

Environmental monitoring in parks

Abstract :

Monitoring activities in protected areas have a long history. Internal planning and management needs early led to ecological inventories. More recently the increasing number and awareness of external threats to parks has led to a variety of monitoring programs. A final section presents some principles for monitoring the state of protected areas. Examples are drawn from experience with Canadian national parks.

Introduction :

Environmental monitoring refers to systematic sampling of air, water, soil, and biota in order to observe and study the environment, as well as to derive knowledge from this process. One of the objectives of Environmental Monitoring is to monitor the performance of a project and the effectiveness of mitigation measures. The project may be a new one or an existing project under expansion or an existing project opted for change in product mix.

To ensure the effective implementation of the EMP and weigh the efficiency of the mitigation measures, it is proposed to undertake environmental monitoring both during construction and operation period of the up-coming Commercial project at Noida, UP.

Policy and Management Contest:

The 1916 National Park Service Organic Act is the core of park service authority and the definitive statement of the purposes of the parks and of the National Park Service mission. The act establishes the purpose of national parks. To conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." NPS Management Policies (NPS 2006) state that "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 that "Decision makers and planners will use the best available scientific and technical information and scholarly analyses to identify appropriate management actions for protection and use of park resources". In the National Park System Management Act of 1998, Congress specifically directed the NPS to "undertake 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".

Program Goals and Implementation Strategy:

The common programmatic goals of Vital Signs Monitoring for the 32 actworks are as follows:

1. Determine the status and trends in selected indicators of the condition of park ecosystems to allow managers to make better-informed decisions and to work more effectively with other agencies and individuals for the benefit of park resources.
2. Provide early warning of abnormal conditions of selected resources to help develop effective mitigation measures and reduce costs of management.
3. Provide data to better understand the dynamic nature and condition of park ecosystems and to provide reference points for comparisons with other, altered environments.
4. Provide data to meet certain legal and Congressional mandates related to natural resource protection and visitor enjoyment.
5. Provide a means of measuring progress towards performance goals.

Steps in Monitoring Design:

The complex task of developing a network monitoring program requires a front-end investment in planning and design to ensure that monitoring will meet the most critical information needs of each park and produce scientifically credible data that are accessible to managers and researchers in a timely manner. The investment in planning and design also ensures that monitoring will build upon existing information and understanding of park ecosystems and make maximum use of leveraging and partnerships with other programs, agencies, and academia. We found that the following basic steps for designing & long-term ecological monitoring program worked effectively across all 32 networks. Detailed guidance, examples, monitoring plans, and sampling protocols are available on the internet (NPS 2007).

Clearly Define Goals and Objectives:

One of the most critical steps in designing a complex interdisciplinary monitoring program is to clearly define the goals and objectives of the program and get agreement on them from key stakeholders. In our evaluation of "lessons learned" by other monitoring programs, we found that differences in opinion regarding the purpose of the monitoring as the program was being developed often led to significant problems later during the design and implementation phases. The 32 networks of parks all shared the same five goals of vital signs monitoring, as listed above in Section 3. (Garrett et al. 2007)

Compile and Summarize Existing Information

Another important early step in the process of developing a monitoring strategy is the task of identifying, summarizing, and evaluating existing information and understanding of park ecosystems. The I&M networks discovered and summarized existing information through a series of literature reviews, scoping workshops, and interviews and surveys with park managers and subject-matter experts. The results from these "data mining" and scoping efforts were summarized in databases and reports that were used as the basis for conceptual modeling and subsequent monitoring design work, these databases and reports are expected to have multiple future applications by park managers, planners, educators, the scientific community, and others.

Develop Conceptual Models

Early in the planning and design process, I&M networks developed simple models that were highly aggregated representations of ecological systems, primarily as a framework for organizing, summarizing, and communicating the large amount of information obtained from literature reviews, scoping sessions, and interviews with park managers, staff, and subject-matter experts (eg, Figure 3). Many networks based their highest-level model on a very general ecosystem (Chapin et al. 1996), modified to include broad-scale stressors more specific to the park or ecosystems of interest (eg, Miller 2005). Once potential indicators were identified, models became more detailed and often more mechanistic, to clearly articulate relationships between measurements and the ecological attributes they represent.

Application of Monitoring Results to Natural Resource Stewardship

Natural resource monitoring provides site-specific information for understanding and identifying meaningful change in natural systems characterized by complexity, variability, and surprises. Monitoring results help managers determine whether observed changes are within natural levels of variability or may be indicators of unwanted human influences. The improved understanding of the status and trend in resource condition and "how park systems work" will be used by park managers to adjust management practices that sustain or improve the health of park resources, such as reallocating funding and staffing to achieve desired outcomes, initiating or modifying restoration activities, or working with State or federal partners to achieve desired outcomes. The J&M program has infused NPS with an increased scientific capacity to evaluate and interpret monitoring data.

Summary and Future Challenges

The National Park Service has completed the first steps in developing a long-term ecological monitoring program to provide information on the status and trends of selected park resources as a basis for making decisions and working with other agencies and the public for the long-term protection of park ecosystems. We found that the basic steps involved in planning and designing a long-term ecological monitoring program were the same for a diverse range of ecological systems. The process of building the program seemed to be as important as the final result in terms of building a shared understanding between scientists and managers of what the priorities are for obtaining status and trend information, and why. Key benefits of our approach are that