



Natural Resource Monitoring at Zion National Park



NPS/D. Thomas

Spring snowfall.

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.

Water Quality



Virgin River.

NCPN water-quality monitoring is made possible through partnerships between the I&M Program, individual park units, the U.S. Geological Survey, and the State of Utah's Division of Water Quality. In 2010, the network published its second biennial report on water quality in NCPN parks, covering the period from January 1, 2006 to December 31, 2009. Of 3,450 comparisons of results against beneficial use standards conducted at nine sites in and near Zion NP, 97 (2.8%) exceeded water quality standards or indications of impairment. Stan-

dards were exceeded for six constituent categories—most commonly, total dissolved solids, nutrients, and dissolved oxygen. On North Creek, the continuation of routine monthly monitoring and installation of a continuous monitoring station should provide additional information about the recovery of post-fire water quality. After enough data are obtained, a long-term trend analysis will be performed for various parameters, which should facilitate discussion about fire effects and post-fire watershed recovery.

Air Quality



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Park airshed.

Understanding changes in air quality can aid in interpreting changes in other monitored vital signs and support evaluation of compliance with legislative and reporting requirements. The NCPN acquires and analyzes air quality data from existing stations in and near NCPN parks. The network's second air quality report was produced in 2010. For Zion NP, the report focused on ozone and visibility monitoring. While ozone levels were estimated to be of

significant concern at the park, there were not enough data to determine trend; as such, it is not known if the park is currently meeting its 2009 GPRA goal for ozone. Visibility, the most sensitive air quality-related value at the park, was estimated to be in moderate condition at the park, and has been improving on clear days. The park is currently meeting its 2009 GPRA goal for visibility.

Riparian Systems



Examining riparian vegetation.

Integrated riparian monitoring involves the collection of biological and physical measures, such as riparian vegetation, non-native species invasions, streamflow, alluvial groundwater dynamics, and changes in channel form. Credible, efficient monitoring will help the NCPN to assess riparian-system health and provide early warning of system degradation. The East Fork of the Virgin River was selected for monitoring at Zion NP. Monitoring began in 2008

and has expanded each year since. To date, three integrated monitoring reaches have been sampled for vegetation, with a fourth reach planned for implementation in 2011. At one of these reaches, network staff installed shallow groundwater-monitoring wells and surveyed cross-sections of the channel and the location of the thalweg. A total of seven reaches will be monitored throughout the stream, and implementation will continue in 2011.

Uplands

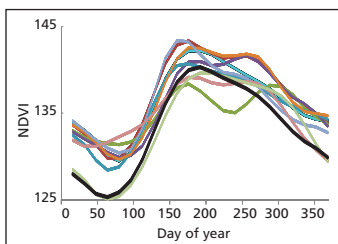


Uplands monitoring plot.

NCPN uplands monitoring is intended to strike a balance between increasing fundamental understanding of these systems and providing managers with early warning of undesirable change. This protocol measures soil stability, hydrologic function, biological soil crusts, and

plant community characteristics. In 2010, the network initiated discussions with park staff to determine which vegetation systems should be selected for integrated uplands monitoring at Zion NP. The network will implement uplands monitoring at the park in 2011.

Land Condition



Annual NDVI curves stacked for inter-annual comparison, Zion NP, 2000–2009.

The NCPN and U.S. Geological Survey have developed remote-sensing methods to improve understanding of how broad-scale vegetation condition responds to short-term weather events, long-term climate trends, land use, and geographic position. The satellite-derived Normalized Difference Vegetation Index (NDVI) and snow-cover imagery, available bi-weekly,

are used to measure vegetation greenness and snow-covered area through time. In 2011, the NCPN published its first status and trends report on remote sensing of vegetation phenology and snow-cover extent in NCPN parks, covering the years 2000–2009. The maximum NDVI greenness at Zion NP in 2009 (black line in chart) was 2.2% below the nine-year average.

Landbirds



Bewick's wren.

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The NCPN is partnering with the Rocky Mountain Bird Observatory to assess breeding bird species trends in three habitats: riparian, pinyon-juniper, and sagebrush-shrubland. In 2009, the fifth year of monitoring was completed, including one plot in pinyon-juniper woodland and two in low-elevation riparian habitat at Zion NP. The first trend analyses were conducted this year. Although populations for most species of conservation concern within

the NCPN appeared to be stable, Bewick's wren, in pinyon-juniper habitat, and black-billed magpie, in sage-shrubland habitat, appeared to be experiencing significant declines. In addition, the 2010 density estimate for Bewick's wren in low-elevation riparian habitat was the lowest estimated for the six years of the program. Long-term monitoring will continue to be necessary for interpreting population status and trends for avian species of the NCPN.

Additional Efforts

The NCPN is continuing to expand ecological monitoring at Zion NP, where additional ef-

forts include monitoring of climate, land cover/land use, and invasive exotic plants.

For more information

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