Chihuahuan Desert Network
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

Chihuahuan Sun

Newsletter of the Chihuahuan Desert Network August 2018

CHDN Participates in Binational Vital Signs Workshop

The Chihuahuan Desert is the largest, most diverse desert in the Western Hemisphere and is shared by two nations: Mexico and the United States. Sister park partnerships were established so that parks and protected areas in the Chihuahan Desert on both sides of the border could address shared natural resource issues.

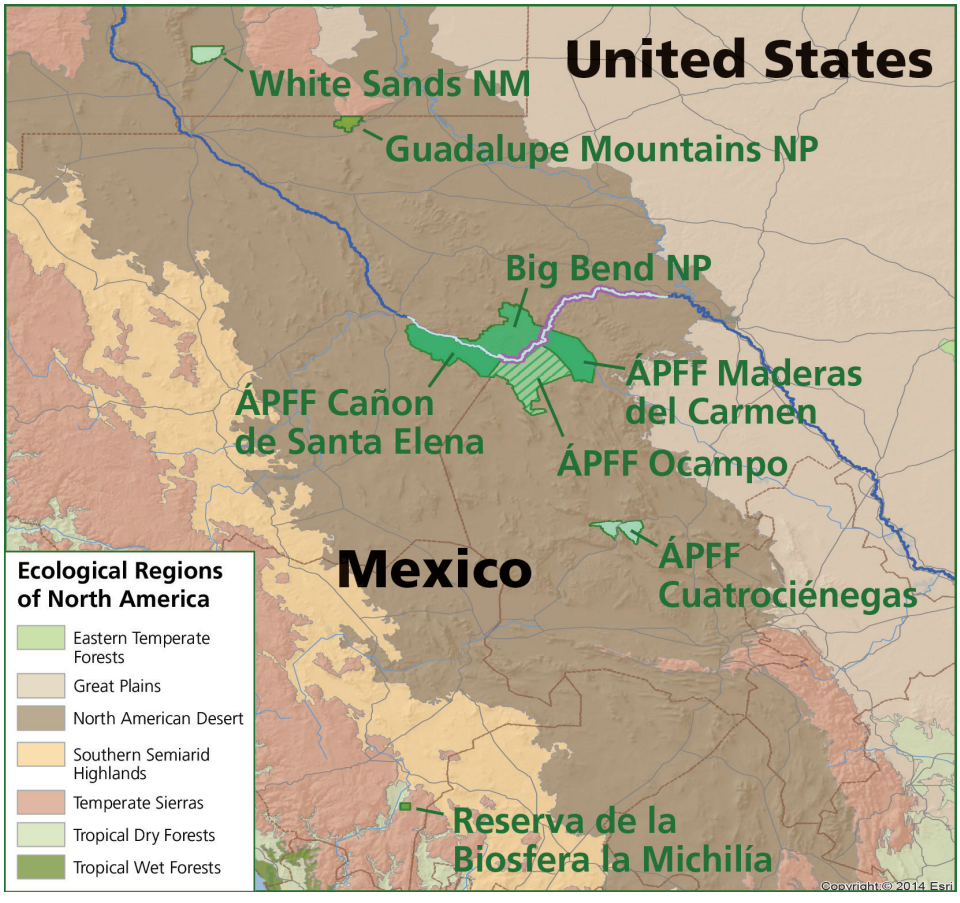
The sister parks of Big Bend National Park (NP) are Área de Protección de Flora y Fauna (ÁPFF) Maderas del Carmen and ÁPFF Ocampo in Coahuila, Mexico, and ÁPFF Cañon de Santa Elena in Chihuahua. White Sands National Monument (NM) has a sister park relationship with ÁPFF Cuatrociénegas in Coahuila. The sister park of Guadalupe Mountains National Park (NP) is Reserva de la Biosfera la Michilía in Durango.

On March 13–14, 2018, representatives of the Mexico National Commission of Protected Natural Areas (CONANP), the World Wildlife Fund (WWF) and the National Park Service (NPS) met in Ojinaga, Chihuahua to participate in a Binational Chihuahuan Desert Vital Signs Workshop. This workshop was the continuation of the Vital Signs Workshop held in September 2017 in Cuatrociénegas, Coahuila, and the Binational U.S.-Mexico Monitoring Workshop held at Big Bend NP in August 2015.

The goal of this workshop was to collaboratively select vital signs that will be used to monitor the health of Chihuahuan Desert ecosystem on both sides of the border.

Marcia Wilson, Cheryl McIntyre and Michael Bozek from NPS Inventory and Monitoring Division were in attendance.

– *Marcia Wilson,* CHDN Program Manager



CHDN ecologist/physical scientist Cheryl McIntyre and Big Bend NP physical scientist Jeffrey Bennett at the binational meeting.

