



Natural Resource Monitoring at Casa Grande Ruins 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 Casa Grande Ruins National Monument (NM).



Casa Grande Ruins National Monument/NPS

Resource Inventories



Couch's spadefoot toad.

USEWISGARY STOLZ

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. From 2001 to 2002, biologists from the University of Arizona and SODN conducted comprehensive field investigations of mammals, birds, amphibians, reptiles, and vascular plants at Casa Grande Ruins NM. These detailed surveys documented the occurrence and distribution of 60 plant species, 21 of which were new to park species lists. Species richness was equally impressive for such a small unit, as biologists documented 14 amphibians and reptiles (13 new to park species lists), 82 birds (70 new species), and 13 mammals (7 new species). Notable observations included the

rare and beautiful night-blooming cereus cactus, unusually high abundances of Couch's spadefoot toads and long-nosed snakes, 10 species of diurnal raptors (including 4 species of falcon), and the American badger.

Since 2001, SODN staff and cooperators have completed resource inventories on vertebrates, vascular plants, air quality and air quality-related values, vegetation classification and mapping (described below), baseline water quality, climate, hydrography, and a natural resource bibliography. The remaining project, geologic-resource evaluation and mapping, is underway and expected to be complete in 2011. Collectively, these inventories provide an important baseline for management and monitoring efforts to support effective park resource protection.

Vegetation Mapping



Mesquite mistletoe.

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Using a combination of high-resolution satellite imagery and field data, SODN staff and cooperators at the Arizona Remote Sensing Center classified and mapped vegetation communities at Casa Grande Ruins NM in 2009, resulting in a local classification report and

key, mapping report, digital map, and geodatabase. These products are valuable tools for use in park planning, natural and cultural resource management, interpretive programs, and as a baseline for designing and evaluating ecological monitoring and research studies.

Vegetation and Soils



Measuring soil crust thickness.

U.S. GEOLOGICAL SURVEY

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 Casa Grande Ruins NM in fall 2008. The first status report and resource brief were completed in 2009. These detailed measurements will be repeated every five years to ascertain any trends in the condition of these important resources.

Climate



Climate monitoring station.

NPS

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 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 data from existing weather stations. Data are interpreted in annual climate monitoring reports, and are referenced in most reports for other vital signs.

Groundwater



Measuring depth to groundwater.

NPS

Water is the most limiting factor for ecosystem productivity in the Sonoran Desert, 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. The SODN compiles and analyzes depth-to-groundwater information at Casa Grande Ruins NM by accessing data from nearby monitoring wells operated by the Arizona Department of Water Resources. Data are interpreted in annual groundwater monitoring reports, and are referenced in other monitoring efforts such as climate, vegetation, and dynamic soil function monitoring.

Landbirds



Mourning dove.

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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. Dramatic changes

to the landscape in and around Casa Grande Ruins NM over the past 80 years are reflected in the park's bird communities, with increasing representation by species that favor areas of human development. The SODN initiated annual bird monitoring at Casa Grande Ruins NM in 2007. 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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For more information

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