Long-term Vital Signs Monitoring in the Southwest Alaska Network

Alagnak Aniakchak Katmai Kenai Fjords Lake Clark

SWAN Southwest Alaska Network

Integrating science, education, and resource protection though monitoring

The Role of Long-term Monitoring in Protecting Park Ecosystems

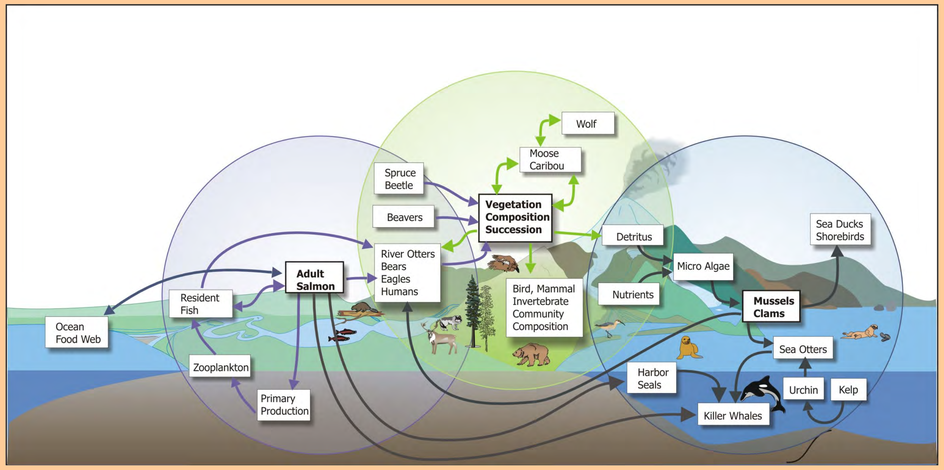
Alaskan national park units are among the last remaining wilderness areas of the world—large enough to allow ecological processes and wildlife populations to fluctuate and biological diversity to evolve and adapt naturally. In order to protect and manage these parks, National Park Service managers need to know how and why park ecosystems change over time, and what amount of change is "normal." Because Alaska parks are large and budgets are comparatively small, natural resource monitoring within them has traditionally been focused on relatively small areas and brief time periods. Long-term, vital signs monitoring addresses this shortcoming by providing park managers with information on status and trends of key elements of park ecosystems over broad spatial and temporal scales.

Long-term ecological monitoring is important for a variety of reasons:
(1) it provides understanding and insight into the functioning of complex park ecosystems.
(2) it is necessary to evaluate objectively whether NPS is protecting park natural resources.
(3) it is necessary in order to detect long-term adverse effects of human activities on park ecosystems.

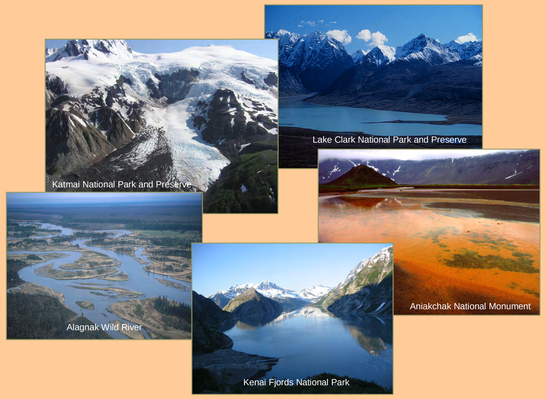
Choosing Vital Signs That Characterize Entire Park Ecosystems

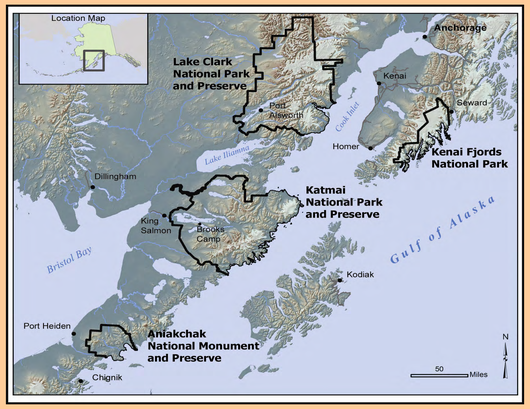
To achieve success and continued support, long-term monitoring must provide data that are both useful and widely used. Most importantly, the information generated from monitoring needs to assist park managers in clarifying and addressing resource protection issues. The intent of the program is to monitor a selected set of ecosystem elements and processes that reflect the status of Network ecosystems and are relevant to resource protection issues. A key challenge is identifying a set of attributes to monitor that characterize entire park ecosystems yet are simple enough to be effectively and efficiently monitored.

Conceptual ecosystem models are visual or narrative summaries that describe the important biological and physical components of an ecosystem and the interactions among them. Through the development of conceptual models, SWAN scientists and park managers built a common understanding of how park ecosystems work and how key resources might be affected by natural events or the actions of humans. These models, along with park management issues and specific monitoring questions, formed the hierarchical framework for identifying what biological, chemical, and physical attributes (vital signs) to monitor. Park vital signs can be physical, chemical, and biological elements and processes of park ecosystems that represent the overall health or condition of the park. In practice, vital signs are measurable, early warning signals that indicate changes.



Ecosystem Interactions Conceptual Model. Some important ecologcial interactions in SWAN involve (i) the transport of nutrients by mobile species; (ii) herbivore-predator interactions that maintain a heterogeneous distribution of resources; (iii) ecosystem engineers, such as beavers and clams, that structure habitats and influence the distribution and abundance of other species; and (iv) species, such as the spruce bark beetle, that create or modify disturbance regimes.