CHDN Park Profile: White Sands National Monument

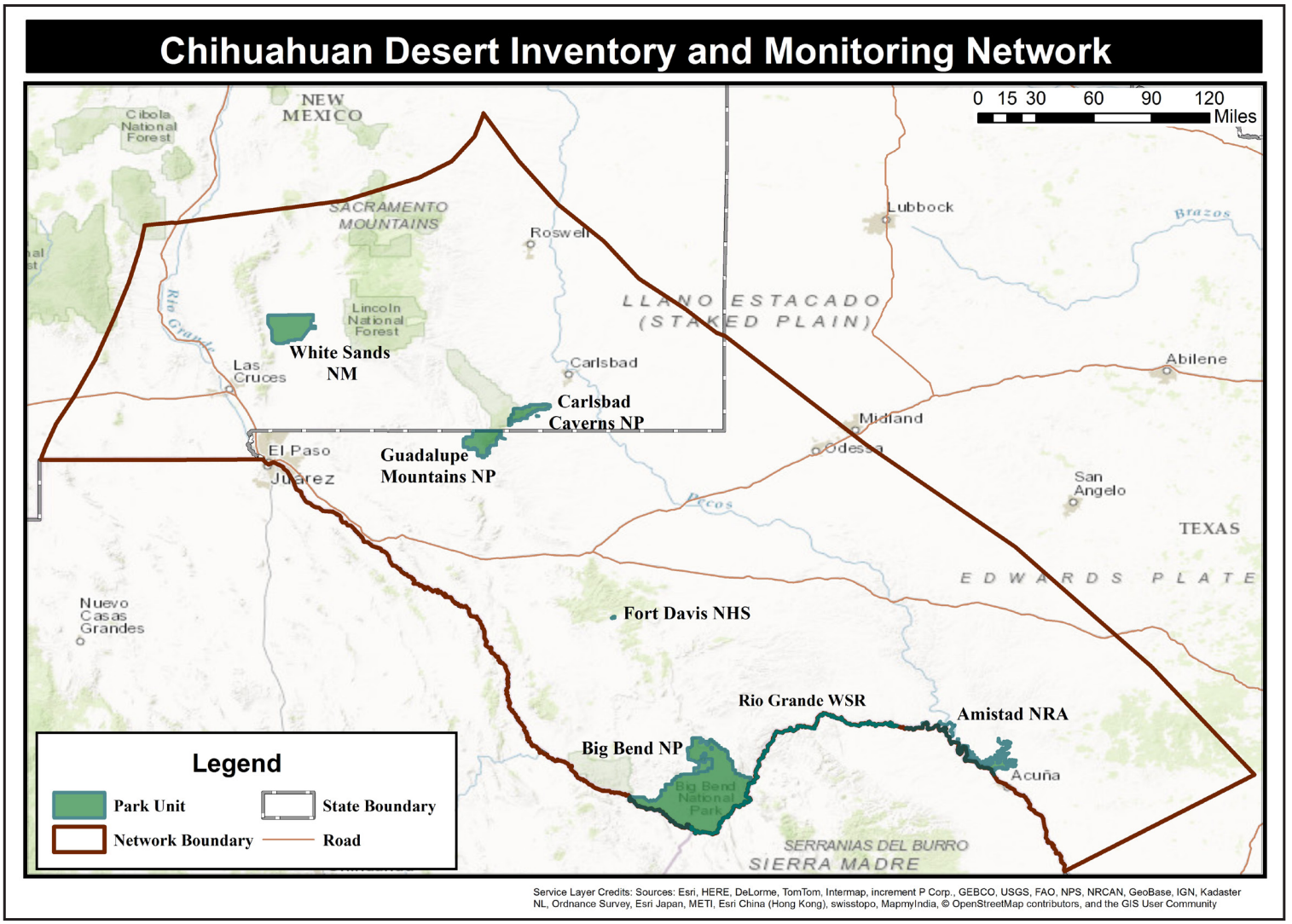
White Sands NM in New Mexico was established to preserve a major portion of the world's largest gypsum dunefield. The primary source of gypsum sand in the dunefield is ancient lake deposits such as those from Paleo-Lake Otero. Approximately 7,000 years ago, a period of aridity led to the drying of these lakes and the formation of the White Sands dunefield.

Hundreds of thousands of fossil tracks of ground sloths, mammoths, camels, bison, carnivores and humans that walked along the shores of these ancient lakes have been discovered in the monument. See the Park Spotlight on page 9 to learn more about recently-described tracks that suggest that humans possibly hunted giant ground sloths.

The dunefield today presents a harsh environment for vegetation and wildlife, yet the park is home to diverse ecosystems. Among the other notable natural resources found in White Sands NM are the extremely well-developed biological soil crusts that form

on gypsiferous soils and the shallow groundwater system that helps stabilize the dunes.

Vital sign monitoring protocols for dune dynamics, springs and seeps, upland vegetation and soils, birds, groundwater, air quality, climate and landscape dynamics have been or will be implemented at White Sands NM.



