Rocky Mountain Network

National Park Service
U.S. Department of the Interior

Inventory & Monitoring Program

News and Highlights

Great Sand Dunes National Park and Preserve

GREAT SAND DUNES NP AND PR/NATIONAL PARK SERVICE/B. SCHWEIGER

Network News and Highlights

Final Vital Signs Monitoring Plan Approved

Just as a doctor might use a specific set of "vital signs" as a tool to determine the health of a person, scientists can monitor selected physical, chemical, and biological elements and processes of ecosystems to gauge the overall health or condition of a park. In August 2007, the Rocky Mountain Network (ROMN) achieved a major milestone by publishing its Vital Signs Monitoring Plan. The plan is the foundation of the network's long-term ecological inventory and monitoring program and has been administratively and scientifically reviewed and approved by peers. It is available online at http://science.nature.nps.gov/im/monitor/MonitoringPlans.cfm.

Pilot Monitoring

The scientific nuts and bolts of the ROMN Inventory and Monitoring (I&M) Program are being developed in rigorous, peer-reviewed monitoring protocols. Protocols explicitly describe how monitoring will be accomplished and include specific objectives; statistical design; field procedures including logistics and safety; data management, analysis, and reporting; and importantly, how results will be evaluated.

In 2007, the network and its collaborators began ambitious pilot monitoring efforts in five parks using well-established field methods. Stream ecological integrity monitoring was conducted in Glacier National Park (NP) in collaboration with the University of Montana Flathead Lake BioStation. Wetland ecological integrity monitoring was conducted in Rocky Mountain NP in collaboration with Colorado State University. Vegetation composition, structure, and soils monitoring was conducted in Grant-Kohrs Ranch National Historic Site (NHS) and Little Bighorn Battlefield National Monument (NM) in collaboration with student interns from the Tehabi Internship Program at Utah State University. Pilot analysis of weather and climate was also initiated in Rocky Mountain NP. Resource management and other park staff were key advisors and facilitators for these projects. See pages 2 and 3 for more information on vital signs and monitoring in 2008.

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Wetland ecological integrity monitoring fieldwork at Rocky Mountain NP in 2007. Long-term vital signs monitoring helps determine changing conditions of natural resources in order to guide adaptive management decisions.

Park Highlights and Plans: Great Sand Dunes NP and Pr

Vegetation Mapping

The Rocky Mountain Network is continuing to coordinate the interagency Great Sand Dunes NP and Pr vegetation mapping project this year. The US Geological Survey (USGS), Bureau of Reclamation, and Fish and Wildlife Service are mapping vegetation associations. This summer, the Colorado Natural Heritage Program will assess map accuracy in the field and crews will be based at park headquarters. The USGS Biological Resources Discipline is using preliminary map data from this project to develop ecological models of bison habitat that will be used in a National Park Service-Fish and Wildlife Service bison conservation initiative.

Alpine Vegetation Composition, Structure, and Soils

The alpine environment is one of the most sensitive terrestrial ecosystems because of extreme conditions such as wind, temperature, snow and ice, solar radiation, and thin atmosphere which help define this ecological type. Alpine communities and species adapted to this environment are threatened by changes to known ecosystem drivers, including climate change, atmospheric deposition, and human use.

In July, the ROMN and park resource management staff will evaluate the potential to establish a Global Observation Research Initiative in Alpine Environments (GLORIA) site in Great Sand Dunes NP and Pr. GLORIA, established in 2001, is an international monitoring network established to assess and predict biodiversity and temperature changes in fragile alpine communities in response to broad drivers such as climate. The goals of the program include providing a global baseline for vegetation monitoring in alpine environments and assessing the risks of biodiversity loss and ecosystem instability from climate change. This methodology is being extended by cooperators to create a long-term monitoring network at the global scale. GLORIA aims to collect baseline and monitoring data by using an array of plots to measure vegetation across a set of four local peaks.

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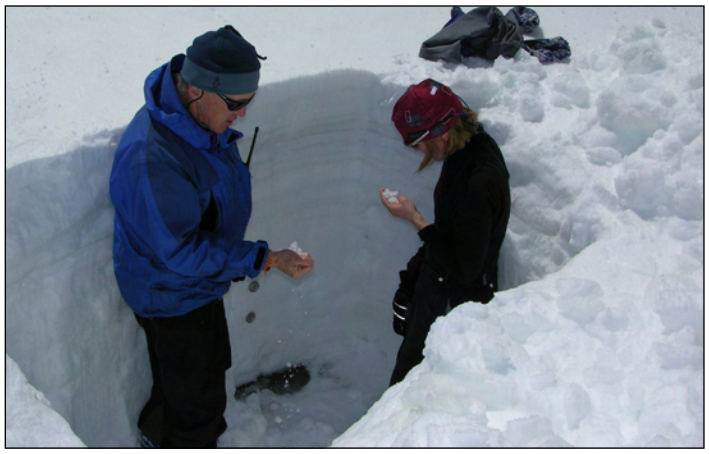
Alpine communities are threatened by changes to known ecosystem drivers, including climate change, atmospheric deposition, and human use



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Snow chemistry information can help assess atmospheric deposition and has been monitored in the park since 2006.

