National Park Service
U.S. Department of the Interior

Natural Resource Program Center
Natural Resource Information Division

Park vital signs monitoring

Taking the pulse of the national parks

Scientists sample marine intertidal areas at Olympic National Park, Washington, as a part of park vital signs monitoring.

Preserving the national parks unimpaired for the enjoyment of future generations is the fundamental purpose of the National Park Service. Critical to this endeavor is knowing the condition of natural resources in the national parks. Park managers across the country are confronted with increasingly complex and challenging issues that require a broad-based understanding of park resources as a basis for making decisions, working with other agencies, and communicating with the public to protect park natural systems and native species. To provide park managers with the information they need the National Park Service has embarked on a new era of science-based management. An essential component of this strategy is park vital signs monitoring, a national effort to characterize and determine trends in the condition of park natural resources. Trend information is essential to assess the effectiveness of management and restoration activities, and to provide early warning of impending threats.

We have to know what we have, how and why it is changing, what changes we can accommodate, and which we must combat.

Fran Mainella,
Director of the National Park Service

Scientists with the Heartland Monitoring Network conduct vegetation monitoring at Scotts Bluff National Monument, Nebraska.

Park vital signs

Park vital signs are selected physical, chemical, and biological elements and processes of park ecosystems that represent the overall health or condition of the park; they may also be park attributes that are highly valued but not necessarily indicative of general park health. Park vital signs monitoring is designed to inform managers of the condition of water, air, geologic resources, plants and animals, and the various ecological, biological, and physical processes that act on those resources. In situations where natural areas have been highly altered so that physical and biological processes no longer function naturally (e.g., fires and floods in developed areas), information obtained through monitoring can help managers understand how to develop the most effective approach to restoration or, in cases where restoration is impossible, ecologically sound management. The broad-based, scientific information obtained through monitoring will have multiple applications for management decision making, research, education, and promoting public understanding of park resources.

Program details

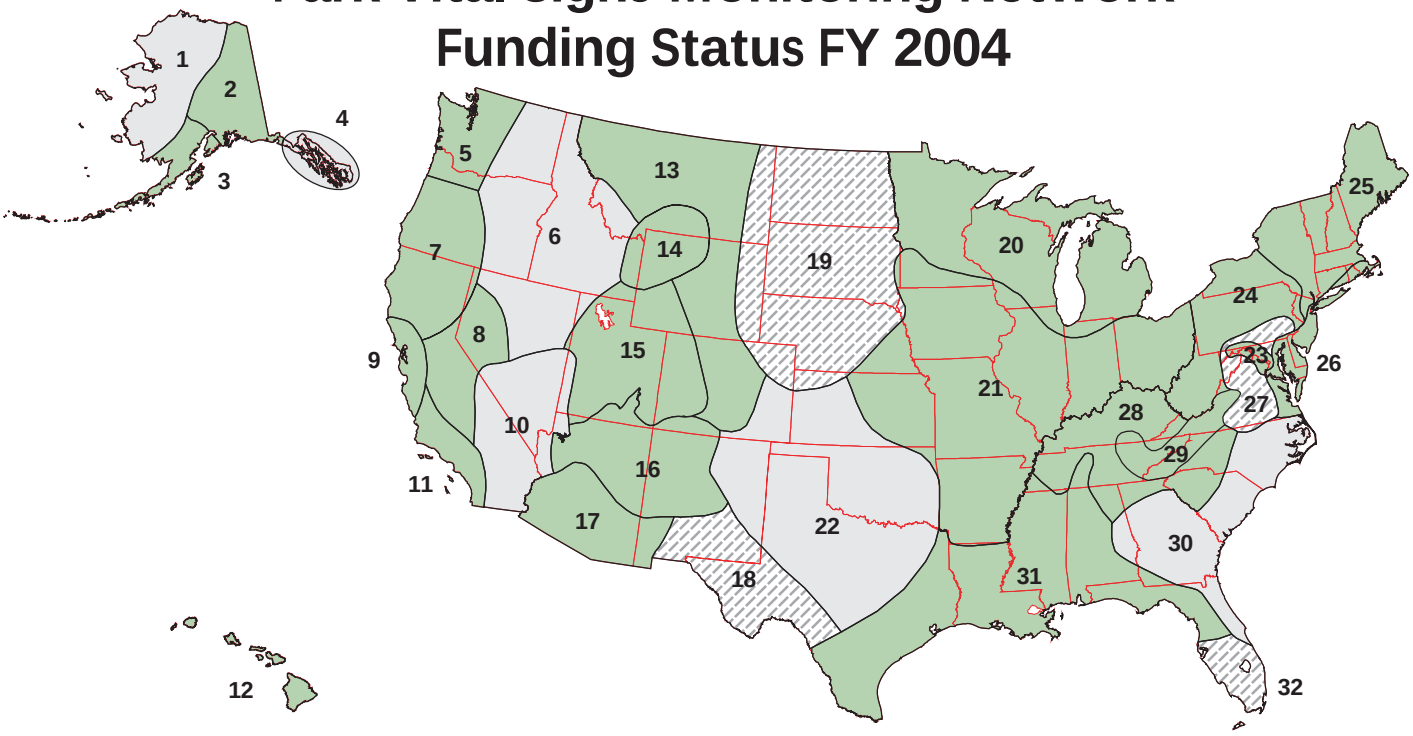
Under the program approximately 270 park units have been organized into 32 networks to conduct long-term resource monitoring. Each network links parks that share similar geographic and natural resource characteristics to improve efficiency and reduce costs. Parks within a network share funding and professional staff to avoid duplication of efforts. They also partner with universities and federal and state agencies to complete basic park resource inventories and monitor the condition of selected resources.

