



Natural Resource Monitoring at Zion National Park



Nagant Mesa, Kolob Canyons (NPS/M. Large)

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



Monitoring on La Verkin Creek (NPS)

At Zion NP, the NCPN cooperates with the State of Utah to conduct water quality monitoring to assess condition and trends in water resources relative to the Clean Water Act, human health, and ecological function. Elevated phosphorus concentrations are prevalent in streams throughout Zion, likely derived from natural weathering. However, nutrient enrichment in North Creek associated with the 2006 Kolob fire is still causing summer eutrophication,

which may be preventing recolonization by native fish. *E. coli* contamination was observed in North Fork Virgin River above the Narrows in summer months in 2001, 2006, 2007, 2008, and 2009. The North Fork Virgin River was recently added to the 303(d) list of impaired water bodies by the State of Utah. The NCPN, in cooperation with the State of Utah and Zion NP, will continue monitoring bacteria in 2010.

Uplands



Kolob Terrace (NPS)

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 and site stability, hydrologic function, biotic integrity, and

vegetation composition and structure. In 2010, in cooperation with park staff, the network will 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.

Landbirds



Black phoebe (©Greg Lavaty)

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 areas at Zion NP. We currently estimate that we will be able to detect a population change of at least 3% within 30 years for 55 species, repre-

senting more than 90% of all individual birds observed thus far. To date, only one species is showing a consistent annual decline in NCPN parks: mourning dove, in low-elevation riparian areas. Three species have shown consistent annual increases: black phoebe and black-throated sparrow, both in low-elevation riparian habitat, and dusky flycatcher, in sage-shrubland. This trend information is preliminary.

Air Quality



Zion NP airshed (NPS/M. Large)

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 NCPN parks. The network's first air quality report was produced in 2009. For Zion NP, the report focused on ozone and visibility monitoring. Ozone was rated as being in a condition of significant concern. The data set for the park's visibility

monitor, is currently too limited to allow trend identification, but based on interpolated data from Bryce Canyon NP, visibility on the clearest days has improved and has shown no trends on the haziest days at Zion NP. Visibility was estimated to be in moderate condition at the park, which is currently meeting its 2008 GPRA goal for visibility. Due to limited data, it cannot be determined if Zion NP is meeting its GPRA goal for ozone.

Riparian Systems

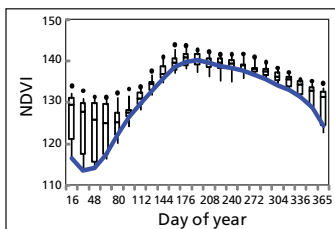


Monitoring plot (NPS)

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 Virgin River was selected for monitoring at

Zion NP. Monitoring began in 2008 and has expanded each year since. To date, two integrated monitoring reaches have been sampled for vegetation and geomorphology, with a third reach planned for implementation in 2010. The final monitoring plan for Zion NP was completed in 2009, with a proposed seven reaches to be monitored throughout the stream. Monitoring implementation will continue in 2010.

Land Condition



Normalized Difference Vegetation Index values for Zion NP in 2009, plotted with historical ranges.

The NCPN and U.S. Geological Survey have developed remote-sensing methods to study how broad-scale vegetation condition responds to short-term weather patterns, long-term climate trends, land use, and geographic position. Understanding vegetation response enhances knowledge of the biological ecosystems and physical processes affected by vegetation productivity and distribution. The Normalized Difference Vegetation Index (NDVI) is

a measure of vegetation greenness, or productivity, derived from satellite imagery. Green-up lagged well behind the 9-year average in 2009, due to persistent snow cover. However, by mid-season, greenness was caught up to the 9-year average. At that point, the unusually dry monsoon resulted in declining greenness, which fell well below average by the end of the growing season. End of season brown-down occurred earlier and faster than in previous years.

Additional Efforts

Efforts are underway to complete a Natural Resource Condition Assessment for Zion NP,

and the park's list of natural resource inventory needs was updated in 2009.

For more information

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