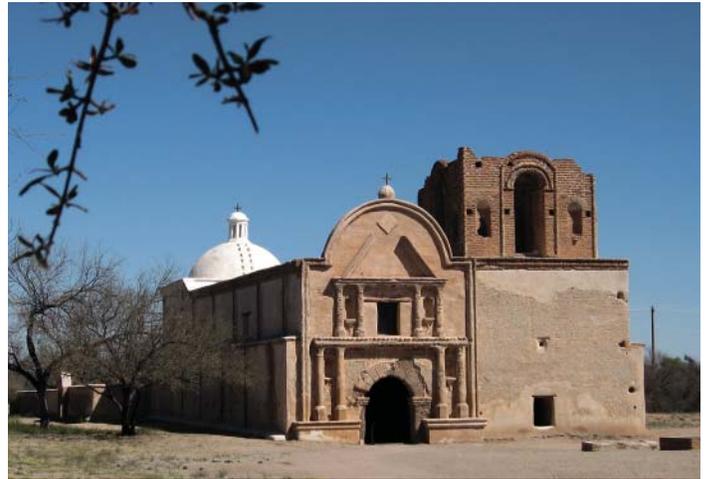




Natural Resource Monitoring at Tumacácori National Historical Park

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 Tumacácori National Historical Park (NHP).



Mission San José de Tumacácori/NPS

Streams



Santa Cruz River.

Set aside to protect and commemorate the unique mission and settlements along the Santa Cruz River, Tumacácori NHP also protects and manages the rich riparian ecosystems that attracted early peoples to the site. Perennial streams and the ecosystems they support are biological “hot spots” within the expansive, semi-arid landscapes of the Sonoran Desert and Apache Highlands ecoregions. The SODN monitors water quantity, quality, aquatic biota, channel morphology, and riparian vegetation in an integrated fashion

to provide managers, scientists, and the public with key information on the condition of this critical park resource. Tumacácori NHP was a focus for early research and development efforts for SODN streams monitoring, with preliminary efforts starting in 2006. Full implementation of streams monitoring at Tumacácori NHP began in 2007. Status reports, field summaries, and resource briefs are produced annually, with a detailed synthesis and trend report to be produced in 2012, based on five years of monitoring information.

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 un-

derstanding 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 Tumacácori NHP at two monitoring wells located on the park. Data are interpreted in annual groundwater monitoring reports, and are referenced in other monitoring efforts such as climate, vegetation, and dynamic soil function monitoring.

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. The SODN compiles and analyzes climate information from existing long-term stations. Data are interpreted in annual climate monitoring reports and resource briefs, and are referenced in most reports for other vital signs.

Landbirds



Vermilion flycatcher.

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 Tumacácori NHP in 2007, 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 2012 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. From 2000 to 2003, biologists from the University of Arizona and SODN conducted comprehensive field investigations of mammals, birds, amphibians, reptiles, and vascular plants at Tumacácori NHP. These surveys documented the occurrence and distributions of 378 plant species, 168 of which were new to park species lists. Species richness of other taxa was equally impressive for such a small unit, as biologists documented 8 fish (3 new to park species lists), 24 amphibians and reptiles (22 new species), 146 birds (40 new species), and 35 mammals (33 new species). Notable observations included the second observation of muster John Henry (an aggressive exotic plant), Great Plains narrow-mouthed toad, eastern fence lizard, Sonoran mud turtle, yellow-billed cuckoo, green king-

fisher, and the endangered southwestern willow flycatcher. Four native fish species were detected, including an important population of the Gila topminnow. Mammals inventoried included black bear and all four species of skunk known to occur in Arizona. This tremendous species richness in a mere 350 acres reflects the ecological importance and diversity of the Santa Cruz River and the productive riparian system that it supports.

Since 2001, SODN staff and cooperators have completed resource inventories on vertebrates, vascular plants, air quality and air quality-related values (updated in 2009), vegetation classification and mapping, baseline water quality, climate, hydrography, and a natural resource bibliography for Tumacácori NHP. The remaining project, currently underway, is geologic-resource evaluation and mapping, expected to be complete in 2011. Collectively, these inventories provide an important baseline for management and monitoring efforts to support effective park resource protection.

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For more information

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