Southwest Network Collaboration

The Southwest Network Collaboration (SWNC) is a joint effort between three natural resource inventory & monitoring programs in the NPS: Chihuahuan Desert Network (CHDN), Sonoran Desert Network (SODN), and Southern Plains Network (SOPN). The goal of the SWNC is to improve effectiveness and efficiency across the networks.

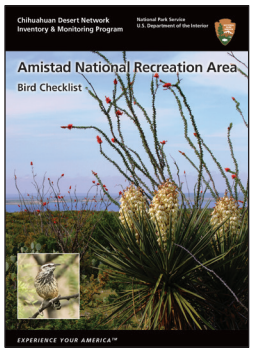
Under SWNC, the networks, in varying combinations, share protocols, training, data management, and reporting responsibilities for eight different protocols: air quality, climate, invasive exotic plants, groundwater, landbirds, springs, seeps and tinajas, and terrestrial vegetation and soils.

The methods and datasheets used by field crews are uniform for shared protocols. Data management duties are shared among the networks' data management staff: CHDN data manager Mark Isley, SOPN data manager Heidi Sosinski and SODN data manager Kristen Bonebrake. The data for shared protocols are stored in a central database accessible to all of the networks.

Henry Whitenack joined CHDN in January 2018 as an assistant data manager, hired through the New Mexico Water Resources Research Institute (WRRI). He received a BS in Environmental Geosciences from Michigan State University in 2014 where he worked with the Michigan State Hydrogeology Lab. Since graduating, Henry has worked as a biological technician, GIS analyst and data manager. He has previously worked at Mesa Verde National Park and for the US Forest Service in Michigan and Alaska. In addition to his data management duties, Henry also assists with monitoring fieldwork. He is very excited to be part of the CHDN team.

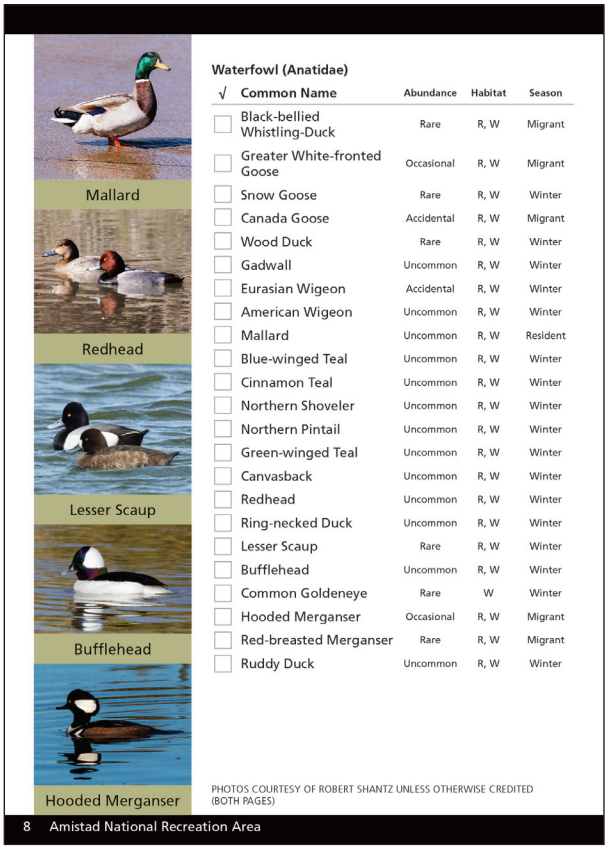
CHDN Producing Bird Checklists for Network Parks

CHDN is working with four network parks to produce illustrated bird checklists. The checklist booklets will include an interpretive essay, a list of birding "hot spots" along with a location map and the actual checklist which will include information on species occurrence, habitat and season. The checklist will also feature identification photos for many species, along with short profiles on selected species or related topics. Wildlife photographer Robert Shantz has generously provided permission to use his images in the booklets. The data source for the checklist is NPSpecies, CHDN landbird surveys and expert review. The goals of the checklist booklets are to provide not only baseline information about bird species, but also to provide park-specific content that will be of interest to both serious and casual birders.



CHDN is responsible for project coordination (biologist Missy Powell) and editing and design (writer/editor Allyson Mathis), with park staff providing subject-matter expertise and park-specific information.

Checklists are in development for Amistad National Recreation Area (NRA), Fort Davis National Historic Site (NHS), White Sands NM, and Carlsbad Caverns National Park (NP). The booklets will be available as downloadable PDFs and some parks are printing the 5x7 inch booklets for distribution to park visitors. To learn more about the checklists, please contact Marcia Wilson at 575-646-5294 or marcia_wilson@nps.gov.



