



# Natural Resource Monitoring at Zion National Park



Zion National Park/©A.W. Biel

## 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 Zion National Park.

## Landbirds



Gray vireo/RMBO

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.

NCPN data will contribute to the RMBO's broader, landscape-scale, breeding-bird monitoring program. The NCPN has monitored one plot in pinyon-juniper woodland, and two in low-elevation riparian areas at Zion NP since 2005. The NCPN and RMBO will begin to look at trend data in 2009, after five years of data collection.

## Uplands



Angel's Landing/NPS

Integrated upland monitoring includes measuring soil and site stability, hydrologic function, biotic integrity, and vegetation composition and structure. To determine the vegetative communities of interest in the monitoring effort, discussions with park staff will begin in 2008, followed by a three-year pilot study

designed to obtain an estimate of the variance in key parameters. The information gathered will be used to determine the number of plots necessary for long-term monitoring. Pilot sites will be selected in a manner that ensures they will be incorporated into data analysis in the future, full-scale monitoring program.

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## Riparian Systems



LaVerkin Creek/NPS

The health of riparian systems is of high interest to park managers in the arid landscape of the Colorado Plateau. Riparian ecosystems are potentially sensitive indicators of landscape-level change because they are linked to both aquatic and upland systems, perform important ecological functions, and support high levels of biological diversity. Integrated riparian monitoring involves the collection of bio-

logical and physical measures, such as riparian vegetation, non-native species invasions, streamflow, alluvial groundwater dynamics, and changes in channel form. Developing credible, efficient monitoring approaches will help the NCPN to assess riparian-system health and provide early warning of system degradation. Integrated riparian pilot monitoring began at Zion NP in fall 2007.

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## Water Quality



North Fork, Virgin River/NPS

Data from water quality monitoring conducted in Zion NP are used to assess condition and trends in water resources relative to the Clean Water Act, human health, and ecological function. Monthly monitoring visits between September 2005 and August 2007 indicated that 4 of 7 sites sampled did not meet state standards for secondary contact and warm water game fish species. The most common problems were occasionally low dissolved oxygen and

high total phosphorus concentrations. North Creek had the most exceedances, which appear related to the June 2006 Kolob fire and subsequent floods. Continued monitoring will track recovery of North Creek. These results raise interesting questions about post-fire watershed response and stream ecology that could be investigated through additional research.

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## Species Lists



Tiger salamander/NPS

The NCPN has completed NPSpecies certification at Zion NP for six taxonomic categories—birds, mammals, reptiles, fish, amphibians, and vascular plants—and has posted the results on its website. An interactive application allows users to select a desired taxonomic category and an alphabetic sort function (i.e., by common name, scientific name, or family-scientific name). Additionally, users can

search by park, by status of the species in the park (e.g., present, historic, unconfirmed), and by individual species—allowing users to query, for example, does Zion NP have a verified report of a tiger salamander? The resulting species list can be downloaded into an Excel spreadsheet for use by the public, park staff, or park cooperators.

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## Climate



Snow at higher elevations/NPS

Climate plays a crucial role in regulating biological and physical processes; rainfall and temperature are the primary factors that limit an ecosystem's structure and function. The NCPN compiles and analyzes climate data from five existing weather stations in Zion NP. Multiple weather stations are necessary due to the park's large differences in elevation and

habitat. For example, in 2006, two different stations recorded annual average maximum temperatures of 77 and 60 degrees, respectively. Total precipitation ranged from 14 to 24 inches, depending on the weather station. Zion NP climate data for the years 1904–2006 is available in an interactive, graphical format on the NCPN webpage.

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## Future Projects

The NCPN is continuing to expand ecological monitoring at Zion NP. Protocols for monitoring aquatic macroinvertebrates; land condition; air quality; land cover and land use;

springs, seeps, and hanging gardens; invasive exotic plants; and human demographics and development are underway and planned for future implementation.

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## For more information

Northern Colorado Plateau Inventory & Monitoring Program  
National Park Service  
P.O. Box 848  
Moab, UT 84532  
435-719-2346  
<http://www1.nature.nps.gov/im/units/ncpn/index.cfm>

