



Natural Resource Monitoring at Arches National Park



Arches National Park (NPS/A. Wondrak 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 Arches National Park.

Vegetation Mapping



Vegetation mapping area (NPS)

The NCPN recently completed a multi-year, multi-partner effort to map vegetation at Arches NP. This project included gathering aerial photography, collecting initial vegetation-plot data, using the vegetation data to classify vegetation types and write descriptions, writing a vegetation-type key, performing photo interpretation, conducting an accuracy assessment, creating a geodatabase, and writing the final report. The team collected vegetation and environmental data from 333 vegetation classification plots,

256 observation points, and 792 accuracy-assessment points. A total of 6,709 map polygons representing 31 natural and semi-natural vegetation map classes were developed for the project, which achieved an overall mapping accuracy of 90.1%. These maps will be a valuable resource for use in park management, resource monitoring, interpretive programs, planning, prescribed fire, and as a baseline for designing ecological studies.

Springs and Seeps



Alcove death camas (NPS)

In 2009, the NCPN completed data collection for a two-year study investigating the effects of anthropogenic disturbance on aquatic macro-invertebrate communities and habitat quality across a range of 45 impacted springs, including 7 springs at Arches NP. Information from these studies will serve as the basis for selecting future core monitoring parameters and provide

metrics for interpreting springs and seeps data. Also in 2009, the NCPN initiated an inventory of rare-plant populations at 21 hanging gardens in Arches NP. 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)

Birds play an important role in the flow of energy through ecosystems and are sensitive to habitat changes, making them good indicators of habitat quality. 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 three in low-elevation riparian areas at Arches 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



Pinyon-juniper (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.

Through discussions with park staff, grassland and shrubland types were selected for monitoring at Arches NP. Network staff will implement full-scale integrated uplands monitoring at Arches NP in 2010, using a sampling design based on data from pilot monitoring conducted at nearby Canyonlands NP.

Water Quality

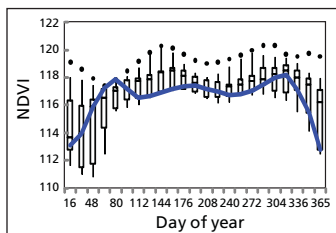


Lower Courthouse Wash (NPS)

At Arches NP, the NCPN is cooperating with park staff to collect water quality monitoring data used to assess condition and trends relative to the Clean Water Act, human health, and ecological function. Salt Wash at Wolfe Ranch consistently exceeds standards for total dissolved solids due to natural geologic sources. Observations from site visits also note con-

sistent turbidity with very fine grey sediment. At spring sites, dissolved oxygen concentrations were below standards for fish, but do not warrant concern because contributions from groundwater seepage near these sites is typically low in dissolved oxygen. Spring flows were lower in 2009 than in previous years.

Land Condition



Normalized Difference Vegetation Index values for Arches 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. The

timing of green-up in 2009 was consistent with the 9-year average, but showed slightly higher early-season peak greenness. The 2009 curve was generally below average during most of the growing season, before catching up to near-average conditions late in the monsoon season. After that, brown-down was considerably more rapid than in previous years. Spring flows 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 Arches NP. A protocol for monitoring riparian communities is underway and planned for implementation in 2010, with the

establishment of two reaches in Courthouse Wash. Climate and air quality are also monitored, and the park's list of natural resource inventory needs was updated in 2009.

For more information

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