



Natural Resource Monitoring at Timpanogos Cave National Monument

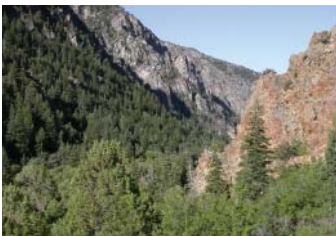


Timpanogos Cave National Monument (NPS)

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 Timpanogos Cave National Monument.

Vegetation Mapping



Vegetation mapping area (NPS)

The NCPN recently completed a multi-year, multi-partner effort to map the vegetation at Timpanogos Cave NM. This project has included gathering aerial photography, collecting initial vegetation-plot data, using the vegetation data to classify vegetation types and write vegetation descriptions, writing a dichotomous vegetation-type key, performing photo interpretation, creating a geodatabase, and writing the final report. The team collected vegetation

and environmental data from 13 vegetation classification plots and 10 observation points. A total of 84 map polygons representing 16 natural and semi-natural vegetation map classes were developed for the Timpanogos Cave NM mapping project. These maps will be a valuable resource for use in park management, natural resource monitoring, interpretive programs, park planning, prescribed fire, and as a baseline for designing ecological studies.

Water Quality



Hansen Cave Pool (NPS/D. Thoma)

At Timpanogos Cave NM, the NCPN cooperates with the State of Utah and 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 of cave water. There have been no water quality exceedances or indications of

impairment observed in the first two years of monitoring. Both the Hidden Lake and Hansen Cave spring sites have excellent water quality, comparable to domestic drinking water supplies. The NCPN has built a robust flow-monitoring device that will be used to evaluate drip rates from a stalagmite over time.

Uplands



Monitoring plot (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 biotic integrity, fuels, and vegetation composition and structure. Through discussions with park staff,

subalpine meadows, Gambel oak woodlands, and mixed conifer forests were selected for integrated uplands monitoring at Timpanogos Cave NM. In 2009, the NCPN completed the first year of data collection at the monument. Network staff will return for a second season of monitoring in 2010.

Climate

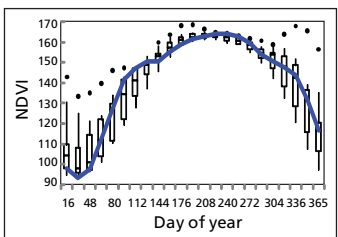


Rainy day (NPS/J. Jasper)

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 two weather stations in Timpanogos Cave 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. Timpanogos Cave NM climate data for the years 1946–2009 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.

Land Condition

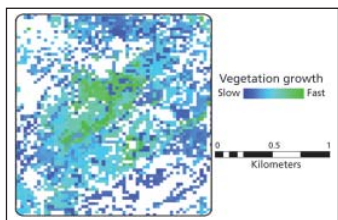


Normalized Difference Vegetation Index values for Timpanogos Cave NM in 2009, plotted with historical ranges.

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 pro-

ductivity, derived from satellite imagery. Early season green-up occurred slightly sooner than the 9-year average, while the later period of green-up occurred more slowly in 2009, which was one of the most productive in the last 10 years, based on peak season greenness and sustained greenness. Late-season productivity was average, and end of season brown-down occurred at the same time and rate as in previous years.

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

Efforts are underway to complete a Natural Resource Condition Assessment for Timpa-

nogos Cave NM, and the park's list of natural resource inventory needs was updated in 2009.

For more information

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