



## News and Highlights

### Little Bighorn Battlefield National Monument



LITTLE BIGHORN BATTLEFIELD NM/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: Little Bighorn Battlefield NM

## Vegetation Mapping

The Rocky Mountain Network is nearing completion of vegetation mapping projects in Little Bighorn Battlefield NM and Grant-Kohrs Ranch NHS. This project has been conducted with collaborators from the University of Montana and the NPS Vegetation Mapping Program. Park vegetation types have been identified, classified, and mapped and the results have been field checked for accuracy. The collaborators, led by Peter Rice from the University of Montana, are currently preparing the final report and products. The network will meet with Little Bighorn Battlefield NM and Grant-Kohrs Ranch NHS staff in the spring to present the preliminary maps and draft reports and plan to complete the projects. The comprehensive vegetation information will serve local management needs and provide an essential baseline of information for the network inventory and monitoring program.

## Vegetation and Soils Monitoring

The native and managed grasslands of Little Bighorn Battlefield NM provide the setting for visitor experiences and historic preservation of the battlefield. The structure and composition of grassland vegetation are also among the primary characteristics used to define these ecosystems. Vegetation structure and composition are fundamental determinants of wildlife habitat quality and rangeland ecosystem functioning (e.g., primary production, nutrient cycling, and microclimate controls).

The ROMN began developing the Vegetation Composition, Structure, and Soils (VCSS) protocol in Little Bighorn Battlefield NM and Grant-Kohrs Ranch NHS in 2006 and 2007. The VCSS protocol addresses two ROMN vital signs: Vegetation Composition, Structure, and Soils and Invasive/Exotic Plants. The ROMN response design is derived from the protocols and recommendations of the US Department of Agriculture–Agricultural Research Service and the Forest Service’s Forest Inventory and Assessment program. This design includes both transect- and plot-based sampling, organized in a “spoked-wheel” pattern. This work will continue in 2008 using a combination of network staff and Student Conservation Association interns. Objectives for vegetation composition, structure, and soils monitoring include:

- Determine the status and trend in vegetation structure (relative cover of shrubs, grasses, herbs, trees, and bare ground) and composition (within classes and at the species level) across the community/management types found within the park.
- Determine the status and trend in soil structure based on texture and stability, water infiltration rates, evidence of erosion, and extent of bare (non-vegetated) soils.
- Determine status and trends in the presence or absence of invasive/introduced species based on park-specific lists of



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Network staff and Tehabi student interns conduct pilot vegetation composition, structure, and soils monitoring at Little Bighorn Battlefield NM in 2007.

likely and ecologically significant invaders (these lists will be periodically updated based on national, state, and NPS “invasive species of concern” lists).

Information on invasive plants will help park staff and the Northern Rocky Mountains Exotic Plant Management Team better understand the current status and threats from noxious weeds and manage the spread of invasive plants. In addition to providing information about the condition of vegetation, data from grassland/shrubland vegetation and soil monitoring will help characterize park-wide ecosystem responses to other vital signs, including Weather and Climate, Wet and Dry Deposition, and Landscape Dynamics.

## Future Monitoring

The surrounding landscape of Little Bighorn Battlefield NM and all national parks is undergoing natural and human-caused changes that can have cascading effects on park resources. For smaller parks, such as Little Bighorn Battlefield NM, these effects can be especially significant and include the spread of invasive weeds as well as impacts to the monument’s viewshed. Wildlife populations (e.g., pronghorn, deer, herons, and grouse) can also be strongly affected by natural and human-caused changes. The introduction of barriers (e.g., highways and fences) and alterations to corridors (e.g., riparian areas) affect wildlife movement and migration. To address these issues, the ROMN will work with park staff and landscape ecologists to develop a Landscape Dynamics monitoring protocol and corresponding metrics that will provide specific information for Little Bighorn Battlefield NM management needs and concerns.

# 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 se-

lect 12 high-priority vital signs for the long-term inventory and monitoring program.

## 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.

### 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.




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

ROMN Vital Signs Monitoring Examples



Longs Peak, Rocky Mountain NP.



Meadow, Florissant Fossil Beds NM.

### WEATHER AND CLIMATE

The atmosphere is a primary driver of most surface ecological processes which determine the distribution and structure of park ecosystems. Because of these influences, understanding how weather and climate vary is essential to interpreting vital signs monitoring results. The goal of weather and climate monitoring is to interpret and report data that maximize our insight into key environmental processes and responses important to parks. Data from existing weather and climate networks and airborne and satellite observations will be matched to other vital signs monitoring.

### 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.



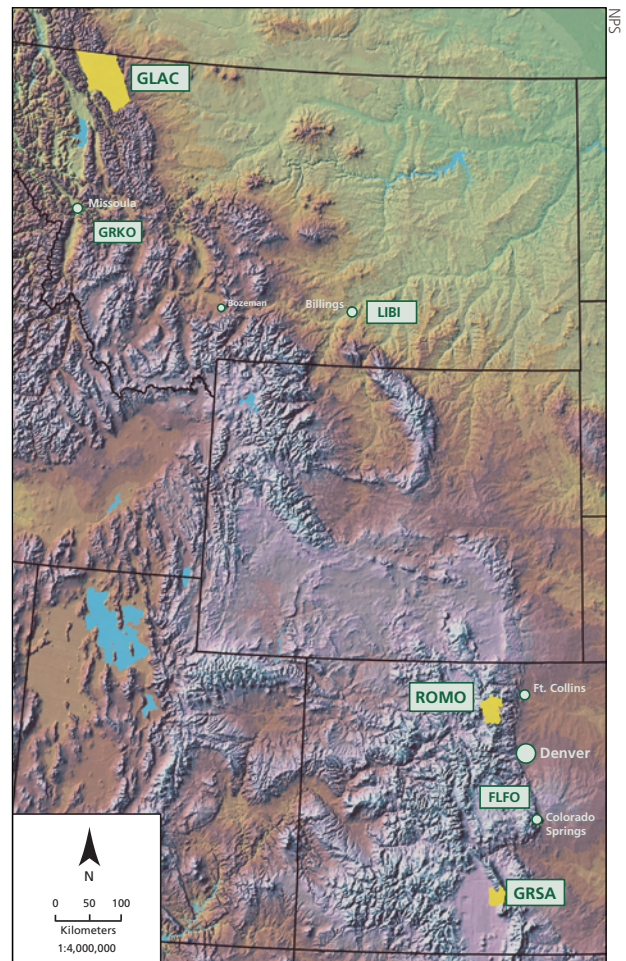
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Fieldwork provides park managers with credible scientific data to make informed management decisions to preserve and protect park resources.

## 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 re-



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).

sources “unimpaired for future generations” and for public benefit and enjoyment. Resource managers, scientists, data managers, and rangers participate in collecting and using this information.

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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