



Natural Resource Monitoring at Arches National Park



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Arches National Park.

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 species, 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.

Aquatic Contaminants



Sleepy Hollow Spring.

In 2010, as part of a special project in cooperation with the Environmental Protection Agency (EPA), the NCPN sampled three water bodies at Arches NP for contaminants of emerging concern (those that have not traditionally been tested for during water quality sampling and may not be adequately cleansed by current wastewater treatment methods). Samples were analyzed at an EPA lab for evidence of pesticides and wastewater indicators, including manufacturing byproducts and agricultural

and human waste contaminants. In preliminary results, several analytes were detected in Sleepy Hollow and Courthouse Boundary springs. Phenol surpassed a known level of biological concern at the latter site. Follow-up samples will determine if these analytes are persistent. Courthouse Boundary Spring will be re-sampled in 2012, and additionally tested for the presence of pharmaceuticals and personal care products. The network will publish final results from this work at a later date.

Riparian Systems



Surveying a reach.

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 approaches will help the NCPN to assess riparian-system health and provide early warning of system degradation. Monitoring of Courthouse Wash began

in 2010 and has expanded each year since. To date, four integrated monitoring reaches have been sampled for vegetation, and cross-sections of the channel and the location of the thalweg have been surveyed at three reaches. Shallow groundwater-monitoring wells were installed at one reach. The proposed monitoring plan for Arches NP includes monitoring seven reaches throughout the wash.

Springs and Seeps

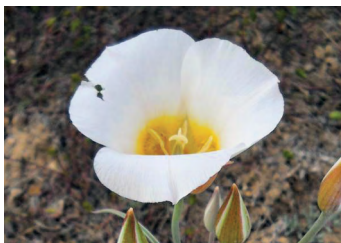


Upper Courthouse Spring.

In cooperation with Southeast Utah Group staff, spring flow monitoring continued at three sites in 2012, and other measures, including water quality and vegetation sampling, were initiated at these sites. Methods for monitoring hanging gardens will be tested in autumn 2012. Also in 2012, the NCPN completed a power analysis of pilot data and selected long-term monitoring locations for the proposed sampling design for springs monitoring. Data suggest that spring flow at two long-term monitoring sites

has declined over a 10-year record. Results from a two-year study investigating the effects of anthropogenic disturbance on aquatic macroinvertebrate communities and habitat quality across 40 impacted springs, including 6 springs at Arches NP, are in press for the journal *Western North American Naturalist*. Data suggest that springs are resilient to—and perhaps even adapted to—moderate levels of disturbance, but there is a threshold beyond which negative impacts begin to accrue.

Flora Update

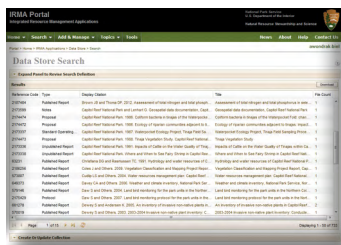


Cisco mariposa.

In 2008–2009, the NCPN published an annotated checklist of vascular plant species for each network park. Since that time, nearly 700 changes have been necessary to keep up with new research, due to the discovery of new species and changes to park status and existing nomenclature. For instance, 432 new vascular plant species have been added to the park floras and the status of another 102 species has

been changed. An [addendum to the original checklists](#), compiled by contractor Walt Fertig and published in 2012, details these changes. Arches NP has seen an increase of 30 new plant taxa, the most notable of which is the Cisco mariposa (*Calochortus ciscoensis*). The park's confirmed and reported flora now stands at 551 taxa, an increase of 5.5% since 2007.

IRMA Data Store



Looking for something? The Integrated Resource Management Applications (IRMA) portal is your web-based “one-stop shop” for documents, data sets, and other types of NPS natural and cultural resource information. In 2011, the NCPN received funding from the national I&M Program to upload digital files to the [IRMA Data Store](#). Overall, a total of 370 digital files were uploaded. About half of those documents were already in digital form; the

other half had to be scanned from hard-copy documents. Of the 370 documents uploaded, [80 were linked to Arches NP](#). These documents covered topics including hanging garden communities, air quality, and invasive exotic plants. Most IRMA records are available to the public; a small number, usually those that contain sensitive information (e.g., the location of paleontological artifacts or endangered plants) are only available internally upon request.

Uplands



Uplands ecosystem.

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. Through discussions with park staff, grasslands and black-brush shrublands were selected for monitoring

at Arches NP. Network staff implemented 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. Network staff returned for a third season of monitoring in 2012. [Annual reports](#) on uplands monitoring are available at the network's website.

Additional Efforts

In addition to the projects described in this brief, the NCPN also monitors climate, landscape dy-

namics, land surface phenology, landbirds, and water quality at Arches National Park.

For more information

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