analyses and graphics, which are produced by the R statistical language, can be customized by users to meet their individual needs and the base code can be used with data from other sources. The underlying system architecture is designed to be re-deployable as a general data analysis solution so that it can contribute to program-wide needs for data analysis and reporting.

An additional product of the climate inventory was the compilation of national GIS maps that summarized approximately 64 climatic parameters from 1961- 1990 based on the NOAA Climate Atlas for the conterminous United States. These maps characterized the climatic history of a given park unit and are available for download through the I&M Program's FTP site (http://science.nature.nps.gov/nrftp).

6. Geologic Resources Inventory

Geologic maps and associated interpretive reports, datasets, and metadata provide park managers and planners with fundamental information about geologic features and processes needed for effective decision-making. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults. Geologic processes include erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic maps are critical for documenting the nature and location of unique park geologic features such as cave and karst resources, paleontological resources, geothermal resources and unique rock formations, ground water supplies, the likely presence of some natural resources, and abandoned mine lands requiring restoration. Furthermore, integrating geologic data with other natural resource information can help park managers better protect visitor safety by identifying the location of potential geologic hazards.

Objectives of the Inventory

The Geologic Resources Inventory provides natural resource managers and staff, park planners, interpreters, researchers, and other NPS personnel with the minimal set of data and information about geologic features and processes needed for resource, visitor, and infrastructure protection.

Inventory Products and Services

This inventory provides each of the 270 I&M parks with a geologic scoping meeting, digital geologic map and associated data, and a park-specific geologic report.

1. Scoping Meeting: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.
2. Digital Geologic Map: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps—such as coastal or geologic hazard maps—may be used by the GRI to create digital data and meet park needs. These digital data allow geologic information to be easily viewed or analyzed in conjunction with a wide range of other resource management information in park geographic information systems. PDF copies of geologic maps that can be used without GIS software are also provided.
3. Geologic Report: Park-specific geologic reports identify geologic resource management issues as well as features and processes that are important to park ecosystems and park visitors. In addition, these reports present a brief geologic history of the park and address specific properties of geologic units present in the park.

Reports and maps are made available through the NPS Data Store and the Geologic Resources Division website (http://www.nature.nps.gov/geology/inventory/gre_publications.cfm). In addition to providing products to park managers and planners, the scientific community, educators, and the public are important users of GRI products which provide, in a user-friendly format, digital geologic GIS coverage unavailable elsewhere. The USGS and various State surveys directly link with the NPS Web sites to facilitate easy and ready access to GRI products.

7. Soil Resources Inventory

The Soil Resources Inventory provides the basic information needed to manage soil sustainability in parks and to protect water quality, wetlands, vegetation communities, and wildlife habitats. Soil resource inventories provide managers with the ability to predict the behavior of a soil under alternative uses, its potential erosion hazard, its potential for ground water contamination, its suitability for control of non-native plant species and establishment of native communities, and its potential for preservation of cultural sites and landscapes.

Objectives of the Inventory

The Soil Resources Inventory provides parks with maps showing the locations and extent of soils, and an interpretive report and other products to provide park managers and planners with data and information about the physical, chemical, and biological properties of the soils, as well as information regarding potential uses and limitations of each kind of soil type. The products are used for park planning (e.g., general management plans, resource stewardship strategy), natural resource condition assessments, park interpretive programs, identification of emerging soil resource management needs, and serve as baseline information for monitoring of soil resources by the Vital Signs Monitoring Program.

Inventory Product and Services

The NPS works cooperatively with the U. S. Department of Agriculture's Natural Resources Conservation Service (NRCS) to provide park managers with basic information about soil resources throughout the parks as well as more detailed information for potentially high-use or developed areas in the park (e.g., visitor centers, campgrounds, trails, access roads, etc.). The inventories provide an orderly, on-the-ground, scientific inventory of soil resources present in NPS units, and consist of digital maps of the locations and extent of soils, data about the physical, chemical, and biological properties of those soils, information pertaining to the use and management of these soils, as well as information and education products such as a soil survey manuscript, fact sheets, and image galleries. The information is in sufficient detail for application by park managers, planners, engineers, scientists, and researchers to specific areas of concern. Soil resource inventories follow procedures identified by the National Cooperative Soil Survey and are customized to meet local park needs and priorities. A more efficient approach and set of products is required for many of the large Alaskan parks because use of the same approaches and development of the same products as used in the other 49 states would be cost prohibitive at the scale of those parks.

Products of the Soil Resources Inventory include:

1. Geospatial soils data consistent with Soil Survey Geographic (SSURGO) standards;
2. Soil attributes, properties and interpretations exported from the National Soil Information System (NASIS) in a MS Access format;

3. Soil survey manuscript in both hardcopy and digital format;
4. Metadata following the Soil Survey Geographic Data Standard.

As a contributor to the National Cooperative Soil Survey (NCSS) effort, the NPS I&M Program is completing basic soil resource inventories for the 270 I&M parks. The NCSS is a nationwide partnership of federal, regional, state, and local agencies and institutions that is working together to cooperatively investigate, inventory, document, classify, and interpret soils and to disseminate, publish, and promote the use of information about the soils of the United States and its trust territories. The activities of the NCSS are carried out on national, regional, and state levels.

In addition to the products listed above, the following "optional" products may also be provided, depending upon the needs of the specific park being mapped:

- A park specific soil survey report, computer generated from the existing data contained in the National Soil Information System (NASIS) database, available in either a MS Word or Adobe PDF format.
- Digitally finished soil maps on an orthophoto base, at 1:24,000 or 1:12,000 scale, on either a full quad or quarter quad format, in an Adobe PDF format.
- USDA, Ecological Site Descriptions (ESD) in an Adobe PDF format, as well as in a park specific report, linked to the USDA Plants database as well as the USDA Ecological Site Information System (ESIS) database.
- Soil profile and soil landscape images in a digital format, with corresponding geospatial locations.
- Soil laboratory analyses for selected soil profiles within the park, with corresponding geospatial locations.

8. Water Body Location and Classification

Water is an essential natural resource that shapes our landscape and the life it supports. Knowledge of the locations and characteristics of water resources in parks is fundamental to understanding park ecological and physical systems and processes. Water resource location data (i.e., hydrography) provides basic information that allows parks, networks, and others to provide a variety of aquatic data to the hydrographic network and to share those attributes readily with others to help achieve common management goals.

Objective of the Inventory

The primary objective of the Water Resources Inventory is to provide information useful for a wide variety of park planning, monitoring, resource condition assessment, management decision-making, and interpretation and outreach purposes. The inventory focuses on the locations (with additional classification from that included in digital cartographic information) of streams, lakes, wetlands, and groundwater (hot springs, cold springs) and water quality use classifications.

Inventory Products and Services

To obtain the locations of hydrographic features in digital form, the NPS Inventory & Monitoring (I&M) Program and the Water Resources Division (WRD) partnered with the U.S. Geological Survey (USGS), State agencies, and other federal agencies to create the high-resolution (1:24,000, 1:63,360 in Alaska) National Hydrography Dataset (NHD) for 8-digit hydrologic units/subbasins containing national park units. The NHD (available at

http://nhd.usgs.gov/) is a feature-based geographic database that interconnects and uniquely identifies all the stream segments (or "reaches") that comprise surface water drainage systems. Included in NHD are hydrographic features such as streams, rivers, canals, lakes, ponds, reservoirs, springs, wells, swamps, and other hydrologic phenomena that appear on the typical USGS 7.5 minute (15' Alaska) topographic map series. A significant component of this inventory entailed incorporating park hydrographic data into NHD whenever a park had better data available than what was typically used to build the NHD.

In addition to location information, this inventory also provides parks with water quality use classifications and impairment status for park water bodies. Under the Clean Water Act, states are required to specify the designated beneficial uses (e.g. warm water fishery, cold water fishery, drinking water, primary contact recreation, etc.) of water bodies within their borders and promulgate legally enforceable water quality criteria that protect and preserve those uses. Water bodies that fail to achieve the specified water quality criteria are reported as 'impaired' on the state's 303(d) list and measures must be taken to bring the water into compliance. The I&M Program and the NPS Water Resource Division have partnered to create the Designated Use and Impairment (DUI) database (available at http://www1.nrintra.nps.gov/wrd/dui/ for NPS use only) to catalog state-designated beneficial uses, 303(d) listed impairments, and NHD-generated hydrographic statistics for parks.

9. Baseline Water Quality Data

Preserving and protecting water resources and water-dependent environments in parks is fundamental to the National Park Service mission. Parks need to ensure that the physical, chemical, and biological characteristics of their waters sustain healthy aquatic ecosystems, support the purposes of the park, and attain all state-designated beneficial uses. Perhaps few resources in parks are more impacted or influenced by activities outside park boundaries than water resources. For that reason, it is imperative that the NPS obtain accurate inventories of water resources within park boundaries from which to detect and quantify changes in both water quantity and quality. Park managers urgently need information about the current status of water quality in the park as well as "benchmarks" against which they can compare future information. In addition to benefiting parks, the information is needed to support activities associated with the Clean Water Act and other national regulatory programs.

Objectives of the Inventory

The primary objective of this inventory activity is to provide descriptive water quality information in a format useful to park managers and planners. For each park, a report is being prepared which summarizes a wide variety of water quality status and trend information. Additional water quality inventories are also being conducted for key water bodies in parks where coverage is incomplete and data gaps need to be filled.

