



Natural Resource Monitoring at Coronado National Memorial

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 Coronado National Memorial (NMem).



Coronado National Memorial/NPS

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 components of the environments upon which they depend. The SODN initiated annual bird monitoring at Coronado NMem 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.

NPS

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 in 2009), water quality, climate, soil resources, hydrography, and a natural resource bibliography. Projects underway include geologic-resource evaluation and mapping (expected completion in 2011) and vegetation classification and mapping. These inventories provide an important baseline for management and monitoring efforts to support effective park resource protection.

Climate



Climate monitoring station.

NPS

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 veloc-

ity, relative humidity, photosynthetically active radiation, and total radiation, provide insights into environmental conditions. The SODN compiles and analyzes climate information from existing climate stations. Data are interpreted in annual climate monitoring reports and resource briefs, and are referenced in most reports for other vital signs.

Vegetation and Soils



Vegetation at Coronado.

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 es-

tablished 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 Coronado NMem in late summer 2009. An interim status report and resource brief will be completed in 2010 and each year after, with comprehensive status and trends reports completed at five-year intervals, beginning in 2013.

Groundwater



Measuring depth to groundwater.

Water is the most limiting factor for ecosystem productivity in the Apache Highlands, and groundwater is a critical component of the hydrologic cycle. Groundwater response to impacts can occur almost instantaneously, as happens when the water table rises during flash flooding, or may take place over extended time periods, such as when groundwater mining depletes springs and other surface waters. 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 Coronado NMem at seven monitoring wells operated by park staff and one operated by the U.S. Geological Survey. 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



Unnamed spring.

Seeps and springs represent the perennial surface water locations across the mountainous landscape of Coronado NMem. Seeps and springs vary greatly in size, permanence, and landscape position. 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



Aerial view of washes.

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

characteristics of major washes at Coronado NMem. 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 summer 2011.

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For more information

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