



Natural Resource Monitoring at Gila Cliff Dwellings National Monument

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 Gila Cliff Dwellings National Monument (NM).



Gila Cliff Dwellings National Monument/NPS

Air Quality



Park airshed.

Air quality can affect many park resources, including scenery and vistas, vegetation, water, and wildlife. Atmospheric deposition and visibility are monitored at Gila Cliff Dwellings NM, with funding and coordination by the NPS Air Resources Division and local operation by park staff. To ensure that park-specific results are communicated in a timely and ef-

fective manner, the SODN compiles, summarizes, and interprets air quality data in annual resource briefs and, as data become available, in comprehensive status-and-trends reports. The first air quality resource briefs for Gila Cliff Dwellings NM will be completed in winter 2010.

Landbirds



Hepatic tanager.

Birds are a conspicuous component of many ecosystems. They have high body temperatures, rapid metabolisms, and occupy high trophic levels. Because they can respond quickly to changes in resource conditions, birds are considered effective indicators of ecosystem condition. Therefore, changes in bird populations and community structure may indicate key changes in the biotic and abi-

otic components of the environments upon which they depend. The SODN initiated annual bird monitoring at Gila Cliff Dwellings NM in 2009, to provide insights into human perturbations and natural events. Status reports and resource briefs are produced annually; a detailed synthesis and trend report will be produced in 2013, based on five years of monitoring information.

Resource Inventories



White-tailed deer.

Managers need reliable data to maintain resources “unimpaired for future generations,” especially as conditions outside of parks rapidly change. Natural resource inventories are extensive, point-in-time surveys of plants, animals, and the physical environment. Since 2001, SODN staff and cooperators have completed resource inventories on vertebrates, vascular plants, air quality and air quality-related values (updated 2009), water quality,

climate, hydrography, and a natural resource bibliography. Projects underway include geologic-resource evaluation and mapping (expected completion 2011) and vegetation classification and mapping. Soils inventories are planned for the future. Collectively, these inventories provide an important baseline for management and monitoring efforts to support effective park resource protection.

Vegetation and Soils



Gambel's oak.

NPS/D. YOUNG

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 (includ-

ing established exotic plants) in an integrated fashion, we can gain key insights into the condition and trends of Apache Highlands ecosystems. The SODN began monitoring terrestrial vegetation and dynamic soil vital signs at Gila Cliff Dwellings NM in summer 2009. A comprehensive status and trend report and resource brief will be completed in 2010, and repeated every five years.

Climate



Climate monitoring station.

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Climate is a primary driver of ecosystem structure and function in the Apache Highlands ecoregion. Spatial and temporal variability in precipitation and temperature extremes have critical consequences for flora and fauna, and set the limits for community composition and productivity in these semi-arid environments. Additional parameters, including wind velocity, relative humidity, photosynthetically active

radiation, and total radiation, provide insights into environmental conditions. The SODN compiles and analyzes climate information from existing stations in and around Gila Cliff Dwellings NM. Data are interpreted in annual climate monitoring reports and resource briefs, and are referenced in most reports for other vital signs.

Streams



Streams monitoring in the park.

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Set aside to commemorate and protect the unique prehistoric settlement along the Gila River, Gila Cliff Dwellings NM also protects and manages the rich riparian ecosystems that attracted early peoples to the site. Perennial streams and the ecosystems they support are biological “hotspots” within the expansive and semi-arid landscapes of the Sonoran Desert and Apache Highlands ecoregions. The SODN monitors water quantity, water quality, aquatic biota, channel morphology, and riparian vegetation in an integrated fashion to provide managers, scientists, and the public with

key information on the condition of these critical park resources. Gila Cliff Dwellings NM was a focus for early research and development efforts for SODN streams monitoring, with preliminary efforts starting in 2005. Full implementation of streams monitoring at Gila Cliff Dwellings NM commenced in 2007. Status reports, field summaries, and resource briefs are produced annually, with a detailed synthesis and trend report to be produced in 2012, based on five years of monitoring information.

Seeps, Springs, and Tinajas



Cliff Dweller Spring.

NPS

Seeps and springs are important surface water locations in upland areas of the mountainous landscape of Gila Cliff Dwellings NM. Seeps and springs vary greatly in size, permanence, and landscape position. 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 2010–2011.

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For more information

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