Inventory Products and Services

A range of products have resulted from the Baseline Water Quality Data Inventory, including:

1. Baseline Water Quality Data Inventory and Analysis Reports. These reports summarize publicly-available physical, chemical, and biological water quality data contained in EPA's STORET Data Warehouse, EPA's Legacy Data Center, and the USGS National Water Information System.

2. Conversion of Data Sets to Digital Formats. Numerous physical, chemical, and biological water quality data were digitized or archived in EPA's STORET Data Warehouse, including over 2.8 million results at more than 19,000 sample sites for 848 projects.
3. Water Quality Gaps Filled. Level I Inventories were conducted for more than 70 national park units when the Baseline Water Data Inventory and Analysis Report revealed inadequate water quality data for key park water bodies.

Several basic water quality parameters for "key" water bodies (determined on the basis of size, uniqueness, threats, etc.) within the park boundaries are being included in the inventory. Water quality parameters include alkalinity, pH, conductivity, dissolved oxygen, rapid bio-assessment baseline (EPA/state protocols, involving fish and macro-invertebrates), temperature, and flow. Other constituents may be included on a case-by-case basis where deemed important, including toxic elements, clarity/turbidity, nitrate/nitrogen, phosphate/phosphorous, chlorophyll, sulfates, and bacteria.

10. Vegetation Inventory

The Vegetation Inventory is a cooperative effort between the NPS I&M Program and the U.S. Geological Survey to classify, describe, and map vegetation communities in more than 270 national park units across the United States. The inventory provides a digital map and other basic information on plant species and communities that are needed by park managers and planners to conserve plant biodiversity; manage challenges such as non-native species, insect outbreaks, and diseases; and to understand resources and processes such as wildlife habitat relationships and wildland fires. The Vegetation Inventory is making an important contribution to science and conservation because it represents the first time in the history of land management in the United States that vast acreages are being mapped and described using a unified vegetation classification and mapping standard. Field and lab teams that work in each park are expected to follow standardized field sampling and mapping protocols, and products of the inventory are made available to the scientific community and the general public through NPS I&M and USGS websites.

Objectives of the Inventory

The primary objective of the Vegetation Mapping Inventory is to produce high-quality, standardized maps and associated data sets of vegetation and other land-cover occurring within parks. This information fills and complements a wide variety of resource assessment, park management, and conservation needs.

The NPS vegetation inventory follows well-established procedures that are compatible with other agencies and organizations. The inventory uses the National Vegetation Classification Standard, a system that is integrated with the major scientific efforts in the taxonomic classification of vegetation, and is a Federal Geographic Data Committee standard. In addition, stringent quality control procedures ensure the reliability of the vegetation data and encourage the use of resulting maps, reports, and databases at multiple scales.

Inventory Products and Services

The process followed for each park (other than those in Alaska – see below) can be summarized by grouping essential activities as follows: (1) acquire and review existing data and "best

practices" to develop initial proposal; (2) scoping meeting/workshop for each park; (3) develop and submit study plan for approval of funding; (4) field data collection; (5) develop vegetation classification, alliance/association descriptions and field key; (6) acquire and prepare imagery; (7) image processing and segmentation; (8) GIS database and vegetation map preparation; (9) accuracy assessment; and (1) preparation of final reports and deliverables. The final products prepared for each park unit mapped are provided digitally on websites maintained by the NPS I&M Program and the U.S. Geological Survey (see http://biology.usgs.gov/npsveg/). Products for each park include digital files of the vegetation field data and map, keys and descriptions to plant communities (associations), reports, metadata, map accuracy verification summaries, and aerial photographs.

Maps are produced in UTM coordinates (NAD 83) with a 1:24,000 scale and a minimum mapping unit of 0.5 hectares. The vegetation maps must meet the National Map Accuracy Standards for positional accuracy, and a target accuracy goal of 80 percent across all vegetation and land cover classes.

Spatial Data products include:

- Aerial photography / imagery with flight line datasets
- Map classification
- Map classification description and key
- Spatial database of vegetation communities
- Hardcopy maps of vegetation communities
- Metadata for spatial databases
- Complete accuracy assessment of spatial data

Vegetation Information products include:

- Vegetation taxonomic classification
- Dichotomous field key of vegetation classes
- Formal description for each vegetation class
- Photointerpretation report for imagery
- Ground photos of vegetation classes
- Field data in database format

11. Species Lists

One of the fundamental resources and values that national parks were established to protect is the maintenance of biodiversity. To manage parks "unimpaired for future generations," park managers, planners, and scientists require basic information on the occurrence and status of species in parks as a basis for making decisions and working with other agencies, the scientific community, and the public for the long-term protection of park ecosystems. Park visitors are often extremely interested in knowing what species are found in parks and that are likely to be observed during different times of the year, and species information is essential for park resource interpretation programs, displays, and information packages. Information about threatened and endangered species and non-native species in the parks is often needed for development of management actions and preservation programs.

Objectives of the Inventory

As stated in NPS-75 (p. 15), "the ultimate goal is to establish an accurate inventory of all life forms with a park, but this is a long-term goal." Several parks have initiated ATBIs (All Taxa Biodiversity Inventory) through a variety of partnerships to work towards this long-term goal. To efficiently use the limited funding available during the initial phase of the Species Lists and Species Occurrence and Distribution inventories conducted prior to 2008, the focus has been on compiling existing data and undertaking targeted field investigations to document the occurrence of at least 90 percent of the species of vascular plants and vertebrates (birds, mammals, fish, amphibians, reptiles) currently estimated to occur in parks. These taxonomic groups were selected for the initial phase of the inventory because information was more readily available, taxonomy and field methodologies were better developed, and because they are more often the focus of park management actions or concerns compared to other species groups.

Inventory Products and Services

The initial phase of the Species Lists Inventory was a compilation of existing species lists and evidence records for vertebrates and vascular plants in the 270 I&M parks. Data existing as of 2000, when the effort began, were entered into the NPS master species database, NPSpecies, in a standard format and were quality-checked (certified) by subject-matter experts.

NPSpecies includes standardized information associated with the occurrence of species in parks, including scientific names and their synonyms, common names, abundance, residency, nativity, T&E status, and reasons why a species may be of particular management interest to a park. Historical and currently-accepted scientific names from multiple taxonomic classification systems are cross-referenced using taxonomic standards to allow for data comparison and sharing across parks and with other agencies and organizations. The certified species lists and supporting evidence records in NPSpecies support NPS staff and collaborators at the park, network, regional, and national levels by managing fundamental park-level species information, and making this information available to other applications and databases for more specialized analyses.

12. Species Occurrence and Distribution

A 1993 survey of 250+ natural resource parks revealed that more than 80 percent of those parks lacked reliable information about which species were present, their geographic and ecological distribution, and the relative abundance of species in the park. The Species List inventory involved the compilation, standardization, and quality-checking (certification) of existing species lists already available before 2000. This Species Occurrence and Distribution inventory provided for systematic field inventories, "data mining" activities, and other efforts to develop, organize, and deliver basic information about the occurrence, distribution, and relative abundance of vertebrate and vascular plant species in parks.

Objective of the Inventory

The Species Occurrence and Distribution inventory provides park managers with comprehensive, scientifically-credible information about the nature and status of selected biological resources occurring within park boundaries in a form that increases its accessibility and utility for making management decisions, for scientific research, and for informing educators and the general public. The objective of the inventory is to provide parks with funding and technical guidance

needed to describe the distribution and relative abundance of high-priority species of special concern, such as Threatened and Endangered species, non-natives, and other species of special management interest occurring within park boundaries. The inventory is also designed to provide the baseline information needed to design protocols for long-term monitoring of the condition of selected species and communities that parks identify as one of their "vital signs". The initial focus was on vertebrates and vascular plants because of funding restrictions. Inventories of other species and communities will be undertaken as part of the continuing inventories.

Inventory Products and Services

The primary products resulting from these inventories are peer-reviewed scientific reports; GIS products such as maps, geodatabases, and metadata; voucher specimens or photographs; and digital datasets, typically using the Natural Resource Database Template schema to promote quality and consistency throughout the NPS. Products are available through the Inventory Tracking Database and are posted on I&M network websites. The results of species detections are incorporated into the national NPSpecies database.

Special Considerations for Alaska Parks

Alaska Landcover Maps

The 16 national park units in Alaska contain about two-thirds of the total acreage in the National Park System, with 10 of the 16 parks exceeding 1 million acres. Because of the remote character and large size of Alaskan Parks it was recognized that the Vegetation Inventory must be done at a resolution that is more general than other I&M vegetation mapping efforts. The goal of the Alaska landcover mapping effort is to provide a cost effective mapping using existing technologies at a level of detail that will provide timely, useful input to I&M and park management decisions. The Alaskan landcover mapping effort is guided by Service-wide standards and provides a foundation for more detailed mapping efforts in the future.

The landcover mapping effort managed by Alaska Regional Office staff has identified a consistent suite of products that are produced for each of the park units. Landcover products are provided in hardcopy format and in digital format for use with ArcGIS, and guidance and products are made available to parks and collaborators on intranet and internet web pages. Although the majority of Alaska landcover projects have utilized satellite imagery and digital image processing techniques, manual interpretation of aerial photography has been used to derive landcover maps for specific parks where appropriate. The landcover program uses a variety of contractors and cooperative agreements to assist in developing products. NPS staff are heavily involved in product development and contract/cooperative agreement management.

