



# Natural Resource Monitoring at Bryce Canyon National Park



Thor's Hammer/NPS

## The Northern Colorado Plateau Network

The Northern Colorado Plateau Network (NCPN) covers a geologically and biologically diverse region comprising 16 national parks in four western states. These parks contain desert grasslands, shrublands, forests, caves, large rivers, perennial streams, seeps, springs, and striking geology. Invasive plants, trampling and grazing by livestock, and adjacent land-use activities are some of the most significant threats to NCPN parks. The NCPN is designing and implementing a long-term monitoring program to measure key indicators of ecological integrity, or “vital signs.” Multiple monitoring efforts will help inform managers of the health of park resources and provide early detection of potential problems. This brief describes recent NCPN activities at Bryce Canyon National Park.

## Flora Checklist



Segoe lily.  
Sheri Hagwood@USDA-NRCS PLANTS Database

In 2008, a revised checklist of the vascular flora of Bryce Canyon NP was completed. This entailed a thorough review of existing literature, re-examination of specimens from the Bryce Canyon NP herbarium and other state and national museum collections, and additional field work to corroborate unverified species reports and locate new species. Based on this study, 587 vascular plant taxa have been confirmed or reliably reported as occurring in the

park. Another 76 species formerly considered part of the park flora have now been shown to be falsely reported. Although no plant taxa are listed as threatened or endangered, at least 50 are considered species of concern by state and/or federal agencies. Introduced plants make up 10% of the park flora (60 species), of which 7 are considered noxious weeds by the State of Utah.

## Water Quality



Sonde/NPS

The NCPN is conducting long-term water quality monitoring at selected sites in Bryce Canyon NP, chosen through consultation with park resource management staff. Data are used to determine compliance with the Clean Water Act and monitor trends in water quality that may impact visitors as well as the eco-

logical function of aquatic systems. Monthly monitoring visits indicate that Sheep Creek has consistently exceeded EPA standards for sulfate in drinking water, though no bacteria standards have been exceeded since summer 2007. In 2008, Sheep Creek was dropped from monitoring, while Mossy Cave was added.

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## Landbirds



Juniper titmouse.  
©Greg Lavaty

Birds play an important role in the flow of energy through ecosystems because they occupy various levels in the food web. Birds are also sensitive to habitat changes, which make them good indicators of habitat quality. The NCPN is partnering with the Rocky Mountain Bird Observatory (RMBO) to assess breeding bird species trends in three habitats: riparian, pinyon-juniper, and sagebrush-shrubland. The NCPN has monitored one plot in pinyon-juniper woodland and two in sagebrush-

shrubland at Bryce Canyon NP since 2005. The NCPN and RMBO will produce the first trend estimates for individual bird species after the 2009 field season, the fifth year of NCPN landbird monitoring. The goal is to be able to detect a population change of at least 3% within 30 years. We currently estimate that we will be able to do this for 52 species, representing more than 90% of all individual birds observed during 2005–2007.

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## Air Quality



Bryce Canyon NP airshed.  
IMPROVE

Understanding changes in air quality can aid in interpreting changes in other monitored vital signs. The NCPN will acquire and analyze air quality data from existing stations in NCPN parks. The network's air quality monitoring protocol was undergoing final review in late 2008; its first air quality report will be produced in 2009. For Bryce Canyon NP, the report will focus on wet deposition of air pol-

lutants and visibility monitoring. Under the Clean Air Act, Class I areas, like Bryce Canyon NP, are subject to regulatory standards for particulates and visibility. A digital camera monitoring station was active at Yovimpa Point from 1984 to 2007, and will be active again beginning in 2009, when the park will take over its funding.

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## Climate



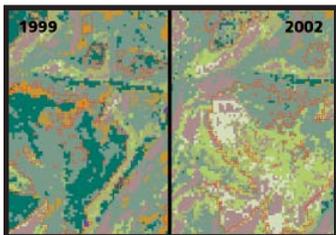
Bryce Amphitheater/NPS

The overarching goal of NCPN climate monitoring is to compile and present climate data in a form that helps us to understand the reasons for trends seen in other network vital signs. The NCPN compiles and analyzes climate data from five weather stations in Bryce Canyon NP, which is one of eight NCPN parks that have shown an increase in average minimum annual temperature over the past 41 years or more. The average maximum high for 2007 was 59.6°, the third-highest average

ever recorded for this station. Precipitation for 2007 was 7.65 inches, the lowest amount ever recorded for this station. In 2007, maximum and minimum temperatures were generally above average, and snowfall below average, at climate stations across the network. Bryce Canyon NP climate data for the years 1948–2007 are available in an interactive, graphical format on the NCPN web page. A climate report, produced by the NCPN in 2008, is also available on the network's web page.

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## Land Cover and Land Use



Example fire-effects map.  
USDA Forest Service

The composition, configuration, and connectivity of land-cover types determine habitat availability, energy and material flows, and the movement of organisms on a landscape. Changes in landscape structure due to natural and human-caused disturbances can be detected by evaluating imagery representing conditions across many years. Custom algorithms are being refined to unambiguously separate long-term change from seasonal and

annual phenological changes due to variations in weather. These data will provide park managers with a baseline against which to assess future changes in landscape structure and composition; the ability to detect large-scale disturbances in remote areas; and information on land-use activities along park boundaries. A pilot report is expected in May 2009, with protocols and standard operating procedures to follow.

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## Additional Efforts

The NCPN is continuing to expand ecological monitoring at Bryce Canyon NP. Protocols for monitoring land condition and uplands

are underway and planned for future implementation.

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## For more information

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