

Rocky Mountain Network

INFORMATION BRIEF

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Inventory & Monitoring Division



Checking Rocky's Vital Signs

Rocky Mountain Network Science in the Park

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. Development, 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 Rocky 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 decisions*.



Paula Capece, Program Manager, leads snow chemistry monitoring



Billy Schweiger, Ecologist, leads stream and wetland monitoring



Erin Borgman, Plant Ecologist, leads alpine monitoring



Kirk Sherrill is our Data Manager



Kati Zybko is our Biological Technician



Sonya Daw is our Writer/Editor

What do we monitor at Rocky Mountain National Park?

Wetland Ecological Integrity



Monitoring a fen plant community near Haynack Lakes

Network research:

Schweiger, E. W., J. B. Grace, D. Cooper, B. Bobowski, and M. Britten. 2016. Using structural equation modeling to link human activities to wetland ecological integrity. *Ecosphere* 7(11):e01548.

Rocky has abundant wetlands. From wet meadows and fens (peatland), to riparian and alpine wetlands, 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 and boreal toad, need wetlands to reproduce. Elk and beaver dine on wetland plants. Rapid climate change and invasive exotic plants, however, threaten wetlands. Furthermore, heavy grazing by elk in the past, especially in low-elevation riparian wetlands on the park’s east side, has impacted the water cycle and native wetland plants. A moose population that became established in the Kawuneeche Valley after introduction outside the park is an added stress. Moose are increasingly using wetland habitat on the east side of the park. We monitor wetland health parkwide to learn how these biologically rich ecosystems function and respond to stresses.

Some resources we measure:

- The different native plant species and forms (sedges, forbs, shrubs)
- Groundwater levels and the pattern of water flow across the ground surface
- Presence/absence of invasive exotic plants
- Presence of beaver

Learn more at our [website](#)

(What We Monitor>Protocols>Wetland Ecological Integrity)

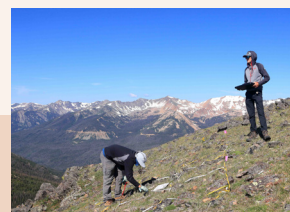
Alpine Communities

Visitors delight in the views atop Rocky's high mountain peaks. 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 at Rocky. 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), and explore the GLORIA program: [Global Observation Research Initiative in Alpine Environments](#)

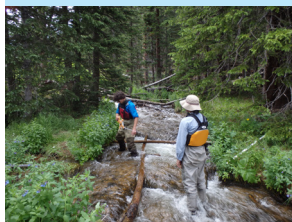
Some resources we measure:

- 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



GLORIA monitoring site on the tundra

Stream Ecological Integrity



Stream crew measuring channel dimensions near Hidden Valley

Rocky's streams are vital resources. They anchor the hydrology (the water cycle) of the park, recycle nutrients like carbon, and provide habitat for wildlife. Visitors fish and recreate along Rocky's pristine streams. However, these streams are sensitive to a variety of stressors. Excessive nutrients, sediment, and air pollution degrade them. Climate change warms streams and lowers flow by shrinking the snowpacks that feed streams, potentially affecting fish and invertebrates. Because streams signal the effects of multiple stressors, we monitor their status and long-term trends to inform park resource managers.

Some resources we measure:

- Water chemistry, like pH and nitrogen concentration
- Physical habitat, like woody debris and the size of sand and cobble along the streambed
- Algae and aquatic insects

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

Snow Chemistry



USGS-Colorado Water Science Center partners sampling snow chemistry

High mountain snowpack feeds Rocky's streams. 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 Rocky's 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.

Some resources we measure:

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

Learn more at our [website](#) (What We Monitor>Protocols>Snow Chemistry), and from the following program:

- [USGS Rocky Mountain Regional Snowpack Chemistry Monitoring](#)

Explore the [Rocky Mountain Network website](#)

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

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

Contact us!

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