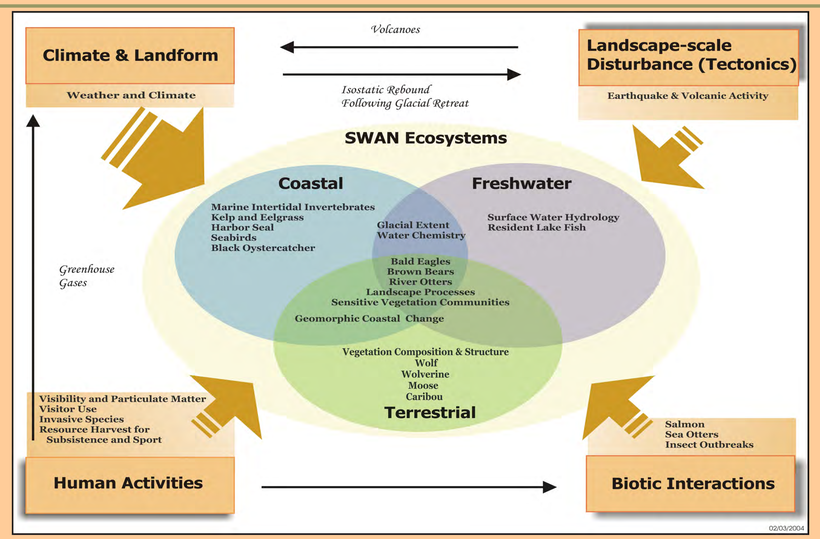
The Southwest Alaska Network consists of five units of the National Park Service: Katmai National Park and Preserve, Alagnak Wild River, Aniakchak National Monument and Preserve, Lake Clark National Park and Preserve and Kenai Fjords National Park. Collectively these units comprise 9.4 million acres, 11.6 percent of the land managed by the National Park Service, or 2 percent of the Alaska landmass,

These 5 park units as a network facilitate collaboration, information sharing, cost savings, and link parks that share similar geographic and natural resource characteristics, resource protection issues, and public use patterns.

Additional information on the Southwest Alaska Network vital signs monitoring program and a complete copy of the Vital Signs Monitoring Plan can be obtained from the Network's web site:
http://www1.nature.nps.gov/im/units/swan/

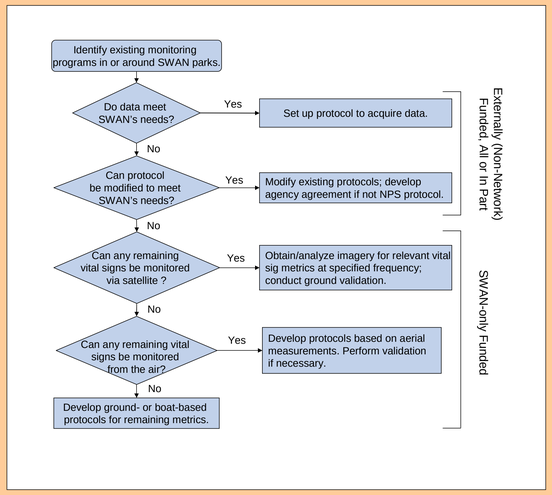
SWAN Program Leaders
Michael Shephard, Network Coordinator
Cuyler Smith, Data Manager
Bill Thompson, Quantitative Ecologist
Amy Miller, Vegetation Ecologist
Jeff Shearer, Aquatic Ecologist
Heather Coletti, Nearshore Ecologist
Bruce Giffen, Geologist

Southwest Alaska Network, National Park Service,
240 W 5th Ave, Anchorage, AK 99501



Conceptual Model depicting SWAN vital signs as they relate to drivers of change (boxes) and ecosystems (ovals). Collectively, vital signs drawn from all categories improve diagnostic power of monitoring and provide context and insight into the mechanisms of change. This feature distinguishes vital signs monitoring from programs that focus only on response variables, such as the national Breeding Bird Survey.

From Vision to Reality - Development of a Practical Sampling Design



Steps involved in developing designs for monitoring SWAN vital signs.

Practical considerations, such as accessibility and cost, will limit design alternatives that can be realistically implemented in Alaskan parks. To the extent possible, we will use remotely-sensed data and/or data collected by others to address SWAN monitoring objectives. Where ground-based sampling is implemented, it should be flexible enough to allow continued sampling at a few high-priority areas if funding drops to levels too low to support the full program. We will use a combination of nonrandom (representative locations, sites of interest) and spatially balanced, random sampling designs for vital sign protocols developed by SWAN alone.

Information Management - Enabling Access, Analysis, and Interpretation of Complex Ecological Data

Vital Signs Monitoring represents a paradigm shift for data and information management by the National Park Service. In the past, data on park resources might have resided in an inadequately documented file in paper or electronic form that would often become unusable upon staff turnover or office relocations. In other cases, the effort required to assemble poorly managed datasets across investigators, disciplines, and time scales often meant that access to the data was a barrier to its use. Under vital signs monitoring, information management is an integral part of the science process. A Data Management Plan provides standardized procedures to acquire, store, manage and archive data; ensure data quality; document and disseminate data; and ensure the long-term access to and utility of data. Written protocols for collecting and managing data, master databases, GIS, and other tools will form an information system that is intended to serve as a key component of resource stewardship and the building of institutional knowledge about the status and trends in the condition of park resources.