Rocky Mountain Network

National Park Service
U.S. Department of the Interior

Inventory & Monitoring Program

News and Highlights

Glacier National Park

GLACIER NP/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: Glacier NP

Stream Ecological Integrity Monitoring Pilot Project on the North Fork

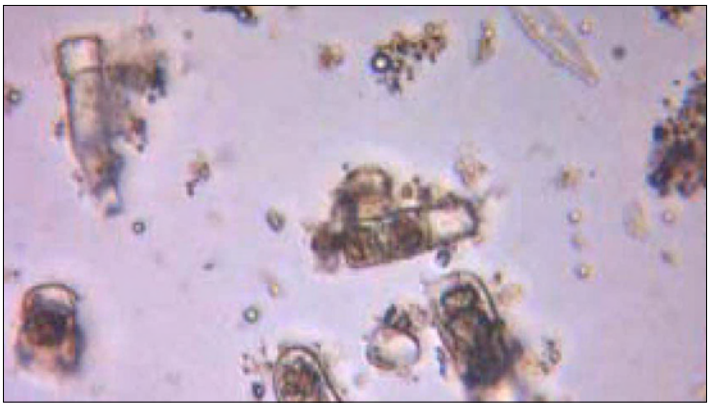
The Rocky Mountain Network, with help from Glacier NP and other network park staff, the University of Montana Flathead Lake BioStation (FLBS), and the US Geological Survey (USGS), completed a draft protocol for stream monitoring field methods in August 2007. Using the protocol, 27 pilot sampling events were conducted mostly in the North Fork of the Flathead River drainage in 2007. Fieldwork was conducted by network and park staff, FLBS field techs and aquatic ecologists, USGS Water Resources Discipline researchers, and volunteers.

Sampling at each site includes water chemistry (e.g., temperature, pH, dissolved oxygen, conductivity, anions/cations, and nutrients), discharge, physical habitat, macroinvertebrates and periphyton. The network will continue pilot monitoring in 2008, sampling up to 50 new sites. When pilot monitoring is finished and the results are analyzed, the first park-wide assessment of the ecological condition of streams will be available in the next few years.

15 New Species Recorded in Glacier

A core piece of the ROMN Stream Ecological Inventory protocol is the composition and dynamics of periphyton (diatoms and algae) at each of our sample sites. Although these organisms are not commonly recognized by visitors, they may be some of the most important species in the park. They are among the most diverse and ubiquitous organisms on earth. Diatoms and algae are primary producers and the foundation of nearly all stream food webs. They stabilize substrata and serve as habitat for many other organisms. They can absorb contaminants, removing them from the water column and limiting their movement through the environment. Diatoms and algae are affected by physical, chemical, and biological disturbances, often over a small temporal and spatial scale. Finally, we often have detailed knowledge of the ecology of diatoms and how they respond to stress. All of these attributes allow calculation of multiple, sensitive metrics of environmental condition and change and they have therefore become common and powerful components of long term monitoring and bioassessment.

Our work with periphyton in Glacier NP has been done in collaboration with FLBS and Dr. Loren Bahls, a well-recognized expert in Montana diatoms and algae. Dr. Bahls has also been conducting an independent biodiversity study in Glacier on diatoms and our work nicely dovetails with this effort. Dr. Bahls has focused on two taxa in the park: *Distrionella incognita* or "glacier gold", a relatively rare diatom and a glacial relict species and *Didymosphenia geminata* or "didymo" or "rock snot," an aggressive, opportunistic invader that forms conspicuous growths on stream bottoms. Early results suggest that these two taxa may be useful species-specific indicators of stream condition, with glacier gold occurring in the cleanest sites and didymo indicating streams that may have some anthropogenic disturbance like excess sediment or nutrients.



L. BAHLS

Figure 1: Rare and unique brown algae *Heribaudiella fluviatilis.*

L. BAHLS

Figure 2: New to science *Gomphonema sp.*

While our Stream Ecology Integrity pilot work has only just begun and we have not yet calculated any synthetic metrics of stream condition, we are already seeing some interesting results. In particular, out of the roughly 300 taxa we found in the 27, 2007 sample events, Loren believes there are at least 15 "new to science" taxa, never before recorded! Many of these are in the genus *Gomphonema* (figure 2). We have also seen rare and unique soft bodied algal taxa like *Heribaudiella fluviatilis* (figure 1). In fact the samples are so interesting that we have temporarily loaned them out to other diatom experts like Dr. Pat Kociolek, director of the University of Colorado Natural History Museum to review. Dr. Kociolek is still looking at the samples, but also believes there are many new species in the mix and that some taxa may be outside their previously documented ecological and geographic ranges.

