



Natural Resource Monitoring at Fort Bowie National Historic Site

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 Fort Bowie National Historic Site (NHS).



Fort Bowie National Historic Site/NPS

Air Quality



View from Sugarloaf Mtn., Chiricahua NM.

Air quality can affect many park resources, including scenery and vistas, vegetation, water, and wildlife. Ozone, atmospheric deposition, and visibility are monitored at Fort Bowie NHS by extrapolating information collected by instruments at nearby Chiricahua National Monument. To ensure that park-specific re-

sults 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 Fort Bowie NHS will be completed in winter 2010.

Landbirds



Ladder-backed 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 abi-

otic components of the environments upon which they depend. The SODN initiated annual landbird monitoring at Fort Bowie NHS 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 2011, based on five years of monitoring information.

Resource Inventories

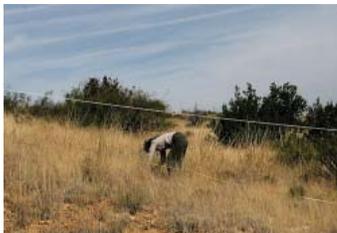


Couch's spadefoot toad.

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 2009), water quality,

climate, hydrography, soil resources, vegetation classification and mapping, and a natural resource bibliography. The remaining project, geologic-resource evaluation and mapping, is underway and expected to be completed in 2010. Collectively, these inventories provide an important baseline for management and monitoring efforts to support effective park resource protection.

Vegetation and Soils



Measuring vegetation cover.

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. Soils and landform characteristics mediate available water in semi-arid systems, influencing vegetation composition, distribution, and production. By monitoring soils and vegetation 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 soil vital signs at Fort Bowie NHS in fall 2008. A comprehensive status and trend report and resource brief were completed in 2009, indicating that upland systems were in generally very good ecological condition and within the range of natural variability for the site. These detailed reports will be repeated at five-year intervals.

Climate



Climate monitoring station.

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 velocity, relative humidity, photosynthetically active

radiation, and total radiation, provide insights into environmental conditions. For Fort Bowie NHS, 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.

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. 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 Fort Bowie NHS at a monitoring well operated by park 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



Apache Spring.

Seeps and springs represent the perennial surface water locations across the mountainous landscape of Fort Bowie NHS. Seeps and springs vary greatly in size, permanence, and landscape position; Apache Spring is the most ecologically and historically prominent of these features in the park. These surface waters provide critical access to water for animals, plants, and humans. Working with park

staff, the SODN will initiate monitoring of these ecosystems in 2009, with focus on water quantity, basic water quality, sedimentation, and qualitative monitoring of aquatic biota. Results from this effort will be presented in annual status reports and resource briefs, with more comprehensive synthesis and trends reports being generated at five-year intervals.

Washes



Siphon Canyon.

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 vegetation characteristics of the major wash

at Fort Bowie NHS, in Siphon Canyon. 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

Sonoran Desert Network
7660 E. Broadway Blvd, Suite 303, Tucson, Arizona 85710
(520) 546-1607, <http://science.nature.nps.gov/im/units/sodn>