As of FY 2004, Congress has provided funding through the Natural Resource Challenge for the first 22 of 32 planned networks, encompassing 185 national parks. These 22 networks are involved in a three-phase effort to develop and implement a monitoring program that maximizes the use and relevance of monitoring data for management decision making, research, and education. Each phase of the design undergoes peer review and refinement before being implemented.

The first 12 networks, funded in FY 2001–2002, have completed phases 1 and 2 of the planning and design process to implement monitoring of natural resource vital signs. These networks compiled and synthesized existing information, evaluated current monitoring efforts, and drew on expert recommendations to identify the highest priority vital signs. In spite of augmenting the monitoring program with personnel and funding from partnerships and other sources, only the most essential vital signs can be monitored given current funding levels. Therefore, selecting the optimal set of vital signs for the initial implementation of monitoring is critical.

Early detection and trend monitoring of exotic species is a high priority because exotic plants often take over ecosystems, choking out native species and greatly altering ecological processes.

Park Vital Signs Monitoring Network
Funding Status FY 2004



22 monitoring networks funded FY 2001–2004 for core park vital signs

6 monitoring networks proposed for funding in FY 2005

Unfunded

1 Arctic Network (5 parks)

2 Central Alaska Network (3 parks)

3 Southwest Alaska Network (5 parks)

4 Southeast Alaska Network (3 parks)

5 North Coast and Cascades Network (7 parks)

6 Upper Columbia Basin Network (8 parks)

7 Klamath Network (6 parks)

8 Sierra Nevada Network (3 parks)

9 San Francisco Bay Area Network (6 parks)

10 Mojave Desert Network (6 parks)

11 Mediterranean Coast Network (3 parks)

12 Pacific Island Network (9 parks located in Hawaii, American Samoa, Guam, and Saipan)

13 Rocky Mountain Network (6 parks)

14 Greater Yellowstone Network (3 parks)

15 Northern Colorado Plateau Network (16 parks)

16 Southern Colorado Plateau Network (19 parks)

17 Sonoran Desert Network (11 parks)

18 Chihuahuan Desert Network (6 parks)

19 Northern Great Plains Network (13 parks)

20 Great Lakes Network (9 parks)

21 Heartland Network (15 parks)

22 Southern Plains Network (10 parks)

23 National Capital Region Network (11 parks)

24 Eastern Rivers and Mountains Network (9 parks)

25 Northeast Temperate Network (10 parks)

26 Northeast Coastal and Barrier Network (8 parks)

27 Mid-Atlantic Network (11 parks)

28 Cumberland/Piedmont Network (14 parks)

29 Appalachian Highlands Network (4 parks)

30 Southeast Coast Network (17 parks)

31 Gulf Coast Network (8 parks)

32 South Florida/Caribbean Network (6 parks, including U.S. Virgin Islands, not shown)

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The three most common vital signs identified by the 12 networks are exotic plant species occurrence, changes in land cover type (e.g., agricultural to suburban), and vegetation community composition and structure. For example, early detection and trend monitoring of exotic species is a high priority because exotic plants often overtake ecosystems, choking out native species and greatly altering ecological processes. The National Park Service directs a great deal of its resources annually to combating exotics and restoring affected habitat, and the early detection and monitoring of these species occurrences will improve control and restoration efforts. Changes in adjacent land cover are commonly monitored because they influence park habitat loss and fragmentation, pollution, hydrology, and other important ecological factors. By linking monitoring of this attribute with that for air and water quality, and vegetation changes, park managers will have early warning of impacts to park ecosystems.

