

Rocky Mountain Network

INFORMATION BRIEF

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Inventory & Monitoring Division



Checking Great Sand Dunes' Vital Signs

Rocky Mountain Network Science in the Park and Preserve

National parks are the guardians of unique American natural and cultural history. But perhaps more than ever before, parks exist in a rapidly changing landscape. Urban growth, replacement of native species by invasive exotics, air and water pollution, increasing visitor use, and climate change all impact the natural web of life. This leads park managers to ask:

How healthy are parks?

How are they changing?

In answer, the National Park Service clustered parks into 32 Inventory and Monitoring Networks. In 2007 at Great Sand Dunes and nearby parks, a small team of scientists with the [Rocky Mountain Network](#) began monitoring natural resources, called “vital signs,” that can serve as red flags if conditions deteriorate. Our team supports park managers’ efforts to make *science-based management decisions*.

What do we monitor at Great Sand Dunes National Park and Preserve?

Wetland Ecological Integrity

Great Sand Dunes has abundant and diverse wetlands. From wet meadows, marshes, salt flats and riparian wetlands in the park to fens and alpine wetlands in the preserve, these biodiversity hotspots are important to myriad species. Migratory birds, like the Wilson’s warbler and Lincoln’s sparrow eat, nest, and shelter in wetlands. Amphibians, like the chorus frog, need wetlands to reproduce. Elk and bison dine on wetland plants. Rapid climate change and invasive exotic plants, however, threaten wetlands. Furthermore, heavy grazing by elk and bison, especially in the national park, has impacted native wetland plants and possibly the water cycle. We monitor wetland health across the park and at select sites in the preserve to learn how these biologically rich ecosystems function and respond to stresses. We are working with park staff to enhance our wetland monitoring to address information needed to adaptively manage elk and bison in the park.

Some resources we measure:

- The different native plant species and forms (sedges, forbs, shrubs)
- Change in groundwater levels over time
- Presence/absence of invasive exotic plants
- Deer, elk, and bison use of wetlands

Learn more at our [website](#) (What We Monitor>Protocols>Wetland Ecological Integrity)



Alpine Communities

Visitors delight in the views atop high mountain peaks in the preserve. On these windswept slopes above treeline, alpine plants must adapt to extreme wind, temperature, snow, ice, and intense solar radiation. To do this, they are shorter, grow frugally, and bear leaves resistant to freeze damage and desiccation. Predictions are for alpine temperatures to moderate and snowpack to decrease. This could lead to invasion by subalpine plants that outcompete alpine plants in the absence of heavy snowpack and extreme temperatures. Alpine communities are also sensitive to heavy visitor use, air pollution, and overuse by animals (such as elk). We monitor alpine communities because of their value to visitors and vulnerability to multiple stresses in the preserve. Our sites are included in the international GLORIA research network (Global Observation Research Initiative in Alpine Environments) of 130+ alpine monitoring sites worldwide. As temperatures increase, evidence from GLORIA sites indicates that trees and other subalpine species are invading alpine communities.

Learn more at our [website](#) (What We Monitor>Protocols>Alpine Vegetation and Soils)

Explore the [GLORIA](#) project

Some resources we measure:

- The different native plant species and forms (sedges, forbs, shrubs, trees)
- Soil temperatures at different elevations and aspects (direction the slope faces)
- Presence/absence of invasive exotic plants



Snow Chemistry



USGS-Colorado Water Science Center partners sampling snow chemistry at Medano Pass

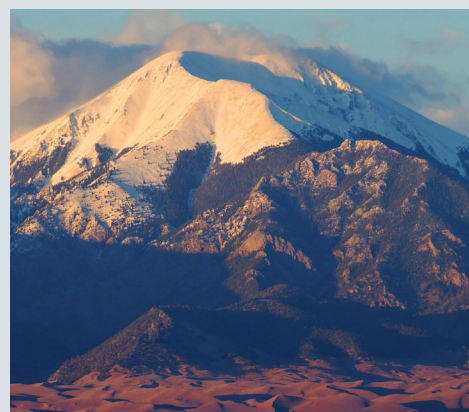
Ultimately, snowpack in the Sangre de Cristo Mountains drives the streams and groundwater systems in the park and preserve that helped create and maintain the Great Sand Dunes. Unfortunately, it also acts like a collection basket for air pollution. Particles of nitrate, ammonium, sulfate, and mercury enter falling snow and concentrate in the snowpack. Over the spring and summer, these pollutants find their way into Great Sand Dunes streams as snows melt, affecting downstream ecosystems and species. Each winter we partner with other National Park Service and US Geological Survey scientists to sample snowpack chemistry. This helps us track current conditions and long-term trends.

Learn more at our [website](#) (What We Monitor>Protocols>Snow Chemistry) and explore these links:

- [USGS Rocky Mountain Regional Snowpack Chemistry Monitoring](#)
- [Changing Regional Emissions of Airborne Pollutants Reflected in the Chemistry of Snowpacks and Wetfall in the Rocky Mountain Region, USA, 1993–2012](#)

Some resources we measure:

- Dissolved concentrations of air pollutant, including nitrate, ammonium, and sulfate
- Total mercury concentration
- Snow depth and water contained in the snowpack (snow water equivalent)



Explore the [Rocky Mountain Network website](#)

[Contact us!](#)

Learn about inventory and monitoring in the park and preserve and play with:

- [species lists](#) for your park (What We Inventory>Species Lists)
- [interactive visualization tools](#) for learning about climate, water quality, air quality, snowpack, and landscape patterns (Reports & Publications>Data Visualization)