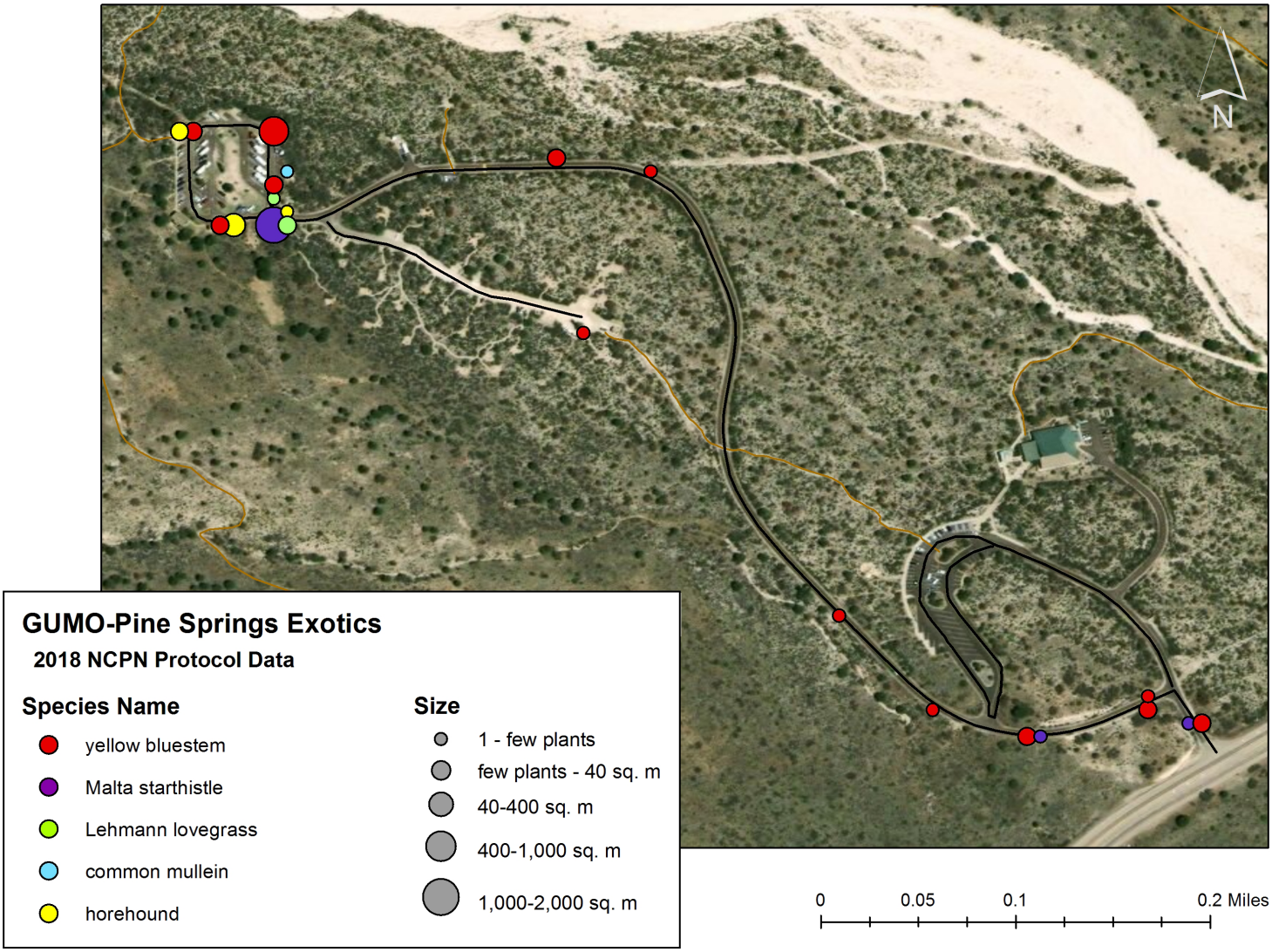
CHDN Tests Different Protocol for Exotic Plants

CHDN tested the protocol used by the Northern Colorado Plateau Network (NCPN) for monitoring exotic plants during the spring 2018 field season. The NCPN protocol assigns a size and cover class at every point along a vector where exotic plants are detected, and generates point locations quickly that park managers can use, in turn, to readily treat infestations.

CHDN's existing protocol utilizes 50-meter blocks along high priority vectors to collect data on the density of exotic plant infestations, the spread of exotic plants into park interiors away from roads and trails, and plant phenology. This protocol is good for evaluating trends in exotic species infestation via year-to-year comparisons, but does not provide managers with exact locations of exotic plants and the data require time to summarize and report.

CHDN ran the NCPN protocol side-by side-with the network's current protocol along several transects in Guadalupe Mountains NP. The exotics crew will test the NCPN protocol again this fall in Carlsbad Caverns NP, and CHDN will present the results of these pilot efforts to the Technical Committee in winter 2018-2019.

If the NCPN protocol is adapted by CHDN, it is hoped that with technological advances, data collected could be uploaded to an online dashboard and that the data would be immediately accessible to park managers. This protocol would also be available for use by CHDN uplands and springs monitoring crews to map exotic plant infestations encountered while conducting other fieldwork.



Exotic plants data collected in spring 2018 in the Pine Springs area of Guadalupe Mountain NP

Springs Deconstructed: Spectrophotometry

Ever wonder what's in the water at a spring? The CHDN springs crew uses a field-ready photometer to determine chemical concentrations in natural water sources in network parks. The crew first collects a clean water sample. Next, they do some mini-lab work with the photometer.