Alaska Base Cartography

This inventory theme includes digital elevation models (DEM), digital line graphs for park boundaries, hypsography, hydrography, orthophotography, and transportation networks. In most of the United States, up-to-date aerial photography and ortho image products are routinely available for NPS lands, but these products are generally not available in Alaska. The USGS 1:63,360 topographic maps are currently the best available cartographic base for Alaska parks, but these maps were developed from 1950's era photography and technology, and often do not accurately reflect significant landscape changes that have occurred over the last 50+ years

including changes in water bodies, shorelines, glaciers, rivers, and human development. In addition, with the development of GPS units, the ability of researchers and the general public to identify spatial location has exceeded the accuracy of the 1:63,360 map. The creation of new, more accurate base cartographic products will significantly enhance park management, research, and visitor use.

Orthorectified TM satellite mosaics have been prepared for most national parks in Alaska as part of the Landcover Mapping Inventory. This imagery has a 30 m pixel and is useful for interpretation or delineations at a scale of approximately 1:100,000. The horizontal accuracy of these products is approximately ± 60 m. Current commercial satellite imagery vendors provide high resolution products (≤1 m pixel) that can be used to update imagery within Alaska's national parks. A minimum National Map Accuracy Standard (NMAS 1:24,000 or ± 12 m) has been proposed for these high-resolution orthoimage products. The NPS is currently working to develop these orthoproducts in cooperation with the USGS through the use of the USGS Commercial Remote Sensing Data Contract (CRSDC).

Currently hypsography and hydrography data are being updated through a cooperative agreement with USGS. An improved DEM for NPS units is being pursued through a cooperative Alaska-wide multi-year initiative that includes many local, state and federal agencies.

Alaska Soil Resources Inventory

It is not financially or logistically feasible for the NPS I&M Program to complete the Soil Resources Inventory for all of the large, remote Alaskan parks using the same approaches, standards, and products as used in the other 49 states. The cost to complete the first two parks was more than $2 Million over six years for Denali NP, and an estimated $2 Million over five years for Yukon-Charley NP. A more general reconnaissance soil product has been developed for BELA, CAKR, KOVA, NOAT, GAAR, and WRST (See Appendix 1 for a list of park names and acronyms). This more general product allows for a cost effective implementation of soils inventories throughout Alaska park units and provides classifications for soils to the soil subgroup level according to NRCS soil taxonomy. Using this approach, soil-landscape associations, or soil landscapes, are developed to characterize and map broader relationships among soil type, physiography, and vegetation. Park units with high-priority management areas needing more detailed soils information will have medium level NRCS Order 3 (1:63,360 scale) inventories conducted for such locations to augment the generalized soils product.

Status of the Initial Phase of the 12 Basic Inventories as of October 2008

The status of the initial phase of the AQRV, Geology, Soils, and Vegetation inventories is shown in Figure 2 (the initial phase is complete for all other inventories). As defined in Chapter 1, the initial phase of the inventory is "complete" for a park when the minimum supporting products deemed necessary for park managers and planners to effectively use and interpret the digital map, such as an explanatory report, metadata, and database files, have been delivered to the park. The AQRV inventory is expected to be complete for all 270 I&M parks by September 30, 2010. The projected number of parks that will not have completed inventories by September 30, 2012, based on current funding and staffing levels, is 34 parks for the Geologic Resources inventory, 42 parks for the Soil Resources Inventory, and 40 parks for the Vegetation Inventory (Figure 2). In the case of the Vegetation inventory, the 40 parks projected to be incomplete after FY 2012 include more than 12 million acres, which is more than one-third of the total acres to be mapped by this inventory (this does not include parks in Alaska, which use a different approach as described above).

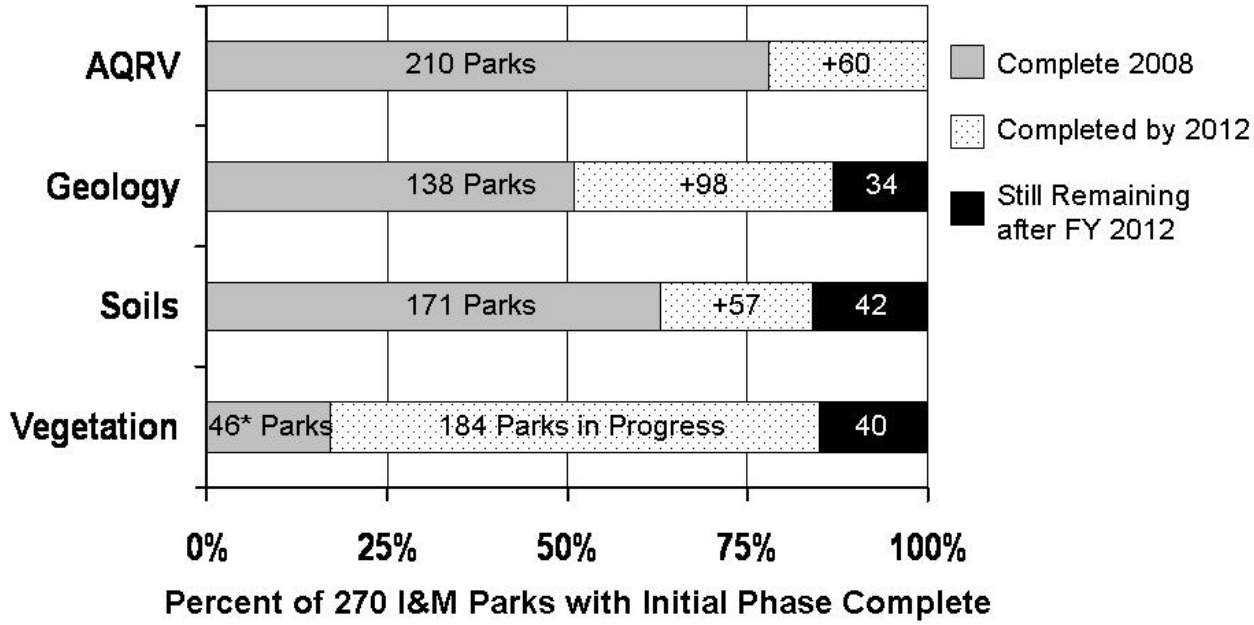

Figure 2. Status showing the number of parks for which the initial phase of the AQRV, Geology, Soils, and Vegetation inventories was complete as of September 30, 2008. Projections are shown, based on current funding and staffing levels, for the number of parks that will have received the inventory by September 30, 2012, and the number of parks that are not expected to have been completed by that time. *A digital vegetation map was available for 155 parks in FY 2008, but the additional needed products such as the report, metadata, and database files were only complete for 46 parks.

Chapter 3: Data and Information Management, Analysis, and Reporting

As part of the National Park Service's effort to "improve park management through greater reliance on scientific knowledge," a primary role of the I&M Program is to collect, organize, and make available natural resource data and to contribute to the Service's institutional knowledge by facilitating the transformation of data into information through analysis, synthesis, and modeling. Data and information are the common currency among the many different activities and people involved in the stewardship of a park's natural resources. Activities such as park planning, inventories, monitoring, research studies, restoration, control of non-native invasive species, management of threatened and endangered species, fire management, and interpretation all either require or provide natural resource data and information to others. Information obtained through the I&M Program represents a tremendous investment, and the Service has an obligation to ensure that those investments are protected and to ensure that the information and products are readily available for resource planning and management efforts throughout the agency.

Two of the goals of the I&M Program, namely "Integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making", and "Share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives", can only be achieved through the development of a modern information management infrastructure (e.g., staffing, hardware, software) and procedures to ensure that relevant natural resource data collected by NPS staff, cooperators, researchers and others are entered, quality-checked, analyzed, reported, archived, documented, cataloged, and made available to others for management decision-making, research, and education. The primary audience for many of the products from the I&M program is at the park level – provide park managers with the information they need to make better-informed decisions and to work more effectively with other agencies and individuals for the benefit of park resources. However, certain data are also needed at the regional or national levels for a variety of purposes, and as stated by the National Park Advisory Board (2001), the findings "must be communicated to the public, for it is the broader public that will decide the fate of these resources".

For most parks, funding and staff from the I&M Program is the primary means of measuring the status and trends in the condition of park resources and is a central component of an effective natural resource management program. Network staff are involved in numerous activities such as organizing and cataloging data collected by network staff and others, data analysis and synthesis, modeling, providing data and expertise to park planners, providing data and expertise for occasional resource assessments and resource stewardship strategies, and contributing to performance reporting. In just a few short years, the I&M networks have become known as a key source and supplier of reliable, organized, and retrievable information about parks that was formerly unavailable, misplaced, or lost to managers and others who needed the information for sound decisions or sound science.

Data and Information Systems - Operation and Maintenance

A comprehensive data management system is vital to achieving the I&M Program's goals related to information management, integration, and dissemination and for building institutional

knowledge. Standardized databases, which facilitate consistent data storage and retrieval throughout the Service, are needed to adequately protect the tremendous investment the Service is making in data acquisition. Standardized databases need to be linked with other planning and resource management databases as well. In addition to data storage and retrieval, inventory data must be analyzed and synthesized as part of "turning data into information" and providing a scientific basis for park management decisions and reporting on the status of America's natural resource heritage.