Snow Chemistry

Snowfall accumulating from October until March, April, or May provides about 50 to 70 percent of the annual precipitation in headwater basins of the Rocky Mountains. As snowpack accumulates (wet deposition) during the winter and spring, chemicals deposited from the atmosphere (dry deposition) are stored until snowmelt begins in spring. Deposition can include a variety of naturally occurring and human contributed chemicals and pollutants, including inorganic elements and compounds (e.g., nitrogen, sulfur, basic cations, mercury, and other metals) and organic compounds (e.g., pesticides and herbicides). Because snowmelt supplies most of the freshwater in mountain lakes, streams, and wetlands, monitoring the water quality of snow is critical to understanding the effects of atmospheric deposition to alpine ecosystems. Snowpack sampling is a cost effective method of collecting a substantial portion of annual precipitation in a single sample.

Alpine and subalpine environments in Great Sand Dunes NP and Pr are sensitive to changes in chemical composition of the water. Thin soils and diluted water bodies in these ecosystems typically have a limited capacity to buffer acidity that may be deposited with airborne acidic compounds such as ammonium, nitrate, and sulfate. Aquatic and wildlife populations may be impacted as annual snowpack melts and the accumulated atmospheric deposition is released to Great Sand Dunes NP and Pr watersheds.

In 2006, the network sponsored USGS monitoring at Mosca, Medano and Music passes. In 2007, the park sponsored sampling at Mosca, and Medano passes with Rocky Mountains Cooperative Ecosystem Studies Unit funding. The ROMN is working with Great Sand Dunes NP and Pr and the NPS Air Resources Division to continue long-term monitoring of this important vital sign. In 2008, snow samples from Great Sand Dunes NP and Pr and the Southern Rocky Mountains will also be analyzed for organic carbon through funding from the NPS Air Resources Division.

Vital Signs Monitoring

Scientists in the Rocky Mountain Network monitor vital signs to determine the health and condition of a park. These can be natural resources such as water, air, plants, and animals as well as the ecological, biological, and physical processes that act on those resources. Network personnel work with park staff and regional scientists to ensure the program is based on sound science and that information generated is integrated into the adaptive management of parks.

Monitoring efforts provide early detection of potential problems and enable park managers to be proactive in minimizing damage to park resources. Long-term vegetation monitoring can encourage habitat restoration, trigger invasive plant eradication, and inform prescribed fire planning. Information gathered from vital signs monitoring can also be used to develop research questions and foster public understanding of natural resources in national parks.

Vital signs are monitored according to a series of scientific protocols currently under development. When possible, protocols follow an integrated approach and may monitor multiple vital signs. Network staff work with personnel from existing park, university, and other programs to conduct monitoring.

The network collaborated with NPS managers, staff and other professional scientific and technical partners to select 12 high-priority vital signs for the long-term inventory and monitoring program.

High Priority ROMN Vital Signs

Monitoring category	Vital sign
Air and Climate	Wet and Dry Deposition
	Weather and Climate
Biological Integrity	Invasive/Exotic Aquatic Biota
	Invasive/Exotic Plants
	Freshwater Communities*
	Vegetation Composition, Structure, and Soils*
	Focal Species: Beaver, Elk, Grizzly Bear, and Great Sand Dunes Endemic Insects
	Wetland Communities
Ecosystem Patterns and Processes	Landscape Dynamics
Geology and Soils	Surface Water Dynamics*
	Vegetation Composition, Structure, and Soils*
Water	Water Chemistry
	Groundwater Dynamics
	Surface Water Dynamics*
	Freshwater Communities*

*This vital sign is listed under two monitoring categories.

Pilot Monitoring in 2008

Pilot projects will continue in 2008 and monitoring will expand to all network parks: vegetation composition, structure, and soils monitoring will begin in the montane community at Florissant Fossil Beds NM and a Global Observation Research Initiative in Alpine Environments (GLORIA) site will be established Great Sand Dunes National Park and Preserve (NP and Pr). GLORIA, established in 2001, is an international effort to monitor changes in alpine communities.

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A potential GLORIA site in the alpine communities of Great Sand Dunes NP and Pr.

ROMN Vital Signs Monitoring Examples

NPS

Meadow, Florissant Fossil Beds NM.

VEGETATION COMPOSITION, STRUCTURE, AND SOILS

The structure and composition of vegetation are among the primary characteristics used to define ecosystems. They are fundamental determinants of wildlife habitat characteristics and quality, visitor experiences, historic preservation, and basic ecosystem functions (e.g., primary production, nutrient cycling, and microclimate controls). The frequency and cover of major functional plant groups (e.g., native bunchgrasses) and condition of soil quality will be monitored to determine status and trend of ecosystem integrity.