Simply put, a photometer is an instrument that measures color intensity. Light passing through a test tube containing a sample and then through a colored filter is detected by a light sensor. The light sensor quantifies how much light passed through the sample. For example, all of the light passes through a completely colorless solution. In colored samples, however, some light is absorbed, reducing the amount of light measured by the sensor.

Where do the colors come from? Specific reagents are added to water samples to test for the six different chemical parameters (alkalinity, sulfate, potassium, calcium, chloride and magnesium) that CHDN monitors in springs and seeps. These reagents color the samples, ranging from a green obtained from alkalinity to a bright pink indicating calcium. The intensity of the color is dependent on the amount of chemical compound present. The photometer is then used to determine how much of the compound is present in the sample.

Although most tests are completed by CHDN staff in the field (or in the office when necessary), several springs have such high concentrations of chemical compounds that they must be sent to a laboratory for analysis.

Water chemistry is just one part of the water quality protocol used at CHDN springs. A spring's geologic and biologic characteristics impact what chemical signatures are in the water. A simple photometer enables the crew to "see" the chemistry of spring water and efficiently monitor this aspect of the diversity of springs and seeps in CHDN parks.

Megan Podolinsky and Tim Pine test water samples in the CHDN office.

A Persistent Problem: Johnsongrass

Johnsongrass (*Sorghum halepense*) is a highly invasive species that is very disruptive to natural ecosystems and has been documented in all CHDN parks except White Sands NM. It was present in 11% of blocks surveyed last fall at Fort Davis NHS during exotics monitoring.

Johnsongrass was introduced from the Mediterranean region in the early 1800s for forage, but quickly became invasive. In fact, in 1900, the species became the target of the first federal grant for weed control. It is also considered to be one of the ten most invasive plants worldwide.

Johnsongrass reproduces both by seed and from rhizomatous roots, is allelopathic and grows well in disturbed sites. A single plant can produce as many as 80,000 seeds each year that remain viable in the seedbank for several years. The species has the capacity to colonize large areas. Once established, Johnsongrass persists in the landscape despite eradication efforts.

The species is also difficult to control or eradicate, as it can resprout from roots and rhizomatous root fragments, and is well adapted to fire. Control efforts generally need to include a variety of techniques, appropriately timed and repeatedly applied. For example, multiple herbicide treatments over several years may be required to control infestations. Manual treatments may not be effective because of Johnsongrass' ability to resprout from rhizomes.

Johnsongrass

Allyson Mathis

Springs as Sentinels

Springs Monitoring Field Season Update

The CHDN field crew monitored 39 springs between February and April 2018 under the direction of spring crew lead Megan Podolinsky. This year, the network began monitoring "sentinel springs," or springs that will be surveyed on a yearly basis as part of the new springs and seeps monitoring protocol. These springs were carefully chosen by network staff after analyzing characteristics such as accessibility, persistence, disturbance (natural or anthropogenic), repeatable measurement locations, and presence of obligate/facultative vegetation. Although some of the sentinel springs have been monitored by the network in recent years, many had not been sampled since the network conducted a springs inventory in 2011.

Sentinel springs will be monitored once each vernal (spring) season because it provides the most similar conditions year-to-year in the Chihuahuan Desert. Precipitation inputs are low during the spring which helps in the detection of long-term trends. Additionally, monitoring before peak summer temperatures reduces heat exposure for the crew.

Rio Grande Leopard Frog. The springs crew observed Rio Grande leopard frogs (*Lithobates berlandieri*) at a spring in Big Bend NP. In the US, Rio Grande leopard frogs are native in central and west Texas and southeastern New Mexico. Their coloration helps them stay camouflaged from predators.

Megan Podolinsky and Tim Pine monitor discharge at a spring in Big Bend NP.

The 2018 crew consisted of Brandon Gottung, Timothy Pine, Lindsay Smythe, Susan Singley and Henry Whitenack. The season began with a rigorous week-long training in Tucson under the direction of CHDN Physical Scientist Cheryl McIntyre along with staff from SODN.