Historically, the NPS has had little success in obtaining the funding needed to develop an effective, modern data and information system and adequate IT support. As a consequence, parks do not have a strong culture of data management and relatively few staff are dedicated to data management. As a whole, NPS IT systems have been developed as silos in response to a specific function, such as payroll, budget or project tracking. They were not developed with a master set of blueprints that show how each system would relate to other systems, which would ensure that the overall IT systems work efficiently. As a result, park staff have been dissatisfied with existing IT systems, citing that they are poorly integrated, require redundant data entry, and that it is difficult for them to find the data files and information they need because of the many different, incompatible systems.

During 2004-2006, the I&M Program funded several studies, convened various workgroups, and conducted hundreds of interviews with NPS staff and collaborators to determine user needs and core requirements for modernizing natural resource data systems so that the NPS can more efficiently and effectively meet its mission. In October 2006, the Director of the NPS Natural Resource Program Center (NRPC) issued a policy directive that NRPC will create an integrated system (IRMA: Integrated Resource Management Applications) with a central web portal, single sign-on system, and common user interface for all natural resource applications. The I&M Program has taken the lead to develop IRMA, which will integrate all applications (starting with NatureBib, NPSpecies, and the NPS Data Store), eliminate redundant data storage, and streamline standard functions across applications (e.g., data entry, editing, searching and data retrieval). IRMA uses the Service Oriented Architecture (SOA) approach, which is the industry and Department of Interior "best practice", to modernize and integrate I&M systems and to strategically position the program for future changes in technology.

Data and information management based on state-of-the-art data practices has become a hallmark of the I&M Program. The general rule is that at least a third of the effort, in terms of funding or staff time, will be allocated to data management, analysis, and reporting. Each I&M network planned and implemented a comprehensive data management system that protects and enhances the long-term value of monitoring data. (See network and national data management plans at http://science.nature.nps.gov/im/datamgmt/dmplans.cfm). Providing well-documented data in appropriate formats and in a timely manner to park managers is especially important to the success of the program. Networks must ensure that data (1) can be easily found and obtained; (2) are subjected to full quality control before release; (3) are accompanied by complete metadata; (4) are provided in formats that are most useful to end users; and that (5) sensitive data are identified and protected from unauthorized access and distribution. All networks and the national program office have made a sustained and substantial investment in database design, data archiving, and in reporting data and derived information.

Data Integration, Analysis, and Synthesis (Decision Support)

A major challenge confronting the I&M Program (indeed, the entire Service) is to ensure that the large amount of data, and the many individual data sets and components, are converted into useful and readily-available *information* commensurate with the needs of policy makers, managers, planners and other stakeholders at all levels of the organization. *Information* is created from data as a result of processing, manipulating, synthesizing, or organizing data in a way that provides interpretation or meaning. If the tremendous financial investment the Service is making in ecological data collection and analysis is to be fully utilized, the Program must determine how to effectively integrate inventory and monitoring data and information across resource categories (e.g. vegetation, water, soils, air quality, etc.) to address critical management needs. This process of developing and implementing information needed to support managerial decision-making and planning is generally referred to as "Decision Support."

For most parks, the data and expertise developed and organized by the I&M Program are a major contributor to natural resource condition assessments and park planning documents (e.g., General Management Plan, Resource Stewardship Strategy). Data and expertise from the I&M Program and Natural Resource Condition Assessment Program are a key source of "resource condition" information that parks need to report to GPRA Land Health Goals and other performance goals. The I&M Program must work closely with park planners and NPS staff and collaborators involved in resource assessments to achieve common goals. The detailed, complex scientific data and information depicted as the lower levels of the information pyramid in Figure 3 below must be aggregated and translated through data synthesis, modeling, and resource assessments to produce information products that effectively communicate monitoring results to policy makers and the general public. The I&M networks and NRPC staff are working with science communication specialists and interpreters to develop more effective summary reports and graphics for presenting inventory and monitoring results.

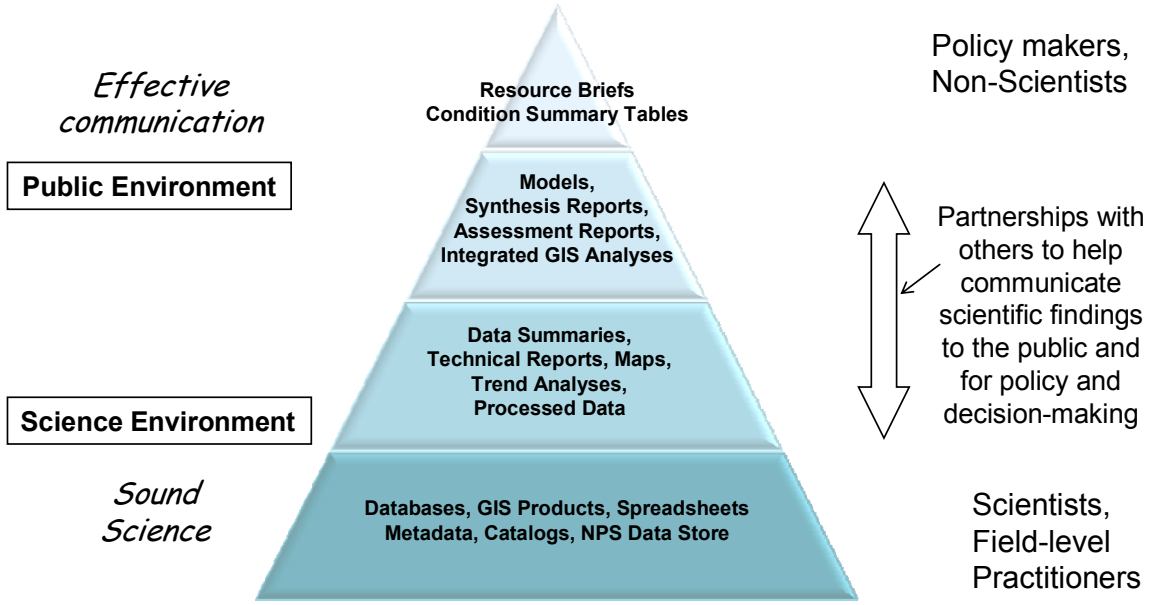

Figure 3. The information pyramid. The amount of detail and scale of analysis of scientific data will differ depending on the intended audience for the various reports and presentations. National-level reporting to policy makers and the general public will involve assessments by experts and presentations of data using highly aggregated indices and simple graphical messages. Results must be supported by a large amount of detailed, complex scientific data that is available at the park and network level.

Chapter 4: Major Programmatic Challenges and Issues

Current needs by park managers, planners, interpreters, and other key users of basic inventory data far exceed the funding that is available. The Inventory and Monitoring Program will face five major challenges associated with natural resource inventories over the next 10-15 years. These challenges will place increasing demand on the Program's ability to achieve its long-term goals, comply with accountability expectations, and provide critical information resources needed by parks and networks throughout the National Park System.

The five major challenges and the actions the Program will undertake to deal with them are summarized as follows:

Challenge 1 - Completing the Initial Phase of Basic Inventories in a Timely Manner

Perhaps the most pressing challenge facing the Inventory and Monitoring Program during the next several years will be to complete the initial phase of the 12 basic inventories in a timely manner, so that all 270 I&M parks have at least the minimal set of natural resource information needed to effectively manage park resources, and so that parks can address other high-priority inventory needs. Since 2000, when the list of 270 I&M Parks was established, additional parks have been added to the National Park System or in some cases park boundaries have been greatly extended, and those park lands also need basic inventory information. Funding from park base and through partnerships with other programs and agencies to augment what the I&M Program can provide has been minimal because of the grim budget and staffing situation for parks and partner organizations. At the current level of funding, if the same approaches and suite of products are developed for the remaining parks, completion of the initial phase of the basic inventories for the remaining parks will take more than six years for the geology and soils inventories, at least 10 years for the minimum inventories needed for Alaska parks, and at least 10-12 years to complete the initial vegetation inventory.

Actions to be taken: Over the next five years, the I&M Program will undertake a number of actions to address these challenges and expedite completion of the initial phase of basic inventories for all parks. These actions were developed based on input from key end users, and reviews of the various inventory efforts during 2006-2008 by the I&M Advisory Council and the I&M Program Leader.

- For the AQRV, geology, soils, and vegetation inventories (as well as for the inventories that remain to be completed for the Alaska parks), clearly define the minimum data set and products for which the I&M Program will provide funding, including the minimum products needed for park managers and planners to effectively use and interpret the inventory data and products. Further, updated guidance, standards, and contract and product specifications based on lessons learned to-date, will be provided to parks, contractors, and collaborators to clarify the set of products and level of detail that the I&M Program will fund. Funding from park base accounts and other partnerships will be needed if the parks require additional products or level of detail beyond what the I&M Program can provide.
- Implement and enforce a set of policies (see Chapter 5) designed to streamline the completion of the initial phase of basic inventories for the 270 parks and to fairly and

effectively deliver the minimum inventory data sets and products to those parks, so that available funding can be provided to I&M parks to address their highest-priority needs.

- Implement project tracking systems and other methods to provide better accountability and oversight of the basic inventories, and to better coordinate field inventories, reduce costs, and expedite project completions.
- Ensure that all products of work funded by the I&M Program through partnerships with other programs and agencies, are clearly identified as products of the NPS I&M Program. It is important for continued funding and accountability reasons that officials in the budget office and Dept. of Interior, park superintendents and other managers, and key individuals with other programs and agencies associate the large number of products and services and the high productivity of the I&M Program with the line-item funding that is provided to the Program.
- Increase efforts and develop incentives to leverage I&M funding through partnerships with parks, other programs (e.g., fire program), and other agencies. Parks that have natural resource staff but are not able to assist in coordinating logistics or help with streamlining the inventory effort should be left until last.
- Continue to inform NPS leadership including Regional Chiefs, Regional Directors, park superintendents, and individuals responsible for overseeing NRPP and other program funds, that funding from the I&M Program can only fund a small portion of the high-priority inventory and monitoring needs of parks, and that funding from park base, NRPP, FLREA (Federal Land Recreation Enhancement Act) funding, and other sources is critical to addressing the needs of parks in a timely manner.
- Pursue increased programmatic funding for inventories, through individual park legislation, FLREA funding, the Centennial Challenge, or other venues.

