



Natural Resource Monitoring at Hovenweep National Monument



© Tony Beaman

Hovenweep National Monument.

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



Temperature sensor.

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 2010, mean annual maximum temperature tended to be below average throughout much of the NCPN region, while mean annual minimum temperature, precipitation, and snowfall

were above long-term averages. Most stations with long observation periods show a general increase in average annual minimum temperature over the past 30–50 years. There is evidence for a declining trend in snowfall from the 1980s to the mid-2000s; however, snowfall in 2010 and during the previous couple of years was higher than the long-term average. A climate report was produced by the NCPN and posted on the network’s web site in 2011.

Springs and Seeps

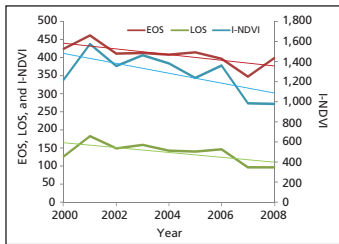


Springs monitoring.

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 40 impacted springs, including 3 springs at Hovenweep NM. Data suggest that springs are resilient to—and per-

haps even adapted to—moderate levels of disturbance, but there is a threshold beyond which negative impacts begin to accrue. Southeast Utah Group (SEUG) staff has reviewed the draft springs monitoring protocol, and site selection is currently underway. A subset of spring-sampling data collected for SEUG water quality monitoring will be incorporated into NCPN springs monitoring.

Land Condition



Annual monsoon phenology metrics with trends, Hovenweep NM, 2000–2009.

The NCPN and U.S. Geological Survey have developed remote-sensing methods to improve understanding of how broad-scale vegetation condition responds to short-term weather events, long-term climate trends, land use, and geographic position. The satellite-derived Normalized Difference Vegetation Index (NDVI) and snow-cover imagery, available bi-weekly, are used to measure vegetation greenness and snow-covered area through time. In 2011, the NCPN published its first status and trends report on remote sensing of vegetation phenology and snow-cover extent in NCPN parks, covering the years 2000–2009. For those years, the

analysis showed five patterns for Hovenweep NM. For the spring growing season, the end of senescence (EOS) and day of peak greenness were occurring later in the year. For the monsoon growing season (see chart), the EOS was occurring earlier in the year and the length of season (LOS) and I-NDVI (the metric most often used as a measure of overall productivity) were decreasing. These patterns should be considered with caution because they are based on a short, 10-year record with two years of missing data. The full report is posted on the network's web site.

Water Quality

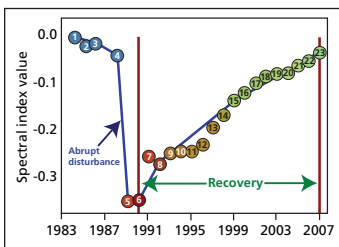


Cajon Spring rain-catchment pool.

NCPN water-quality monitoring is made possible through partnerships between the I&M Program, individual park units, the U.S. Geological Survey, and the State of Utah's Division of Water Quality. In 2010, the network published its second biennial report on water quality in NCPN parks, covering the period from January 1, 2006 to December 31, 2009. Of 628 comparisons of results against beneficial use standards conducted at three sites

in Hovenweep NM, 25 (4.0%) exceeded water quality standards or indications of impairment. Standards were exceeded for five constituent categories—most commonly, nutrients, dissolved oxygen, and pH. However, comparison of observations in light of natural variation and natural weathering processes will serve to improve understanding and protection of these water bodies.

Land Cover and Land Use



Spectral index showing landscape disturbance and recovery over time.

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 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. Cooperators at Oregon State University have analyzed 25 years of Landsat imagery and developed new analysis techniques for arid ecosystems. Pinyon-juniper dynamics at Dinosaur NM are currently being examined; after this work is complete, we will determine the utility of applying these techniques at other NCPN parks. We are also evaluating this technology for application to riparian ecosystems and grazed versus ungrazed environments.

Additional Efforts

The NCPN also reports on air quality at Hovenweep NM.

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/>