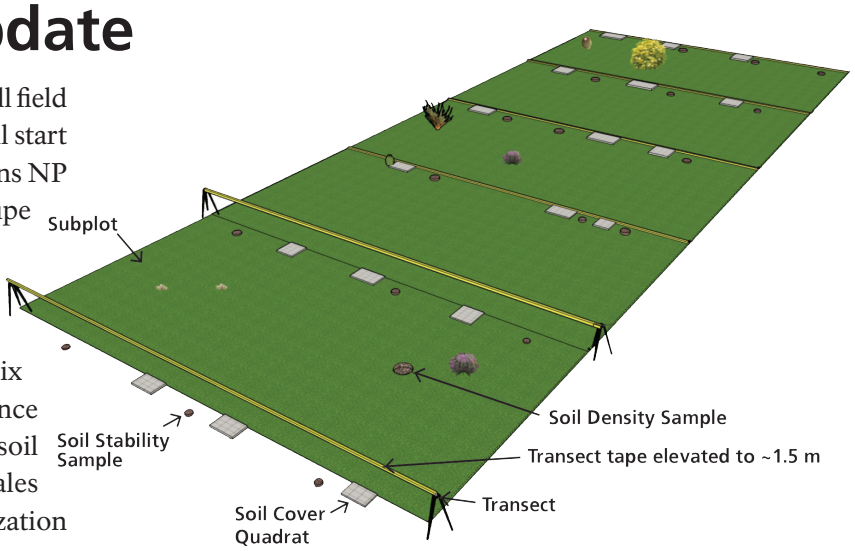
The crew visited springs in five CHDN parks. They sampled 19 springs in Big Bend NP, six springs in Guadalupe Mountains NP, seven springs in Carlsbad Caverns NP, four springs at Amistad NRA and three springs at White Sands NM.

The summer season brought time in the office for data entry and analysis, with the crew looking forward to the next field season and to seeing more beautiful desert oases in early 2019.

Brandon Gottung and Susan Singley monitor spring discharge in Guadalupe Mountains NP.

Uplands Monitoring Update

CHDN monitors uplands vegetation and soils during the fall field season. The field crew under the direction of Tim Pine will start their eighth year of uplands monitoring in Carlsbad Caverns NP in early September. The crew will also visit plots in Guadalupe Mountains NP, Big Bend NP and White Sands NM.



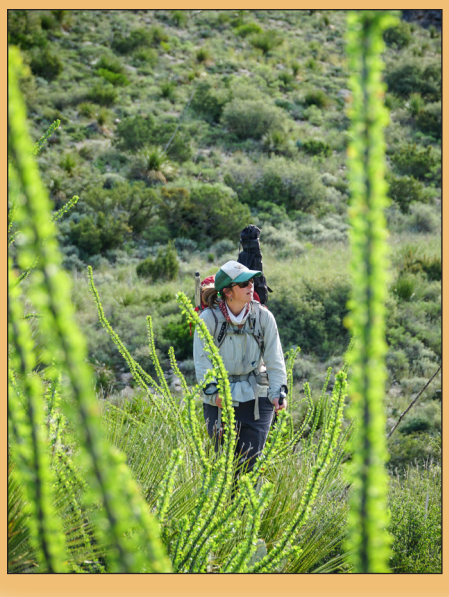
Uplands monitoring plots are permanent and are 20 x 50 m (66 x 164 ft) in size. Vegetative cover in three height classes and soil cover are measured every half meter (1.6 ft) along six transects. In subplots between transects, vegetation presence and ocotillo density is recorded. In addition, biological soil crust and soil aggregate stability is measured at 18 locales along transects. Repeat photography and site characterization descriptions provide supplementary information.

Uplands monitoring plots are established in stable areas and are monitored every five years on a rotational basis. It takes the field crew anywhere from two hours to two days to fully monitor a plot, depending on the diversity and amount of vegetation present, along with the size of the field crew, terrain and weather. The crew may also have to hike as far as ten km (six miles) to access plots and may have to backpack to reach more remote sites.

Sampling plot locations were determined through a random, spatially balanced approach to represent the vegetative communities and soil types (based on the percentage of rock fragments in the soil) found in CHDN parks. Parks with a great range in elevation, such as Big Bend NP, have plots in vegetative communities ranging from desert shrublands and grasslands to oak woodlands. All plots in White Sands NM are in a single vegetative community.

In 2017, the crew monitored 19 plots in Big Bend NP, seven plots in Carlsbad Caverns NP, eleven plots in Guadalupe Mountains NP and five plots in White Sands NM. They are scheduled to monitor a total of 43 plots in 2018. CHDN will next monitor plots in Fort Davis NHS in 2021. Because of its small size, all uplands plots there are monitored in a single field season every five years.

Other Networks Provide Key Assistance for Uplands Monitoring



Conducting field monitoring in the rugged terrain of Chihuahuan Desert parks is a complicated undertaking. It requires setting itineraries in advance and accounting for logistics and contingencies such as adverse weather conditions, planning for safety and coordination with park staff. It also is dependent on having experienced crew members who not only have expertise in botany but also in backcountry travel. Collaboration with other I&M networks has been essential in implementing CHDN's uplands protocol. Staff from other networks were key members of the 2017 uplands crew.

Cayley Faurot-Daniels from the Greater Yellowstone Network and Ryan Manuel of the Northern Great Plains Network were essential members of the 2017 uplands crew and helped CHDN meet monitoring objectives for the season.

Cayley Faurot-Daniels. Photo by Ryan Manuel.

Rare Plant Identified in Big Bend NP

Watson's False Clapdaisy (Pseudoclappia watsonii)

During the 2017 uplands monitoring season, the crew documented a new (and rare) species in Big Bend NP: *Pseudoclappia watsonii* or Watson's false clapdaisy. This species is endemic to the Chihuahuan Desert of Trans-Pecos Texas and known in only three counties.