Challenge 2 - Meeting Park Needs for Continuing and Recurring Inventories

The initial phase of work described in NPS-75 for the 12 basic inventories was developed 16 years ago based on the knowledge and technologies available at that time. To efficiently implement the inventories with very limited funding, the initial phase of work began with tasks that could be completed with the available methodology and technology. For example, species inventories were initiated for vertebrates and vascular plants because field methodologies, taxonomy, and existing information for designing efficient inventories were better developed for those taxonomic groups. Inventories of other species groups were postponed until later (i.e., now), when improved knowledge and technology would allow us to more cost-effectively undertake inventories of those groups. Similarly, inventories of submerged resources such as underwater vegetation, bathymetry, and benthic habitat mapping that are extremely important to some parks, were deferred until later when better knowledge and technology would allow us to undertake them more cost-effectively. The basic inventories can now be continued given our current knowledge and improvements in technology, taxonomy, and methodologies during the past 16 years.

There is also the need to update some of the basic inventories on a periodic basis (i.e., “recurring inventories”). Inventories represent a “snapshot” of resource condition at a single point in time, and the status and distribution of resources such as vegetation, animal species and communities, and water resources can be expected to change over time. If the “digital map” and other products

of the basic inventories of those resources are to maintain their value for natural resource planning and management activities, they need to be repeated at some interval.

Actions to be taken: To meet the Service's need for continuing and recurring inventories, the I&M Program will undertake the following actions over the next five years:

- Implement the actions under Challenge 1 above and the policies in Chapter 5 to complete the initial phase of the 12 basic inventories in a timely manner.
- Network I&M managers, working with their network technical committee and Board of Directors, should begin identifying each network's highest priorities for continuing and recurring inventories. We will use that information to formulate priorities, action plans, funding requirements, and protocol and standards development as necessary to efficiently implement those inventories in the future.
- To strategically position the Service to undertake continuing and recurring inventories in the future, the I&M Program should provide leadership, guidance, and funding now for planning investigations, development of methodology and database standards, protocol development, development of interagency partnerships, and other activities that will require several years to develop but that are identified as a priority and require consistency across a large number of parks.
- Establish cooperative efforts and partnerships with other programs and non-NPS entities to leverage funding and expertise needed to undertake continued and recurring inventories.

Challenge 3 – Adapting to Changing Needs and Priorities as a Result of Climate Change and Other Emerging Issues

It is becoming increasingly accepted that parks must be managed as parts of larger ecological systems, and that scientific information must form the foundation for natural resource stewardship efforts to meet the NPS mission. The day-to-day tasks involved in managing a park's natural resources have become much more technically and politically complex. As a result of climate change, an increased emphasis on ocean stewardship, and other emerging issues, there is a greater-than-ever need for natural resource data and information needs by park managers, planners, educators, and interpreters to allow the Service to more effectively confront and mitigate threats to the park and operate more effectively in political and legal arenas. The priority data and information will need to be updated for some parks as a result of increased knowledge and sophistication, as well as to new partnership and management opportunities that arise because of climate change and other emerging issues.

Challenge 4 - Effective Delivery of Data and Information to Key Audiences

To effectively manage, utilize, and deliver the basic data and information needed for natural resource management and protection, a major challenge confronting the I&M Program over the next 5 years will be to transition to a more efficient data management infrastructure, one that meets stakeholder needs at all organizational levels. Among other things, the infrastructure will need to enhance communication, standardize data formats, improve the ability of staff to find the existing data and products they need, and increase the use of natural resource data to guide management, research, and policy decisions throughout the organization.

Actions to be taken: The I&M Program will undertake the following actions over the next five years to enhance the efficiency and functionality of data and information systems. The program will:

- Provide the leadership, funding, staff, and other resources needed during the first few years (i.e., "start-up phase") of the IRMA project (Integration of Resource Management Applications) in order to develop and implement a strategy for improving the overall effectiveness and implementation of major Program applications.
- Transition the major I&M Program applications (beginning with NPSpecies, NatureBib, and the NPS Data Store) to a Service Oriented Architecture (SOA) as part of the IRMA project, to better integrate those applications, reduce redundancies, streamline functionality, and to position the I&M Program for future integration with other natural resource systems.
- Continue to provide the leadership, guidance, standards, and tools to allow the 32 I&M networks to coordinate their data management efforts and to improve the efficiency and quality of work funded by the I&M program.

Challenge 5 – Data Integration, Analysis, and Synthesis (Decision Support)

Key challenges for the many scientists, data managers, park staff, and collaborators involved with the I&M Program include the need to develop integrated information products through data synthesis and modeling from the data sets and reports produced for individual inventories and vital signs, and the need to aggregate and translate the large amount of complex, scientific data to decision makers, policy makers, and the general public. With the limited staff and funding we have available, we must balance the need for collecting and analyzing new data with the need to better utilize and integrate existing data so that we can provide park managers, educators, and others with useful information products.

Actions to be taken: The I&M Program will undertake several actions over the next five years to address stakeholder information needs. The program will:

- Provide funding, staff, and administrative support for efforts designed to gain a better understanding of the agency's critical "business requirements" and commensurate information needs for natural resource planning, stewardship and protection.
- Continue to sponsor workgroups and workshops to produce a framework for improved coordination and integration between NPS science and planning programs as a means of helping parks effectively implement "condition-based" natural resource management and performance reporting.
- In partnership with the USGS Status and Trends Program, analyze and synthesize biotic and abiotic data generated by the basic inventories and vital signs monitoring to provide useful information, models, and tools to park managers for addressing resource management issues. The USGS is currently providing funding for USGS scientists to work with scientists from the 32 I&M networks on the theme "Integrated Analysis, Modeling, and Synthesis of NPS Inventory and Monitoring Data to Inform Condition-based Management."
- To further develop NPS expertise, tools, and procedures for integrated analysis, synthesis, and modeling of inventory and monitoring data, national I&M Program staff

will work with managers from several parks to develop predictive GIS models and other decision support tools that transform basic inventory data sets into management projections or scenarios to assist with park planning or management decision-making. The National I&M Program will continue to provide assistance to parks and networks from staff with specialized skills and expertise in statistical analysis, computer modeling, and decision support.

- Sponsor development of geographic information systems and other tools designed to convert inventory and monitoring field data into management information that can be used to address business requirements and facilitate an adaptive management approach to natural resource stewardship.
- Continue to provide leadership and coordination among NPS Programs for the "Connect the Dots" effort, which is a strategic, long-term framework developed and supported by multiple individuals and programs at the park, network, regional, and national levels, to better connect science to park management through the planning process.
- Provide expertise and coordination to the Natural Resource Condition Assessment Program, which is funding natural resource assessments for all I&M parks based on existing, already-summarized data. These assessments provide an interdisciplinary, semi-quantitative evaluation of best-available and ready-to-use scientific data and information from all available sources, including the NPS I&M Program, other NPS programs, and other agencies and universities.
- Support the development of "virtual learning centers" such as the Learning Center of the American Southwest and the Greater Yellowstone Science Learning Center, as a means of organizing and disseminating information to key audiences and the general public.

Chapter 5: Policy and Related Guidance

Official policy and guidance for the I&M Program was initially promulgated in *NPS-75, Natural Resources Inventory and Monitoring Guideline*, published in 1992, and has since been augmented by various policy memos as the program has expanded and matured (see Policy Memos at http://www1.nrintra.nps.gov/im/monitor/officialmemos.cfm). The following additional policies are established to implement the recommendations and meet the challenges described in this inventory strategy. (These policies also apply to the prototype monitoring parks for which funding was transferred from the I&M Program to park base).

Policy Statements

Accommodation of "New" Parks – This policy applies to any park unit not currently included on the official I&M park listing (see Appendix 1). During the next five years, I&M funds will not be used for inventories for "new" parks except perhaps in a few unique cases where: (1) the inventory can be done extremely efficiently ("almost free") because of work that is being done at an adjacent or nearby I&M park; (2) a written request and justification is provided to the I&M Program Leader by the Chair of the network's Board of Directors; and (3) written approval is given by the I&M Program Leader. Once inventories have been completed for all 270 parks on the official list, consideration may be given to funding at least some inventories in additional parks.

Accommodation of Park Expansions – Whenever the boundaries of an official I&M park are expanded after I&M funding to initiate an inventory has been provided, inventories within that expanded area will only be accommodated as time and resources permit. Cost leveraging opportunities and efficiencies will be a major factor in deciding which projects will be funded. Individual projects will be considered on a case-by-case basis following the process described in Appendix 2.

Geographic Extent of Inventories – The policy of the I&M Program is to complete inventory projects to legal park boundaries. Inventories may be conducted beyond park boundaries if there is no additional cost (e.g., geologic resource maps are done by quad sheet, and it would actually be more expensive to clip to park boundaries), or if additional funding can be obtained from other sources to cover the incremental costs of conducting inventories in those additional areas. Written approval from the I&M Program Leader is needed to extend inventories beyond park boundaries except in cases where there is no additional cost to the I&M Program.