NPS

Great Sand Dunes NP and Pr.

WETLANDS

Wetlands provide many valuable ecological and socioeconomic functions and support a disproportionate amount of biodiversity relative to their area. Wetland vegetation composition is an excellent indicator of changes in groundwater levels and sediment dynamics. Wetlands are vulnerable to stressors both in the park and on a larger landscape scale. Many network wetlands are likely in a degraded condition related to changes in groundwater levels, stream diversions, overgrazing by native ungulates, historic grazing by livestock, atmospheric deposition, and invasion by exotic species.

The Rocky Mountain Network

Land and Resources

The Rocky Mountain Network is comprised of six parks roughly located along the Continental Divide: Glacier NP, Grant-Kohrs Ranch NHS, Little Bighorn Battlefield NM, Rocky Mountain NP, Florissant Fossil Beds NM, and Great Sand Dunes NP and Pr. Although this is an extremely diverse region, the ROMN parks share some ecological similarities, such as grassland and shrubland ecosystems, streams, and wetlands.

The parks are also subject to many of the same threats—several of which are exacerbated by climate change—including loss of native species, degradation of natural habitats, altered hydrological and disturbance regimes, exotic species invasion, increasing pollution, growing urban and boundary development, harmful wildlife diseases, and inadequate scientific data with which to make informed management decisions.

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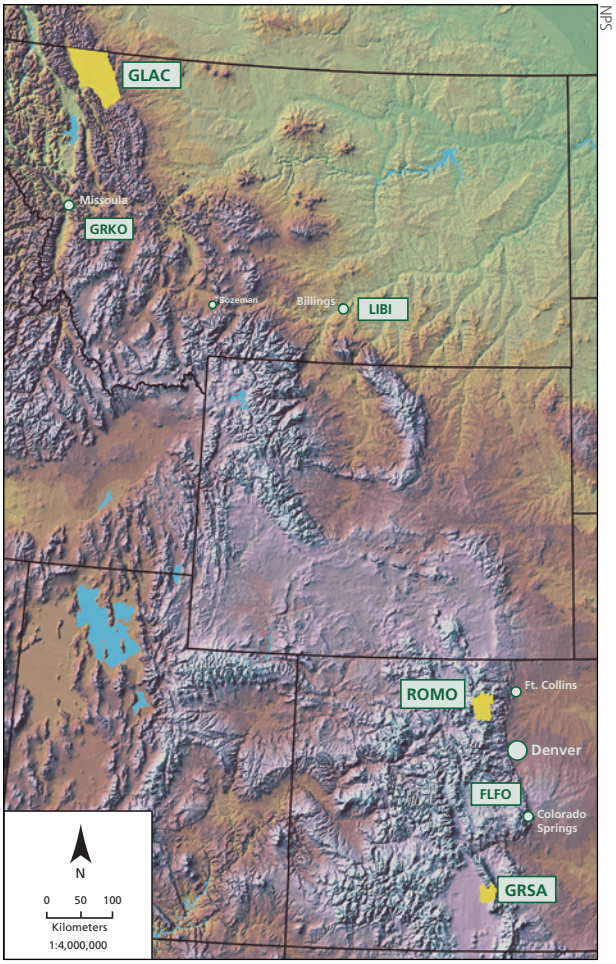
Fieldwork provides park managers with credible scientific data to make informed management decisions to preserve and protect park resources.

Inventory and Monitoring Program

Protecting and managing some of our nation's most significant natural resources requires basic knowledge of the condition of ecosystems and species that occur in national parks. The ROMN is part of the NPS Inventory and Monitoring Program, which was established in the 1990s to better understand the health of the parks. This program organized parks with significant natural resources into 32 networks based on proximity and ecological similarity. There are two major components to the program: (1) gather baseline information about parks and the surrounding ecosystems through inventories and (2) conduct long-term monitoring for key indicators of ecological health, or vital signs.

Park visitors may see scientists collecting data. This fieldwork provides park managers with credible scientific information to meet the challenges of preserving and protecting park resources "unimpaired for future generations" and for public benefit and enjoyment. Resource managers, scientists, data managers, and rangers participate in collecting and using this information.



NPS

The ROMN park units (clockwise north to south): Glacier NP (GLAC), Grant-Kohrs Ranch NHS (GRKO), Little Bighorn Battlefield NM (LIBI), Rocky Mountain NP (ROMO), Florissant Fossil Beds NM (FLFO), and Great Sand Dunes NP and Pr (GRSA).

The ROMN is dedicated to supporting park resource management through outstanding data management and stewardship to ensure that information is well documented, widely available and used, and of the highest quality. Products include NPS inventory products (e.g., maps), certified I&M databases, annual monitoring reports, comprehensive analysis reports, and peer-reviewed scientific articles. Data, analyses, executive summaries of results, and other information will be accessible on the ROMN website.

For More Information

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