Dr. Michael Powell, Director of the Sul Ross State University Herbarium, confirmed the identification of this rarely-observed plant. Dr. Powell first described the species in 1976 with Dr. B.L. Turner, documenting its endemism to dry, gypseous clay soils.

To learn more about this plant, please consult *Rare plants of Texas: A Field Guide* by J.M. Poole, W.R. Carr, D.M. Price and J.R. Singhurst (2007 Texas A&M University Press, 640p.)

Mike and Shirley Powell

Oak Hybridization in Big Bend NP

Big Bend NP contains many different species of oak (*Quercus* sp.). Sixteen different species have been confirmed in the park, and there may be five additional species present. All of the confirmed oak species occur in the Chisos Mountains, including some that are endemic there. A few of these species are exceedingly rare and have only been observed or collected a few times.

Oak variation in the Chisos Mountains

Species in the *Quercus* genus readily hybridize with one another and this tendency is well-known among botanists and researchers. For example, a quick internet search for "*Quercus* hybridization" will produce many results from both scientific journals and oak enthusiasts. The innate ability of oaks to hybridize with one another can produce an amazing amount of morphological variety in plants growing in a very small geographical area.

CHDN field crews have observed this variety on many occasions even within a single 50 x 20 meter uplands plot. This hybridization presents a challenge for technicians in the field as it is difficult to definitively identify a species of oak when there may be three oak intermediates in an area. Field crews combat this challenge by relying heavily on the information provided in dichotomous plant keys and taking a lot of notes on the variability observed at each particular site.

Human – Sloth Trackways Discovered at White Sands NM

Fossil Footprints May Preserve Evidence of Pleistocene Hunts

In April 2018, David Bustos, resource program manager at White Sands NM, and colleagues published a research article about human and giant ground sloth tracks discovered on the western edge of Alkali Flat. These tracks are part of one of the greatest concentrations of fossil tracks in North America. The tracksite also contains traces of mammoth, camel, bison, saber tooth cat and dire wolf. The tracks themselves, known informally as "ghost tracks," are visible only during specific moisture conditions.

Fossil trackways are especially of interest to paleontologists because they record behavior. White Sands NM contains the only known site with fossil prints that show interaction of humans with Ice Age megafauna. This site also contains compelling evidence suggesting that humans may have stalked or hunted giant ground sloths along the edge of Paleo-Lake Otero during the late Pleistocene.

Several features indicate human-sloth interactions. A number of human trackways are superimposed into sloth trackways, indicating that humans either followed sloths or otherwise walked in their footprints. Some sloth trackways near human tracks show that the sloths abruptly changed their direction of travel. And there are several "flailing circles," which are unusual circular sloth trackways that indicate that upright, pivoting animals may have been making defensive actions.

It has been difficult to obtain reliable radiocarbon or other dates for exactly when the tracks were made. The prints were made at least 11,700 years ago, and it is possible that they are even older.

In addition to the tracks described in the recent publication, more tracks showing human and megafauna interactions have been found in multiple locations in the monument. Sloth and mammoth prints also have been found on top of human prints.

The tracks in the study site were recorded and mapped using photogrammetry and photography using a pole-mounted camera. Selected tracks were cast in plaster and then excavated.

Once exposed, the prints found on Alkali Flat often last only a few years. Thousands of prints have been exposed and more will be in the future. It is not possible to preserve or record all the tracks, but monument staff is working closely with the Intermountain Region (IMR), the Washington office (WASO), many universities and volunteers to record and collect representative prints and trackways from each type of trackmaker that has been identified. Photogrammetry, LiDAR, time-lapse photography, and soil and stratigraphic surveys are used to document tracks.

Double human fossil trackway in White Sands NM

Digital evaluation maps also help identify what areas contain trackways and monitor erosion. The monument is working with the US Geological Survey to install weather stations and collect soil moisture data to help predict what areas are at greatest risk of erosion and therefore have the greatest urgency for documentation. Monument staff is also working closely with the Natural Resource Stewardship and Science Directorate, WASO and IMR to create new media to share this incredible story with the public.

To learn more:

Footprints preserve terminal Pleistocene hunt? Human-sloth interactions in North America by David Bustos, Jackson Jakeway, Tommy M. Urban, Vance T. Holliday, Brendan Fenerty, David A. Raichlen, Marcin Budka,Sally C. Reynolds, Bruce D. Allen, David W. Love, Vincent L. Santucci, Daniel Odess, Patrick Willey, H. Gregory McDonald, and Matthew R. Bennett in Science Advances, v. 4, n. 4. DOI: 10.1126/sciadv.aar7621.