Parks Must Meet Minimum Program Standards to be Eligible for Future Inventory Funding
The I&M Program has established minimum standards for all parks eligible for I&M funding. The minimum standards include (1) implementation of a peer-reviewed and approved vital signs monitoring plan; (2) timely development of peer-reviewed monitoring protocols consistent with the Oakley et al. (2003) protocol standards; (3) development and maintenance of databases consistent with the Natural Resource Database Template and other I&M database standards as described in network data management plans; (4) routine analysis and reporting of inventory and monitoring data as described in the network's monitoring plan; and (5) submittal and approval of the annual administrative report and work plan. Any park that does not meet these standards will

not be eligible for inventory funding beyond the initial phase of the 12 basic inventories as described in NPS-75.

Annual Administrative Reports and Work Plans for Inventories – Coordinators for each inventory are required to prepare and submit an annual work plan that documents their accomplishments during the previous year and projected activities for the upcoming year. Among other things, the annual work plan should provide a listing of project completions, projects currently in progress and what stage of completeness they are in, new starts, and a brief rationale for selection of new starts. Guidance, templates, and annual reports submitted in past years by networks and parks are available at the following website: http://www1.nrintra.nps.gov/im/monitor/aarwpguidance.cfm.

Chapter 6: Funding Strategy for FY 2008 - FY 2012

General Strategy

Funding increases for natural resource inventories received through the Natural Resource Challenge allowed the National Park Service to significantly increase the rate at which natural resource inventories have been completed. The vegetation, geology, and soils inventories for all parks, and the base cartography, geology, and soils inventories for the large Alaska parks, are particularly expensive and typically require several years to complete for a given park. Therefore, current expectations are that some of those inventories will not be completed until well beyond FY 2012.

However, given that initial phase for most of the 12 basic inventories has been, or will soon be completed, consideration needs to be given to how the funding previously allocated to those inventories could be used most productively in the future. The following sections focus on future funding strategy for three major components of the inventory program: 1) completion of the initial phase of the 12 basic inventories, 2) continuing and recurring inventories, and 3) operation and maintenance activities.

Allocation of Funding Among Major Inventory Components

Initial Phase of 12 Basic Inventories

As part of the Natural Resource Challenge, the Service requested a funding increase to expedite completion of the initial phase for the 12 basic inventories, and the Congress provided $9.3 Million for that purpose. Prior to receiving the funding increase, the Service estimated 25-30 years would be required to complete the initial phase of the 12 basic inventories for all natural resource parks. Given the increase, estimates were that the initial phase of the inventories could be completed (or fully funded) in 10-12 years. (Although new parks and expanded park lands have been added in recent years, and we have since learned that explanatory reports and metadata and databases needed to be delivered along with the "digital map" to make them useful to parks, no additional funding has been provided to meet those needs). It follows then that the I&M Program's top funding priority **must** be to allocate the majority of available inventory funds towards the completion of the initial phase of the 12 basic inventories for all parks on the official I&M list. To comply with the commitments made to Congress, *a minimum of 80 percent* of all funding available for inventories during each of the next five years will be devoted to completing basic inventories for the 270 official I&M parks, as described in the funding requests as part of the Natural Resource Challenge. The actions and policies described in Chapters 4 and 5 will be implemented to accelerate the process and increase efficiency.

Continuing and Recurring Inventories

Continuing inventories are high-priority inventories that all parks do not have in common, or that were deferred until improved technology, taxonomy, and knowledge were available to allow us to more cost-effectively undertake these high-priority inventories. Examples include inventories of submerged resources (e.g., bathymetry, underwater vegetation, benthic habitat mapping), lichens, invertebrates, fossils, and wetlands. To strategically position the Service to undertake continuing inventories in the future, the I&M Program should provide leadership, guidance, and funding now for planning investigations, development of methodology and database standards,

protocol development, development of interagency partnerships, and other activities that will require several years to develop but that are identified as a priority and require consistency across a large number of parks. The NPS also needs to begin now to establish cooperative efforts and partnerships with other programs and non-NPS entities to leverage funding and expertise needed to undertake continuing and recurring inventories.

More than 70 units of the National Park System are located on the ocean and Great Lakes and more than 40 others include submerged lands and waters within their boundaries. Enhanced conservation and management of submerged marine and estuarine resources is moving to the forefront at the NPS national level, as evidenced by an Ocean Park Stewardship Task Force and Action Plan. Submerged resource maps and inventories are required by managers in order to be effective stewards of park marine and estuarine resources, but the most fundamental of natural resource inventories and maps are often lacking for the submerged portions of most coastal parks. Park managers often require benthic habitat maps, depicting benthic community species composition and indicator species associated with various bottom-types, including seagrass/macroalgal distribution. Comprehensive species inventories of benthic and pelagic species associated with the various submerged habitat types are needed.

Recurring inventories: Some resource conditions, such as those associated with vegetation communities, water resources, and air quality, can be expected to change over time. If the basic inventories of those resources are to maintain their value for natural resource planning and management activities, they need to be repeated at some interval. The Service would undermine the integrity of the entire inventory effort if it did not provide at least some capability for repeating essential inventories (e.g., vegetation maps, water quality, etc.) for parks. For that reason, in addition to completing the outstanding inventories, the Service may allocate a small amount of funding during each of the next five years for recurring needs associated with the 12 basic inventories, but much of this work will need to wait until after the initial phase of work for the 270 parks has been completed.

In order to address the needs for continuing and recurring inventories, the I&M Program will allocate up to *5 percent (maximum)* of the total annual inventory budget over five years, beginning in FY 2008, to meet these needs. This funding will be allocated to projects on a strategic, competitive basis following the process described in Appendix 2. Priority during the next several years will be given to projects that help us develop standards, protocols, and product specifications to prepare for inventories of submerged resources and continued inventories of species groups, with priority given to projects that will benefit multiple parks and networks and that demonstrate a significant cost-leveraging opportunity.

Data Management and Decision Support

Beginning in FY 2008, up to *15 percent (maximum)* of the total inventory budget may be allocated to the acquisition of Information Technology personnel and expertise required for the ongoing operation and maintenance of inventory data management and information management systems, and to fund various contractual and cooperative efforts associated with the development of IRMA and the modernization and streamlining of I&M data systems.

Chapter 7: References

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Appendix 1. List of 270 Inventory and Monitoring Parks.

Unit	Unit Name	Network
Alaska Region		
ALAG	Alagnak Wild River	Southwest Alaska
ANIA	Aniakchak National Monument and Preserve	Southwest Alaska
BELA	Bering Land Bridge National Preserve	Arctic
CAKR	Cape Krusenstern National Monument	Arctic
DENA	Denali National Park and Preserve	Central Alaska
GAAR	Gates of the Arctic National Park and Preserve	Arctic
GLBA	Glacier Bay National Park and Preserve	Southeast Alaska
KATM	Katmai National Park and Preserve	Southwest Alaska
KEFJ	Kenai Fjords National Park	Southwest Alaska
KLGO	Klondike Gold Rush National Historic Park	Southeast Alaska
KOVA	Kobuk Valley National Park	Arctic
LACL	Lake Clark National Park and Preserve	Southwest Alaska
NOAT	Noatak National Preserve	Arctic
SITK	Sitka National Historic Park	Southeast Alaska
WRST	Wrangell-St. Elias National Park and Preserve	Central Alaska
YUCH	Yukon-Charley Rivers National Preserve	Central Alaska
Intermountain Region		
ALFL	Alibates Flint Quarries National Monument	Southern Plains
AMIS	Amistad National Recreation Area	Chihuahuan Desert
ARCH	Arches National Park	Northern Colorado Plateau
AZRU	Aztec Ruins National Monument	Southern Colorado Plateau
BAND	Bandelier National Monument	Southern Colorado Plateau
BEOL	Bent's Old Fort National Historic Site	Southern Plains
BIBE	Big Bend National Park	Chihuahuan Desert
BICA	Bighorn Canyon National Recreation Area	Greater Yellowstone
BITH	Big Thicket National Preserve	Gulf Coast
BLCA	Black Canyon of the Gunnison National Park	Northern Colorado Plateau
BRCA	Bryce Canyon National Park	Northern Colorado Plateau
CACH	Canyon De Chelly National Monument	Southern Colorado Plateau
CAGR	Casa Grande Ruins National Monument	Sonoran Desert
CANY	Canyonlands National Park	Northern Colorado Plateau
CARE	Capitol Reef National Park	Northern Colorado Plateau
CAVE	Carlsbad Caverns National Park	Chihuahuan Desert
CAVO	Capulin Volcano National Monument	Southern Plains
CEBR	Cedar Breaks National Monument	Northern Colorado Plateau
CHCU	Chaco Culture National Historic Park	Southern Colorado Plateau
CHIC	Chickasaw National Recreation Area	Southern Plains
CHIR	Chiricahua National Monument	Sonoran Desert
COLM	Colorado Nation Monument	Northern Colorado Plateau
CORO	Coronado National Memorial	Sonoran Desert
CURE	Curecanti National Recreation Area	Northern Colorado Plateau
DETO	Devils Tower National Monument	Northern Great Plains
DINO	Dinosaur National Monument	Northern Colorado Plateau
ELMA	El Malpais National Monument	Southern Colorado Plateau
ELMO	El Morro National Monument	Southern Colorado Plateau

