



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/©Alan English

Air Quality



NPS

Airshed.

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. SODN compiles, summarizes, and interprets air quality data in annual resource briefs, the latest of which indicated that nitrogen deposition condition is of significant concern at Chiricahua NM, with a degrading trend. Ozone levels are currently rated in moderate condition with no trend, and visibility conditions are rated as moderate with no trend.

Landbirds



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Lazuli bunting.

Birds are a conspicuous component of many ecosystems. They have high body temperatures, rapid metabolisms, and occupy multiple trophic levels. Because they can respond quickly to environmental changes, 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. Since SODN initiated annual bird monitoring at Chiricahua NM in 2009, five species new to park records have been detect-

ed. The Rocky Mountain Bird Observatory, SODN’s primary cooperator for this project, collects and manages the bird monitoring data. Monitoring occurs at seven survey points in each of five upland transects: three in woodland and two in grassland savanna habitat. During 2010, 1,181 birds of 63 species were counted at the park; five were new to park records. Data summaries and resource briefs are produced annually. A detailed status and trends report will be produced in 2014, based on five years of monitoring information.

Vegetation and Soils



Pricklypear fruits.

NPS/SC MCGINTYRE

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 established exotic plants) in an integrat-

ed fashion, we can gain key insights into the condition and trends of Apache Highlands ecosystems. Sampling was initiated at Chiricahua NM in the fall of 2007, and each plot is sampled every five years. As such, repeat sampling of plots will occur during the 2012 field season. Interim data summaries will be produced annually, with comprehensive status and trends reports completed at five-year intervals, beginning in 2012.

Invasive Exotic Plants



Wild oats.

Sa/NI

Invasive exotic plants (IEPs) represent one of the most significant threats to natural resources in national parks. Exotic plants are able to reproduce prolifically, rapidly colonize new areas, displace native species, and alter ecosystem processes across multiple scales. However, if these invaders are discovered in their early stages, control efforts are likely to cost less and achieve higher success rates than

after a species has become more widespread. In collaboration with the Chihuahuan Desert Network and Southern Plains Network, SODN is implementing a new protocol for early detection of invasive exotic plants. Monitoring is scheduled to begin in spring 2012 and will focus on high-priority vectors, such as roads, trails, and other disturbed areas.

Seeps, Springs, and Tinajas



Measuring springs.

Sa/NI

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, SODN completed an inventory and tested potential monitoring techniques in 2009, with the goal of developing and testing a monitoring protocol in 2011–2012.

Washes



Water flowing in a wash.

Sa/NI

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. Sample sites at Chiricahua NM will be used to test monitoring techniques during 2012, with protocol implementation expected in 2013. Status reports and resource briefs will be developed annually, with the first report expected in 2013.

For more information

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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).



NPS/A. WONDRAK BIEL

Coronado National Memorial.

Landbirds



©ROBERT SHANTZ

Common yellowthroat.

Birds are a conspicuous component of many ecosystems. They have high body temperatures, rapid metabolisms, and occupy multiple trophic levels. Because they can respond quickly to environmental changes, 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. SODN initiated annual bird monitoring at Coronado NMEM in 2009, to provide insights into human perturbations and natural

events. The Rocky Mountain Bird Observatory, SODN’s primary cooperator for this project, collects and manages the bird monitoring data. Monitoring occurs at a total of 19 survey points in three transects: two in grassland savanna habitat and one in woodland. During 2010, 452 birds of 61 species were counted at the park; none was new to park records. Data summaries and resource briefs are produced annually; a detailed status and trend report will be produced in 2013, based on five years of monitoring information.

Vegetation and Soils



NPS/A. WONDRAK BIEL

Vegetation monitoring.

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 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 Coronado NMEM in late summer 2009. Since then, 21 permanent monitoring sites have been sampled, with another 11 planned for 2012–2013. Based on estimates from initial data, our sampling design provides enough statistical power to detect trends for most perennial species, lifeforms, and soil parameters. Data summaries are produced annually, with comprehensive status and trends reports scheduled for completion at five-year intervals, beginning in 2013.

Climate



Climate monitoring station.

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. SODN compiles and analyzes climate data from existing weather stations. Data will be interpreted in bi-annual climate monitoring briefs and referenced in most reports for other vital signs.

Invasive Exotic Plants



Red brome.

Invasive exotic plants (IEPs) represent one of the most significant threats to natural resources in national parks. Exotic plants are able to reproduce prolifically, rapidly colonize new areas, displace native species, and alter ecosystem processes across multiple scales. However, if these invaders are discovered in their early stages, control efforts are likely to cost less and achieve higher success rates than

after a species has become more widespread. In collaboration with the Chihuahuan Desert Network and Southern Plains Network, SODN is implementing a new protocol for early detection of invasive exotic plants. Monitoring is scheduled to begin in spring 2012 and will focus on high-priority vectors, such as roads, trails, and other disturbed areas.

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, SODN completed an inventory and tested potential monitoring techniques in 2009, with the goal of developing a monitoring protocol in 2011–2012.

Washes



Wash.

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. Starting in 2010,

SODN staff assisted park staff and cooperators studying channel morphology of several washes at Coronado NMEM, examining the impact of border activities. Information from this study will help guide development of the SODN Washes Protocol. It is expected that sample sites will be revisited on a 10-year cycle, with the first reports expected in 2013.

For more information

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