We will continue to identify these specimens and will be publishing any confirmed new species in the scientific literature. The ROMN will also be working on bioassessment models for Glacier and our other parks over the next year. We think that diatoms in particular will be useful components of long term monitoring in wilderness parks like Glacier and Rocky Mountain, perhaps allowing us to quantify changes in condition in these pristine, largely oligotrophic (nutrient-poor) systems that might be missed using more traditional chemistry-based approaches.

Future monitoring

In addition to stream and snowpack monitoring, the ROMN will work with park staff in 2008 to identify grassland vegetation and soils monitoring sites to document changes in these sensitive communities. We will begin to define important wetland types in the park for long-term health monitoring and work with park staff to plan monitoring objectives and protocols for landscape dynamics and weather and climate.

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

North Fork of Flathead River, Glacier NP.

STREAMS

Streams and rivers are fundamental components of parks, integrating all systems within a landscape. Streams and rivers are dependent on the landscape for energy and nutrient inputs—their ecology is intimately linked with the watersheds they drain. Streams support a wide-ranging ecological services, including wildlife habitat, nutrient processing, hydrologic cycling, recreation, and fisheries. Water chemistry and quality, hydrology, habitat, marcoinvertebrates, and bottom-dwelling organisms will be monitored to determine status and trends in ecological integrity of park streams.

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.

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.

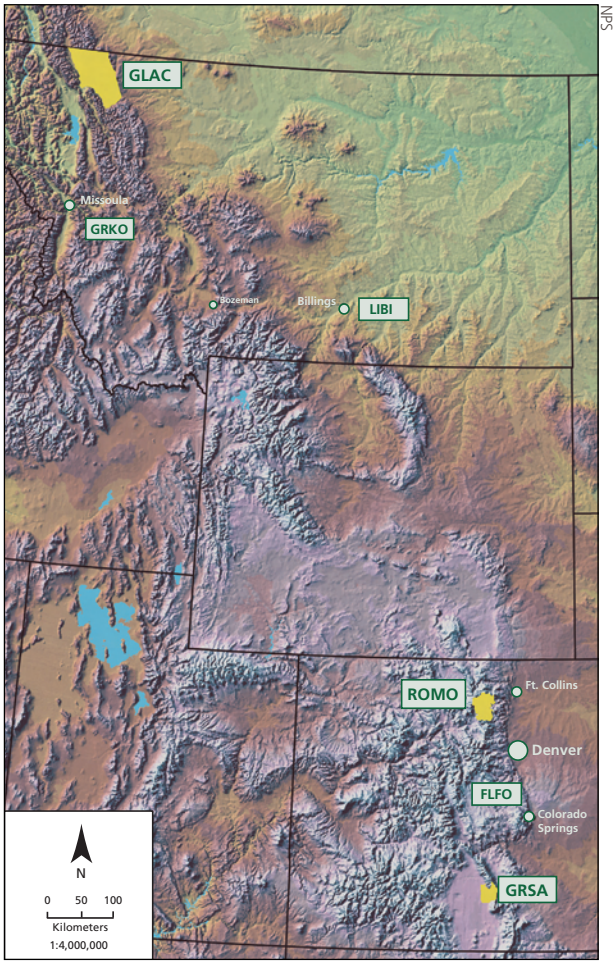
NPS/B. SCHWEIGER

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.



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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

Rocky Mountain Inventory & Monitoring Network
1201 Oakridge Drive, Suite 200, Fort Collins, CO 80525
http://www1.nature.nps.gov/im/units/romn/index.cfm
Program Manager: Mike Britten, 970-267-2150, mike_britten@nps.gov
Ecologist: Billy Schweiger, 970-267-2147, billy_schweiger@nps.gov
Data Management Technician: Dave Pillmore, 970-586-1398, david_pillmore@nps.gov
Ecologist/Crew Leader: Donna Shorrock, 970-225-3583, donna_shorrock@nps.gov
TITLE: Isabel Ashton, isabel_ashton@nps.gov
GLAC contact: Jack Potter, 406-888-7821 and Sallie Hejl, 970-888-7863