Unit	Unit Name	Network
FLFO	Florissant Fossil Beds National Monument	Rocky Mountain
FOBO	Fort Bowie National Historic Site	Sonoran Desert
FOBU	Fossil Butte National Monument	Northern Colorado Plateau
FODA	Fort Davis National Historic Site	Chihuahuan Desert
FOLA	Fort Laramie National Historic Site	Northern Great Plains
FOUN	Fort Union National Monument	Southern Plains
GICL	Gila Cliff Dwellings National Monument	Sonoran Desert
GLAC	Glacier National Park	Rocky Mountain
GLCA	Glen Canyon National Recreation Area	Southern Colorado Plateau
GOSP	Golden Spike National Historic Site	Northern Colorado Plateau
GRCA	Grand Canyon National Park	Southern Colorado Plateau
GRKA	Grant-Kohrs Ranch National Historic Site	Rocky Mountain
GRSA	Great Sand Dunes National Park	Rocky Mountain
GRTE	Grand Teton National Park	Greater Yellowstone
GUMO	Guadalupe Mountains National Park	Chihuahuan Desert
HOVE	Hovenweep National Monument	Northern Colorado Plateau
HUTR	Hubbell Trading Post National Historic Site	Southern Colorado Plateau
LAMR	Lake Meredith National Recreation Area	Southern Plains
LIBI	Little Bighorn Battlefield National Monument	Rocky Mountain
LYJO	Lyndon B. Johnson National Historic Park	Southern Plains
MEVE	Mesa Verde National Park	Southern Colorado Plateau
MOCA	Montezuma Castle National Monument	Sonoran Desert
NABR	Natural Bridges National Monument	Northern Colorado Plateau
NAVA	Navajo National Monument	Southern Colorado Plateau
ORPI	Organ Pipe Cactus National Monument	Sonoran Desert
PAAL	Palo Alto Battlefield National Historic Site	Gulf Coast
PAIS	Padre Island National Seashore	Gulf Coast
PECO	Pecos National Historic Park	Southern Plains
PEFO	Petrified Forest National Park	Southern Colorado Plateau
PETR	Petroglyph National Monument	Southern Colorado Plateau
PISP	Pipe Spring National Monument	Northern Colorado Plateau
RABR	Rainbow Bridge National Monument	Southern Colorado Plateau
ROMO	Rocky Mountain National Park	Rocky Mountain
SAAN	San Antonio Missions National Historic Park	Gulf Coast
SAGU	Saguaro National Park	Sonoran Desert
SAND	Sand Creek Massacre National Historic Site	Southern Plains
SAPU	Salinas Pueblo Missions National Monument	Southern Colorado Plateau
SUCR	Sunset Crater Volcano National Monument	Southern Colorado Plateau
TICA	Timpanogos Cave National Monument	Northern Colorado Plateau
TONT	Tonto National Monument	Sonoran Desert
TUMA	Tumacacori National Historic Park	Sonoran Desert
TUZI	Tuzigoot National Monument	Sonoran Desert
WABA	Washita Battlefield National Historic Site	Southern Plains
WACA	Walnut Canyon National Monument	Southern Colorado Plateau
WHSA	White Sands National Monument	Chihuahuan Desert
WUPA	Wupatki National Monument	Southern Colorado Plateau
YELL	Yellowstone National Park	Greater Yellowstone
YUHO	Yucca House National Monument	Southern Colorado Plateau
ZION	Zion National Park	Northern Colorado Plateau

Unit	Unit Name	Network
Midwest Region		
AGFO	Agate Fossil Beds National Monument	Northern Great Plains
APIS	Apostle Islands National Lakeshore	Great Lakes
ARPO	Arkansas Post National Memorial	Heartland
BADL	Badlands National Park	Northern Great Plains
BUFF	Buffalo National River	Heartland
CUVA	Cuyahoga Valley National Park	Heartland
EFMO	Effigy Mounds National Monument	Heartland
FOLS	Fort Larned National Historic Site	Southern Plains
FOUS	Fort Union Trading Post National Historic Site	Northern Great Plains
GRPO	Grand Portage National Monument	Great Lakes
GWCA	George Washington Carver National Monument	Heartland
HEHO	Herbert Hoover National Historic Site	Heartland
HOCU	Hopewell Culture National Historic Site	Heartland
HOME	Homestead National Monument of America	Heartland
HOSP	Hot Springs National Park	Heartland
INDU	Indiana Dunes National Lakeshore	Great Lakes
ISRO	Isle Royale National Park	Great Lakes
JECA	Jewel Cave National Monument	Northern Great Plains
KNRI	Knife River Indian Villages National Historic Site	Northern Great Plains
LIBO	Lincoln Boyhood National Memorial	Heartland
MISS	Mississippi National River and Recreation Area	Great Lakes
MNRR	Missouri National River and Recreation Area	Northern Great Plains
MORU	Mount Rushmore National Memorial	Northern Great Plains
NIOB	Niobrara National Scenic Riverway	Northern Great Plains
OZAR	Ozark National Scenic Riverways	Heartland
PERI	Pea Ridge National Military Park	Heartland
PIPE	Pipestone National Monument	Heartland
PIRO	Pictured Rocks National Lakeshore	Great Lakes
SACN	Saint Croix National Scenic River	Great Lakes
SCBL	Scotts Bluff National Monument	Northern Great Plains
SLBE	Sleeping Bear Dunes National Lakeshore	Great Lakes
TAPR	Tallgrass Prairie National Preserve	Heartland
THRO	Theodore Roosevelt National Park	Northern Great Plains
VOYA	Voyageurs National Park	Great Lakes
WICA	Wind Cave National Park	Northern Great Plains
WICR	Wilson's Creek National Battlefield	Heartland
National Capital		
ANTI	Antietam National Battlefield	National Capital Region
CATO	Catoctin Mountain Park	National Capital Region
CHOH	Chesapeake and Ohio Canal National Historic Park	National Capital Region
GWMP	George Washington Memorial Parkway	National Capital Region
HAFE	Harpers Ferry National Historic Park	National Capital Region
MANA	Manassas National Battlefield Park	National Capital Region
MONO	Monocacy National Battlefield	National Capital Region
NACE	National Capital Parks-East	National Capital Region
PRWI	Prince William Forest Park	National Capital Region
ROCR	Rock Creek Park	National Capital Region

Unit	Unit Name	Network
WOTR	Wolf Trap National Park for the Performing Arts	National Capital Region
Northeast Region		
ACAD	Acadia National Park	Northeast Temperate
ALPO	Allegheny Portage Railroad National Historic Site	Eastern Rivers and Mountains
APCO	Appomattox Court House National Historic Park	Mid-Atlantic
ASIS	Assateague Island National Seashore	Northeast Coastal Barrier
BLUE	Bluestone National Scenic River	Eastern Rivers and Mountains
BOHA	Boston Harbor Islands National Recreation Area	Northeast Temperate
BOWA	Booker T. Washington National Monument	Mid-Atlantic
CACO	Cape Cod National Seashore	Northeast Coastal and Barrier
COLO	Colonial National Historic Park	Northeast Coastal and Barrier
DEWA	Delaware Water Gap National Recreation Area	Eastern Rivers and Mountains
EISE	Eisenhower National Historic Site	Mid-Atlantic
FIIS	Fire Island National Seashore	Northeast Coastal and Barrier
FONE	Fort Necessity National Battlefield	Eastern Rivers and Mountains
FRHI	Friendship Hill National Historic Site	Eastern Rivers and Mountains
FRSP	Fredericksburg and Spotslvania National Military Park	Mid-Atlantic
GARI	Gauley River National Recreation Area	Eastern Rivers and Mountains
GATE	Gateway National Recreation Area	Northeast Coastal and Barrier
GETT	Gettysburg National Military Park	Mid-Atlantic
GEWA	George Washington Birthplace National Monument	Northeast Coastal and Barrier
HOFU	Hopewell Furnace National Historic Site	Mid-Atlantic
JOFL	Johnstown Flood National Memorial	Eastern Rivers and Mountains
MABI	Marsh-Billings-Rockefeller National Historic Park	Northeast Temperate
MIMA	Minute Man National Historic Park	Northeast Temperate
MORR	Morristown National Historic Park	Northeast Temperate
NERI	New River Gorge National River	Eastern Rivers and Mountains
PETE	Petersburg National Battlefield	Mid-Atlantic
RICH	Richmond National Battlefield	Mid-Atlantic
ROVA	Roosevelt-Vanderbilt Headquarters	Northeast Temperate
SAGA	Saint-Gaudens National Historic Site	Northeast Temperate
SAHI	Sagamore Hill National Historic Site	Northeast Temperate
SAIR	Saugus Iron Works National Historic Site	Northeast Temperate
SARA	Saratoga National Historic Park	Northeast Temperate
SHEN	Shenandoah National Park	Mid-Atlantic
THST	Thomas Stone National Historic Site	Northeast Coastal and Barrier
UPDE	Upper Delaware National Scenic and Recreation River	Eastern Rivers and Mountains
VAFO	Valley Forge National Historic Park	Mid-Atlantic
WEFA	Weir Farm National Historic Site	Northeast Temperate
Pacific West Region		
AMME	American Memorial Park	Pacific Islands
BIHO	Big Hole National Battlefield	Upper Columbia Basin
CABR	Cabrillo National Monument	Mediterranean Coast
CHIS	Channel Islands National Park	Mediterranean Coast
CIRO	City of Rocks National Preserve	Upper Columbia Basin
CRLA	Crater Lake National Park	Klamath
CRMO	Craters of the Moon National Monument	Upper Columbia Basin
DEPO	Devils Postpile National Monument	Sierra Nevada

