



Natural Resource Monitoring at Organ Pipe Cactus National Monument

2012

The Sonoran Desert Network

The Sonoran Desert Network (SODN) covers the geologically and biologically diverse Sonoran Desert and Apache Highlands ecoregions of southern Arizona and southwestern New Mexico. The network comprises 11 national parks containing biomes ranging from low-elevation desert scrub to mixed conifer forests, as well as critical riparian systems associated with perennial rivers, ephemeral and intermittent washes, seeps, springs, and tinajas. The SODN is designing and implementing a long-term monitoring program to measure key indicators of ecological integrity, or “vital signs.” This coordinated, multi-perspective ecosystem monitoring effort will help inform managers and the public as to the condition of key park resources and provide an early warning system for potential problems. This brief describes SODN activities at Organ Pipe Cactus National Monument (NM) the largest unit in the SODN, and one with a rich legacy of research and ecological monitoring.



NP&A WONDRAK BIEL

Organ Pipe Cactus National Monument.

Landbirds



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Common yellowthroat.

Birds are a conspicuous component of many ecosystems. They have high body temperatures, rapid metabolisms, and occupy multiple trophic levels. Because they can respond quickly to environmental changes, birds are considered effective indicators of ecosystem condition. Therefore, changes in bird populations and community structure may indicate key changes in their environments. SODN initiated annual bird monitoring at Organ Pipe Cactus NM in 2007. This effort, built on a rich legacy of bird research and monitoring by park staff and cooperators, provides insights into

human perturbations and natural events. The Rocky Mountain Bird Observatory, SODN’s primary cooperator for this project, collects and manages the network’s bird monitoring data. Monitoring occurs at seven survey points in each of six transects: four in upland desert scrub and two in the xeroriparian habitat type. During 2010, 1,411 birds of 55 species were counted at the park; none was new to park records. Status reports and resource briefs are produced annually; a detailed synthesis-and-trend report will be produced in 2012, based on five years of monitoring information.

Vegetation and Soils



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Organ pipe cactus.

Vegetation comprises or interacts with all primary components of terrestrial ecosystems. Vegetation dynamics can indicate the integrity of ecological processes, productivity trends, and ecosystem interactions that can otherwise be difficult to monitor. Soils and landform characteristics mediate available water in semi-arid systems, influencing vegetation composition, distribution, and production. By monitoring soils and vegetation (including established exotic plants) in an integrated fashion, we can gain key insights into the condition and trends of Sonoran Desert ecosys-

tems. The SODN began monitoring terrestrial vegetation and dynamic soils vital signs at Organ Pipe Cactus NM in winter 2010 after making modifications to the area of study. An east–west gradient sub-subsection of the park will be monitored with lower elevations sampled in the fall/winter and higher elevation sites during spring. An interim status report and resource brief will be completed in 2012 and each year after, with comprehensive status and trends reports being completed at five-year intervals (beginning in 2015).

Air Quality



Sunset.

Air quality can affect many park resources, including scenery and vistas, vegetation, water, and wildlife. Atmospheric deposition and visibility are monitored at Organ Pipe Cactus NM, with funding and coordination by the NPS Air Resources Division and local operation by park staff. SODN compiles, summarizes, and interprets air quality data in annual resource briefs. No trends were seen in ni-

trate, sulfate, or ammonium concentrations in rain and snow at the park from 1999 to 2008. Sulfur conditions were most recently rated as good, but nitrogen conditions are of significant concern. For visibility, no trend was detected for the clearest days from 1999 to 2008. Hazeiest days showed a non-statistically significant improving trend.

Climate Change



Creosotebush.

Scientists from the National Park Service and U.S. Geological Survey recently used long-term vegetation monitoring results from three different plant communities across two Sonoran Desert national parks (Saguaro NP and Organ Pipe Cactus NM) to determine how plant species have responded to past climate variability at a regional scale. In relatively mesic mesquite savanna communities, pe-

rennial grasses and forbs both declined with decreases in annual and winter precipitation. In drier Arizona upland communities, foothill paloverde declined on hillslopes in response to increasing mean annual temperature. In an even drier community, the co-dominant creosote bush and its hemiparasite, white ratany, decreased with a decrease in winter precipitation and increased aridity, respectively.

Seeps, Springs, and Tinajas



Tinaja.

Seeps, springs, and tinajas comprise the majority of surface water locations across the semi-arid landscape of Organ Pipe Cactus NM. Tinajas ("little jars") are small water impoundments that may be fed by groundwater, overland flow, or both, whereas seeps and springs vary greatly in size and landscape position. Collectively, the importance of these

distributed surface waters is inversely related to their size and frequency, as they provide critical access to water for animals, plants, and humans. Working with park staff, the SODN completed an inventory and tested potential monitoring techniques in 2009, with the goal of developing a monitoring protocol in 2011–2012.

Washes



Wash.

Washes (intermittent and ephemeral drainages) are important components of the hydrology and ecology of semi-arid environments. Washes serve as important travel corridors and habitat for many species, and support key vegetation communities. They also direct and mitigate floods and transport sediment within and between watersheds. Starting in 2010,

SODN staff assisted park staff and cooperators studying channel morphology of several washes at Organ Pipe Cactus NM, examining the impact of border activities. Information from this study will help guide development of the SODN Washes Protocol. It is expected that sample sites will be revisited on a 10-year cycle, with the first reports expected in 2013.

Climate



Climate monitoring station.

Climate is a primary driver of ecosystem structure and function in the Sonoran Desert ecoregion. Spatial and temporal variability in precipitation and temperature extremes set the limits for community composition and productivity in these semi-arid environments, and other parameters provide insights into environmental conditions. At Organ Pipe Cactus NM, SODN compiles and analyzes climate information in conjunction with the Ecologi-

cal Monitoring Program (EMP), a long-term research and monitoring effort. Since the late 1980s, the EMP has operated one of the most extensive landscape-scale climate monitoring networks in the western U.S. SODN complements this effort by providing information management, analysis, and reporting support. Data will be interpreted in bi-annual climate monitoring briefs and referenced in most reports for other vital signs and EMP efforts.

For more information

Sonoran Desert Network
7660 E. Broadway Blvd, Suite 303, Tucson, Arizona 85710
(520) 546-1607, <http://science.nature.nps.gov/im/units/sodn>

