



Natural Resource Monitoring at Canyonlands National Park

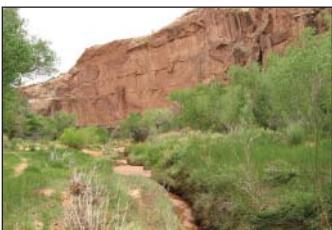


View from Maze Overlook (NPS/N. Herbert)

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 Canyonlands National Park.

Water Quality



Horseshoe Canyon, Maze District (NPS)

At Canyonlands NP, the NCPN is cooperating with the State of Utah and park staff to collect water quality monitoring data used to assess condition and trends in water resources relative to the Clean Water Act, human health, and ecological function. Several monitoring sites continue to exhibit low dissolved oxygen conditions, resulting either from natural groundwater recharge or low-flow conditions during hot summer months. Available data for both

the Green and Colorado rivers show an indication for impairment due to elevated phosphorus concentrations that may be the result of natural weathering processes. Periodic exceedances for dissolved selenium were observed in both the Colorado and Green rivers. Natural weathering of the Mancos Shale is known to cause widespread loading of salinity and selenium throughout western Colorado and eastern Utah; this process may be accelerated by human activities.

Springs and Seeps



Spring site (NPS)

The primary goal for long-term monitoring of springs, seeps, and hanging gardens is to assess trends in key indicators of spring and seep ecosystem health. In 2009, the NCPN completed data collection for a two-year study investigating the effects of anthropogenic disturbance on aquatic macroinvertebrate communities and habitat quality across a range of 45 impacted springs, including 12 springs at Canyonlands

NP. The information from these studies will serve as the basis for selecting future core monitoring parameters and provide metrics for interpreting springs and seeps data. Monitoring protocols for springs are scheduled to be developed in FY 2010 and implemented in FY 2011. Protocols for monitoring rare plant populations at hanging gardens will be developed and tested in FY 2010.

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 two plots in pinyon-juniper woodland and three in low-elevation riparian areas at Canyonlands NP, continuing the riparian bird monitoring conducted by park staff during 1993–2004. We currently estimate that we will be able to detect a population change

of at least 3% within 30 years for 55 species, representing 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.

Uplands



Biological soil crust (NPS/A.W. Biel)

This protocol measures soil and site stability, hydrologic function, biotic integrity, and vegetation composition and structure. Through discussions with park staff, grassland and shrubland types were selected for integrated upland monitoring in Canyonlands NP. Monitoring began in 2006, the first of a three-year pi-

lot study (2006–2008) to obtain an estimate of the variance in key parameters. The results of a power analysis performed on the three years of pilot data were used to create a full operational sampling design, implemented in 2009. In 2010, network staff will complete the fifth year of monitoring at the park.

Air Quality

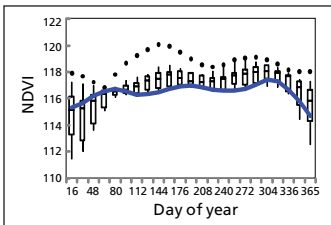


Maintaining air-quality equipment (NPS/A.W. Biel)

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. Air quality monitoring at Canyonlands NP includes a full complement of wet and dry deposition, ozone, and visibility monitoring. Nitrogen and sulfur levels are in good condition at the park, but ammonium has seen increasing trends over the past 10 years. Ozone levels are

rated in moderate condition. Visibility, the most sensitive air quality-related value at Canyonlands NP, is estimated to be in moderate condition, and has been improving on clear days. Canyonlands NP is not currently meeting its 2008 GPRA goal for deposition due to increasing trends in ammonium wet deposition, but is meeting ozone and visibility goals.

Land Condition



Normalized Difference Vegetation Index values for Canyonlands 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 pro-

ductivity, derived from satellite imagery. The timing of green-up in 2009 was approximately the same as the 9-year average, but was slightly more productive in the early growing season and considerably less productive for the remainder of the season, based on sustained seasonal greenness. Spring flows in the park were lower than in previous years, perhaps indicating a short-term link between precipitation and spring flow reflected in vegetation vigor on the surrounding uplands.

Additional Efforts

The NCPN is continuing to expand ecological monitoring at Canyonlands NP. Protocols for monitoring riparian communities and land cover/land use are underway and planned for

future implementation. The network also reports on climate monitoring for the park. The park's list of natural resource inventory needs was updated in 2009.

For more information

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