



Natural Resource Monitoring at Chiricahua 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 Chiricahua National Monument (NM).



Chiricahua National Monument/NPS

Air Quality



View from Sugarloaf Mountain.

IMPROVE

Air quality can affect many park resources, including scenery and vistas, vegetation, water, and wildlife. Chiricahua NM 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 Chiricahua 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 effective 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 Chiricahua NM will be completed in winter 2010.

Landbirds



Arizona woodpecker.

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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 compo-

nents of the environments upon which they depend. The SODN initiated annual bird monitoring at Chiricahua NM in 2009, to provide insights into human perturbations and natural events. Status reports and resource briefs are produced annually, and a detailed synthesis and trend report will be produced in 2014, based on five years of monitoring information.

Resource Inventories



White-tailed deer.

NPS

Managers need reliable data to maintain resources “unimpaired for future generations,” especially as conditions outside 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 in 2009), water quality, climate, geologic resource evaluation and mapping, hydrography, and a natural resource bibliography. Projects underway include a soil resources inventory (expected completion in 2012) and vegetation classification and mapping. These inventories provide an important baseline for management and monitoring efforts to support effective park resource protection.

Vegetation and Soils



Biological soil crust.

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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 Chiricahua NM in fall 2008. An interim status report and resource brief will be completed in 2009 and each year after, with comprehensive status and trends reports completed at five-year intervals, beginning in 2012.

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 set the limits for community composition and productivity in these semi-arid environments, and other parameters provide insights into environmental conditions. For Chiricahua NM, the SODN compiles and analyzes climate in-

formation 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 within the park, due to elevation and aspect differences. Data are interpreted in annual climate monitoring reports and resource briefs, and are referenced in most reports for other vital signs.

Groundwater



Measuring depth to groundwater.

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Water is the most limiting factor for ecosystem productivity in the Apache Highlands, 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 three monitoring wells operated by Chiricahua NM staff. Data are interpreted in annual groundwater monitoring reports and are referenced in other monitoring efforts, such as climate, vegetation, and dynamic soil function monitoring.

Seeps, Springs, and Tinajas



Measuring springs.

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Seeps and springs, which vary greatly in size, permanence, and landscape position, represent the perennial surface water locations across the mountainous landscape of Chiricahua NM. Collectively, the importance of these surface waters is inversely related to their size and frequency, as they provide critical access

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 2010–2011.

Washes



Water flowing in a wash.

SODN

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. In 2008, SODN staff and cooperators began monitoring channel morphology and vegetation characteristics of

major washes at Chiricahua NM. Data from these parameters will provide insights into the status of riparian systems and conditions in the watersheds they drain. Additional sites will be measured each year to ascertain status of these expansive ecosystems, with repeat visits to each site occurring every 10 years. Status reports and resource briefs will be developed annually, with the first reports expected in 2011.

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For more information

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