Recent accomplishments

Monitoring has become a cornerstone of natural resource management in the national parks, and the 32 networks are blazing the trail for a new era of science-based resource management. Highlights from the first funded networks indicate the wide range of benefits derived from the program:

Early Warning—Monitoring of island fox populations, which detected a decline, and understanding ecological connections among 19th century ranching, feral pigs, alien fennel, DDT, bald eagles, golden eagles, and the foxes led to timely restoration of the species in Channel Islands National Park, California.

Program Evaluation—Hydrological and ecological monitoring data at the Hatches Harbor salt marsh restoration site at Cape Cod National Seashore, Massachusetts, are being used to document the response of a degraded salt marsh ecosystem to reintroduction of tidal flow. Monitoring is used to quantify restoration success.

Adaptive Management—Park managers at five small prairie parks (Scott's Bluff, Pipestone, and Effigy Mounds National Monuments; Homestead National Monument of America; and Wilson's Creek National Battlefield) are using data from the monitoring program to gauge restoration success and modify restoration methods or prescribed fire regimes for prairie restoration.

Collaboration—Long-term monitoring data on kelp forests, intertidal areas, sea birds, and pinnipeds at Channel Islands National Park were the primary basis for a recent decision by the California Fish and Game Commission to establish a network of 11 fully protected marine reserves in Channel Islands National Park and Marine Sanctuary.

New Methods—The South Florida/Caribbean Monitoring Network, in partnership with the NASA Wallops Flight Facility and USGS Center for Coastal and Watershed Studies, is using LIDAR remote sensing technology to monitor sensitive coral reefs. Flights over Virgin Islands National Park in spring 2003 provided information on the location, extent, and mass of the park's reefs. The use of LIDAR data with strategic field measurements allowed park managers to complete measurements of coral colonies in a fraction of the time that would be required without this technology.

Completion of remaining networks

The park vital signs monitoring networks are designing a system for scientific data collection, analysis, and reporting that is unprecedented in the history of the National Park Service. The program is very successful because it gives park managers a means of identifying their long-term information needs and it promotes efficient use of limited resources. According to Steven Fancy, the national monitoring program leader, "Networks have been able to accomplish a much greater amount of work by sharing staff and partners among the parks than would have been possible if funds had simply been divided among parks." In FY 2005, the National Park Service seeks additional funding for six of the remaining 10 planned networks. Once all 32 networks are funded, the National Park Service will finally have the minimum infrastructure necessary to provide managers with the scientific information they need to protect the natural treasures of the National Park System.

(Above) Natural resource managers at War in the Pacific National Historical Park, Guam, set up a plot to monitor erosion in the park savanna lands.

(Below) At the same park, natural resource manager Ian Lundgren installs a sediment collection device that will be used to monitor sediment deposition from erosion, a concern for reef health.

Information obtained through monitoring can help managers understand how to develop the most effective approach to restoration.