



Natural Resource Monitoring at Hovenweep National Monument



Hovenweep House (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 Hovenweep National Monument.

Climate



Clouds over the Cajon Group (NPS)

The overarching goal of NCPN climate monitoring is to compile and present climate data in a form that helps us to understand the reasons for trends seen in other network vital signs. The NCPN compiles and analyzes climate data from one weather station in Hovenweep NM. In 2009, average annual maximum temperatures tended to be below average throughout much of the NCPN region. Precipitation in 2009 was noticeably below long-term averages for 20 of 23 stations with valid precipitation totals. Snowfall

was somewhat less than long-term averages at many stations. Most stations with long observation periods show a general increase in average annual minimum temperature over the past 29–49 years. Conversely, there is evidence for a declining trend in snowfall over the past 20–25 years. Hovenweep NM climate data for the years 1957–2009 are available in an interactive, graphical format on the NCPN web page. A climate report, produced by the NCPN in 2010, is also available on the network’s web site.

Water Quality

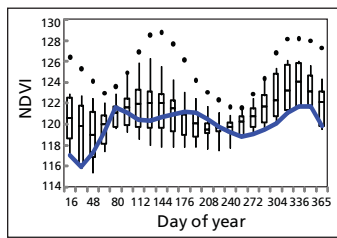


Hackberry Spring pool (NPS)

At Hovenweep NM, 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. Groundwater recharge at Square Tower Spring and low-flow conditions at Cajon Spring result in low dissolved oxygen

conditions. Cajon Spring is a rain-catchment pool, and because this pool tends to radically change in size and regularly dries up, its chemistry can vary dramatically. In 2009, the pool levels at Square Tower and Hackberry springs were the lowest since monitoring began in 2005.

Land Condition



Normalized Difference Vegetation Index values for Hovenweep NM 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 slightly behind the 9-year average in 2009, when

early season peak greenness was lower than in the last 10 years. A mid-season peak indicated higher productivity than normal before falling to one of the lowest late-season productivity levels observed in the past 10 years. End of season brown-down occurred earlier than in previous years. The pools at Square Tower and Hackberry springs were measured at their lowest levels since 2005, perhaps indicating a short-term link between precipitation and groundwater recharge reflected in vegetation vigor in the surrounding uplands.

Inventory Needs



Canyon treefrog (NPS/D. Thoma)

Except for vegetation mapping, the NCPN no longer receives funding for natural resource inventories. However, networks and parks may have opportunities to compete for funds to support additional inventories in the future, or there may be year-end funds available for those inventories. In 2009, NCPN park managers were asked to compile a list of inventories they would like to see completed if funding becomes available, and to rank those inventories as high,

medium, or low priority. In rank order relative to the overall network, the inventories identified as high-priority for Hovenweep NM were amphibians and reptiles, bats, unique insects, small mammals, and aquatic invertebrates. Having this “wish list” ready will provide the NCPN with direction when seeking external funding and potential partnership opportunities that often require quick action.

Springs and Seeps

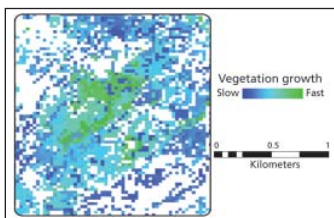


Emergence site (NPS)

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 three springs at Hovenweep NM. 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. Also in 2009, the NCPN initiated an inventory of rare-plant populations at 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.

Land Cover and Land Use



Vegetation growth rates, 1984–2002.
Oregon State University

The composition and connectivity of land-cover types determine habitat availability, energy and material flows, and the movement of organisms on a landscape. Disturbance-based changes in landscape structure can be detected by evaluating imagery representing conditions across many years. Using a time series of remotely sensed imagery collected annually from Landsat satellites, it is now possible, with newly developed image analysis techniques, to determine

spatial extent, rate, direction, duration, and relative magnitude of vegetation-cover change for some ecosystems. Detectable changes include both rapid and gradual change due to fire and drought stress, as well as growth and recovery processes. In the near term, this project will focus on park-specific issues of management concern related to cheatgrass invasion and changes in pinyon-juniper cover.

Additional Efforts

The NCPN also reports on air quality monitoring for Hovenweep NM, and the park's list of

natural resource inventory needs was updated in 2009.

For more information

Northern Colorado Plateau Inventory & Monitoring Program
National Park Service
P.O. Box 848
Moab, UT 84532
435-719-2346
<http://science.nature.nps.gov/im/units/ncpn/>