Unit	Unit Name	Network
DEVA	Death Valley National Park	Mojave Desert
EBLA	Ebey's Landing National Historic Reserve	North Coast and Cascades
FOPO	Fort Point National Historic Site	San Francisco Bay Area
FOVA	Fort Vancouver National Historic Site	North Coast and Cascades
GOGA	Golden Gate National Recreation Area	San Francisco Bay Area
GRBA	Great Basin National Park	Mojave Desert
HAFO	Hagerman Fossil Beds National Monument	Upper Columbia Basin
HALE	Haleakala National Park	Pacific Islands
HAVO	Hawaii Volcanoes National Park	Pacific Islands
JODA	John Day Fossil Beds National Monument	Upper Columbia Basin
JOMU	John Muir National Historic Site	San Francisco Bay Area
JOTR	Joshua Tree National Park	Mojave Desert
KAHO	Kaloko-Honokohau National Park	Pacific Islands
KALA	Kalaupapa National Historic Park	Pacific Islands
LABE	Lava Beds National Monument	Klamath
LAME	Lake Mead National Recreation Area	Mojave Desert
LARO	Lake Roosevelt National Recreation Area	Upper Columbia Basin
LAVO	Lassen Volcanic National Park	Klamath
LEWI	Lewis and Clark National and State Historical Parks	North Coast and Cascades
MANZ	Manzanar National Historic Site	Mojave Desert
MOJA	Mojave National Preserve	Mojave Desert
MORA	Mount Rainier National Park	North Coast and Cascades
MUWO	Muir Woods National Monument	San Francisco Bay Area
NEPE	Nez Perce National Historic Park	Upper Columbia Basin
NOCA	North Cascades National Park	North Coast and Cascades
NPSA	National Park of American Samoa	Pacific Islands
OLYM	Olympic National Park	North Coast and Cascades
ORCA	Oregon Caves National Monument	Klamath
PINN	Pinnacles National Monument	San Francisco Bay Area
PORE	Point Reyes National Seashore	San Francisco Bay Area
PUHE	Puukohola Heiau National Historic Site	Pacific Islands
PUHO	Pu'uhonua o Honaunau National Historic Park	Pacific Islands
REDW	Redwood National and State Parks	Klamath
SAJH	San Juan Island National Historic Park	North Coast and Cascades
SAMO	Santa Monica Mountains National Recreation Area	Mediterranean Coast
SEKI	Sequoia and Kings Canyon National Parks	Sierra Nevada
WAPA	War in the Pacific National Historic Park	Pacific Islands
WHIS	Whiskeytown National Recreation Area	Klamath
WHMI	Whitman Mission National Historic Site	Upper Columbia Basin
YOSE	Yosemite National Park	Sierra Nevada
Southeast Region		
ABLI	Abraham Lincoln Birthplace National Historic Site	Cumberland Piedmont
APPA	Appalachian National Scenic Trail	Northeast Temperate
BICY	Big Cypress National Preserve	South Florida/Caribbean
BISC	Biscayne National Park	South Florida/Caribbean
BISO	Big South Fork National River and Recreation Area	Appalachian Highlands
BLRI	Blue Ridge Parkway	Appalachian Highlands
BUIS	Buck Island Reef National Monument	South Florida/Caribbean
CAHA	Cape Hatteras National Seashore	Southeast Coast

Unit	Unit Name	Network
CALO	Cape Lookout National Seashore	Southeast Coast
CANA	Canaveral National Seashore	Southeast Coast
CARL	Carl Sandburg Home National Historic Site	Cumberland Piedmont
CASA	Castillo De San Marcos National Monument	Southeast Coast
CHAT	Chattahoochee River National Recreation Area	Southeast Coast
CHCH	Chickamauga and Chattanooga National Military Park	Cumberland Piedmont
COSW	Congaree National Park	Southeast Coast
COWP	Cowpens National Battlefield	Cumberland Piedmont
CUGA	Cumberland Gap National Historic Park	Cumberland Piedmont
CUIS	Cumberland Island National Seashore	Southeast Coast
DRTO	Dry Tortugas National Park	South Florida/Caribbean
EVER	Everglades National Park	South Florida/Caribbean
FOCA	Fort Caroline National Memorial	Southeast Coast
FODO	Fort Donelson National Battlefield	Cumberland Piedmont
FOFR	Fort Frederica National Monument	Southeast Coast
FOMA	Fort Matanzas National Monument	Southeast Coast
FOPU	Fort Pulaski National Monument	Southeast Coast
FOSU	Fort Sumter National Monument	Southeast Coast
GRSM	Great Smoky Mountains National Park	Appalachian Highlands
GUCO	Guilford Courthouse National Military Park	Cumberland Piedmont
GUIS	Gulf Islands National Seashore	Gulf Coast
HOBE	Horseshoe Bend National Military Park	Southeast Coast
JELA	Jean Lafitte National Historic Park and Preserve	Gulf Coast
KEMO	Kennesaw Mountain National Battlefield Park	Southeast Coast
KIMO	Kings Mountain National Military Park	Cumberland Piedmont
LIRI	Little River Canyon National Preserve	Cumberland Piedmont
MACA	Mammoth Cave National Park	Cumberland Piedmont
MOCR	Moores Creek National Battlefield	Southeast Coast
NATR	Natchez Trace National Parkway	Gulf Coast
NISI	Ninety Six National Historic Site	Cumberland Piedmont
OBRI	Obed Wild and Scenic River	Appalachian Highlands
OCMU	Ocmulgee National Monument	Southeast Coast
RUCA	Russell Cave National Monument	Cumberland Piedmont
SHIL	Shiloh National Military Park	Cumberland Piedmont
TIMU	Timucuan Ecological and Historic Preserve	Southeast Coast
VICK	Vicksburg National Military Park	Gulf Coast
VIIS	Virgin Islands National Park	South Florida/Caribbean

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Appendix 2 - Interim Guidance for Submitting Proposals for Continuing and Recurring Inventory Funding

Requests for funding from the I&M Program for inventories and monitoring far exceed the funding that is available. To help prioritize funding requests, and to ensure that parks get the greatest possible return from the limited funding available, all new requests to the national program for I&M Program funding after FY 2008 must submit, at a minimum, a 1-2 page pre-proposal describing the project in enough detail so that reviewers will understand how it meets overall program goals and be assured that the project is sufficiently developed to be successful. This pre-proposal process is required for all requests for continuing and recurring inventory funding from the I&M Program after FY 2008.

The pre-proposal should be only a few pages, but should demonstrate that the project leads have "thoroughly done their homework" to figure out why the project is needed, how the results will be used, and what existing work has already been done that we can learn from and build on. Projects that have a reasonable chance of being funded will be asked to develop a more detailed project proposal. The I&M Program will identify projects to be funded in a strategic fashion with the intent being to fund those projects that best further the overall goals for the inventories at this stage of program development. No projects will be funded that appear to be weak in design or concept and that have not been adequately developed.

Process

Project proposals to be considered for I&M funding must have one or more I&M networks as a sponsor (multi-network proposals are encouraged). Pre-proposals should be submitted to the I&M Program Leader no later than December 1st each year. A panel that includes the seven Regional I&M Coordinators and the National I&M Program Leader will evaluate and rank the requests after obtaining peer review and input from subject-matter experts. (This is very similar to the successful process we have used to evaluate and rank proposals for research support that the USGS provides to the I&M Program).

Required Format of Pre-Proposals for I&M Program Funding

All funding requests to the I&M Program are to follow these guidelines for format and content.

Project title: Short, informative title

Principal Investigator(s): Name, phone number, and email address of the lead person(s) for the project. Who is the point person and lead for the project who is responsible for ensuring that products are developed and delivered as promised?

Description: (One to several paragraphs). This is the project abstract. Briefly describe the project, key questions, and projected results, products, and deliverables.

Justification: (One to several paragraphs). Strong, concise statement about why this project is important, and the important issues or questions that are being addressed. Who is the intended audience, and what will they do with the results? What benefits will accrue from the project?

Specific Objectives: What exactly are the objectives that this project will address? The justification statement and set of objectives, by themselves, should provide a good sense of what the resulting data sets and products will include. Objectives should be specific, measurable, and realistic.

Basic Approach: (One to several paragraphs). What is the basic methodological approach? What existing projects or methods or data sets will this project build on? Provide enough information to demonstrate that you have "done your homework" and thoroughly scoped out existing information, and will build on existing projects or methods where it makes sense.

Products/Deliverables: Products, deliverables, and other outcomes. Specify the various reports, databases, websites, GIS products, and other deliverables that will result from the project, including the format (e.g., Word document, Access .mdb file) and how they will be disseminated.

Schedule: A high-level schedule that includes project initiation, key milestones, and an ending date. For some projects, development of a comprehensive project plan is a considerable exercise, and the first deliverable may be a more detailed project plan.

Budget: This should include funding requested from I&M and also funding contributed from other sources. The level of detail will vary with proposal; common budget items include personnel costs, travel, supplies, contractor/cooperator expenses, and overhead. If the request is for more than one year, provide annual budgets and overall project sums for each category of expenses.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS D-2049, May 2009

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U.S. Department of the Interior

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