



# Natural Resource Monitoring at Tonto 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 Tonto National Monument (NM).



NPS/A. WONDRAK BIELE

Tonto National Monument.

## Vegetation and Soils



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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 (including 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 soil vital signs at Tonto NM in autumn 2009 and after initial review, decided to add three more high-elevation plots in 2010. A status report and resource brief will be completed in 2012. These detailed measurements will be repeated every five years to ascertain any trends in the condition of these important resources.

## 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 the biotic and abiotic compo-

nents of the environments upon which they depend. Since SODN initiated annual bird monitoring at Tonto NM in 2008, seven species new to park records have been detected there. Status reports and resource briefs are produced annually and a detailed synthesis and trend report will be produced in 2012, based on five years of monitoring information.

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## Air Quality



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Park airshed.

Air quality can affect many park resources, including scenery and vistas, vegetation, water, and wildlife. The park's air quality related values (AQRVs) are those resources that are potentially sensitive to air pollution, and include vegetation, fish and wildlife, and visibility. At present, visibility has been identified as the most sensitive AQRV in the park. Visibility is

monitored at Tonto 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. Visibility conditions are currently rated as moderate at the park, with a stable or improving trend.

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## Invasive Exotic Plants



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Red brome.

Invasive exotic plants (IEPs) represent one of the most significant threats to natural resources in national parks. Exotic plants are able to reproduce prolifically, rapidly colonize new areas, displace native species, and alter ecosystem processes across multiple scales. However, if these invaders are discovered in their early stages, control efforts are likely to cost less and achieve higher success rates than

after a species has become more widespread. In collaboration with the Chihuahuan Desert Network and Southern Plains Network, SODN is implementing a new protocol for early detection of invasive exotic plants. Monitoring is scheduled to begin in spring 2012 and will focus on high-priority vectors, such as roads, trails, and other disturbed areas.

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## Seeps, Springs, and Tinajas



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Riparian area.

Seeps and springs comprise the perennial surface water across the mountainous landscape of Tonto NM. Seeps and springs vary greatly in size, permanence, and landscape position. Collectively, the importance of these distributed surface waters is inversely related to their size and frequency, as they provide critical ac-

cess to water for animals, plants, and humans in this semi-arid environment. 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.

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## Washes



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Wash.

Washes 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. SODN monitoring objectives for washes seek to better understand watershed condition and xeroriparian ecosystems through integrated moni-

toring of channel morphology, flow duration and peak events, sediment composition, and vegetation characteristics. Pilot testing of wash protocol elements is being conducted in 2011–2012 in Saguaro National Park, with protocol completion and full implementation planned for 2013. An annual report evaluating design elements and feasibility, and showing initial results, will be produced in 2013.

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## Climate



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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, 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 will be interpreted in bi-annual climate monitoring briefs and referenced in most reports for other vital signs.

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## For more information

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