



Natural Resource Monitoring at Saguaro National Park

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 Saguaro National Park (NP).



Rincon Peak/NPS

Air Quality



Rainbow.

Air quality can affect many park resources, including scenery and vistas, vegetation, water, and wildlife. Saguaro NP is a designated Class I air quality area, reflecting the wilderness character and high-quality atmospheric conditions at the park. Ozone, atmospheric deposition and visibility are monitored at Saguaro NP, with funding and coordination by the NPS Air Resources Division and cooper-

ating local agencies, with local operation by park staff. To ensure that park-specific results are communicated in a timely and effective manner, the SODN compiles, summarizes and interprets air quality data in annual resource briefs, and (when data become available), comprehensive annual status and trends reports. The first resource brief for Saguaro NP will be completed in winter 2010.

Landbirds



Arizona woodpecker.

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 abiotic

components of the environments upon which they depend. The SODN initiated annual bird monitoring at Saguaro NP in 2007, 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 2012, based on five years of monitoring information.

Resource Inventories



Javelina.

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, water quality, climate, hydrography, and a natural resource bibliography. Projects underway include geologic-resource evaluation and mapping, as well as 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



SONORAN INSTITUTE

Lichen-dominated biological soil crust.

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 Sonoran Desert ecosystems. The SODN began monitoring terrestrial vegetation and dynamic soils vital signs at Saguaro NP in autumn 2008; an interim status report and resource brief will be completed in 2009 and each year after. Comprehensive status and trends reports will be produced at five-year intervals, beginning in 2012.

Climate



NPS

Climate monitoring station.

Climate is a primary driver of ecosystem structure and function in the Sonoran Desert and Apache Highlands ecoregions. 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 Saguaro NP, the SODN compiles

and analyzes climate information from both long-term cooperative stations and recent SODN established stations with wireless data access. These additional stations were added to capture the tremendous climatic variability caused by elevation and aspect differences within the park. Data are interpreted in annual climate monitoring reports, and are referenced in most reports for other vital signs.

Groundwater



NPS

Measuring depth to groundwater.

Water is the most limiting factor for ecosystem productivity in the Sonoran Desert, and groundwater is a critical component of the hydrologic cycle. Because humans, vegetation, and wildlife require access to water for survival, understanding groundwater dynamics is essential to understanding ecosystem function and integrity. Monitoring groundwater availability also provides key insights into surface waters, as these systems are tightly

coupled in semi-arid systems. In conjunction with park staff, the SODN compiles and analyzes depth-to-groundwater information at Saguaro NP at three monitoring wells operated by park staff. Data are interpreted in annual groundwater monitoring reports and are referenced in other monitoring efforts, such as those for climate, vegetation, and dynamic soil function.

Seeps, Springs, and Tinajas



SONORAN INSTITUTE

Tinaja.

Seeps, springs, and tinajas comprise the majority of surface water locations across the semi-arid landscape of Saguaro NP. 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 2010–2011.

Washes



SONORAN INSTITUTE

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. Washes also direct and mitigate floods and transport sediment within and between watersheds. Starting in 2010, SODN staff and cooperators will begin monitoring channel morphology and vegeta-

tion characteristics of major washes at Saguaro NP. Evaluating these parameters provides insights into riparian system status and the conditions in the overall watersheds that they drain. Additional sites will be measured each year to ascertain status of these ecosystems, with repeated visits to each site occurring every 10 years. Status reports and resource briefs will be developed annually, with the first reports expected in summer 2011.

updated 9/30/2009

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>