Available at http://advances.sciencemag.org/content/4/4/eaar7621.full

Staff Updates

CHDN Welcomes New Field Coordinator

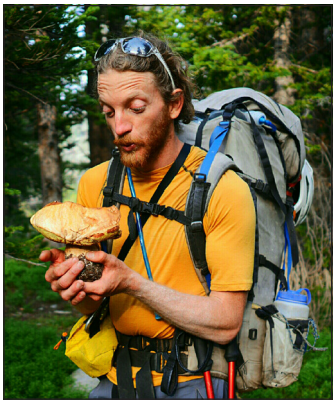
Lindsay Smythe joined CHDN as a biologist and field coordinator in December 2017. Her role with CHDN is to handle logistics for field crews, help with monitoring under the uplands, springs and seeps and exotic plants protocols, and assist with data entry, analysis and reporting.

Lindsay received a BS degree from Colorado State and a MS degree from Texas Tech University, both in wildlife biology. Her MS thesis was on grassland birds in New Mexico. Prior to joining CHDN, she worked for three years for the US Forest Service, first as a district wildlife biologist on the Gila National Forest and then as the Botany Program lead for the Flagstaff Ranger District on the Coconino National Forest. She previously worked as a refuge biologist for the US Fish and Wildlife Service for eight years at Kofa National Wildlife Refuge (NWR) in Arizona and Desert NWR in Nevada, working on desert bighorn sheep and mountain lions. Lindsay has also served as a Peace Corps Volunteer in Gabon.

Her position with CHDN is her first with the NPS. Lindsay splits her time between Las Cruces and her home in Flagstaff, Arizona.

Introducing New Field Crew Members

Kristina (Kiki) Fahey joined the CHDN field crew in February 2018. She has worked with plants in several places across the northern US from the Pacific Northwest to the Northeast, including two previous NPS jobs at Apostle Island National Lakeshore in Wisconsin and Assateague Island National Seashore in Maryland. She enjoys running, exploring, admiring plants and mushrooms and playing Scrabble. Kiki is from Massachusetts, but does not have a Boston accent. Her position is shared with NCPN.



Brandon Gottung began working for the NPS Inventory and Monitoring Division in 2009 when he was a seasonal biological science technician for the Central Alaskan Network. He has continued to work seasonally doing vegetation monitoring for the NCPN and Rocky Mountain Network. He began working for CHDN in fall 2017 and is a part of both the uplands and springs and seeps field crews. He is fascinated with specialized desert plants, and gets to observe warm desert plants in the spring and fall with CHDN and cool desert plants in the summers with NCPN. Brandon spends the majority of his free time rock climbing, packrafting or planning for his next big trip.

Susan Singley, a contractor with Tuscon Audubon Society, was a member of CHDN's field crew who assisted with uplands monitoring in fall 2017 and springs and seeps monitoring in spring 2018. She loves field work because each day is an opportunity to observe, explore and contribute to protecting our unique and beautiful desert southwest landscapes.

TUCSON AUDUBON SOCIETY

CHDN Helps Teach Kids about Native Plants

In early June, springs crew lead Megan Podolinsky presented a special program on native plants to a summer camp at La Semilla Food Center in Anthony, New Mexico. La Semilla is a 501(c)(3) non-profit organization dedicated to fostering a healthy, self-reliant, fair, and sustainable food system in part of southern New Mexico and El Paso, Texas.

The summer camp helps local kids, ranging from first to sixth graders, learn about plants and agriculture in the area. The program consisted of a walk around the farm property to identify various Chihuahuan Desert plant species. La Semilla staff shared information about traditional uses of native plants and the importance of these plants for the natural environment and the people of the region, both historically and in the present. Megan looks forward to continuing to work with La Semilla to help young people foster a strong interest in the Chihuahuan Desert.

CHDN Field Sketches

The CHDN monitoring protocols provide both challenges and opportunities for field staff. Crews sometimes work in difficult environmental conditions due to weather or terrain and have to collect high quality data that will help the NPS determine the condition and trends of park resources. At the same time, field work offers crew members the opportunity to experience the spectacular backcountry of CHDN parks and the camaraderie of being part of a team. Below are a few snapshots of the crew's experiences while out in the field.

Clockwise from top right.
1. Jonathin Horsley running below the speed limit in Carlsbad Caverns NP but still moving fast.
2. Dog Canyon in Guadalupe Mountains NP.
3. Megan Podolinsky, Ben Cooper and Tim Pine hiking to a plot in the Chisos Mountains in Big Bend NP.
4. Megan Podolinsky appreciates the equipment used to monitor springs and seeps.
5. CHDN crew members assist contractors monitoring giant cane removal sites in Boquillas Canyon in Big Bend NP.

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CHDN Fall 2018 Monitoring Schedule

Park	Uplands Monitoring	Exotics Monitoring
Big Bend NP	10/17–10/24 10/31–11/7 11/14–11/21	9/19–9/21
Carlsbad Caverns NP	9/5–9/11	9/5–9/11 9/24–9/26
Guadalupe Mountains NP	9/18–9/24 10/3–10/10	9/5–9/11 9/22–9/23
White Sands NM	11/26–11/30	–

The *Chihuahuan Sun* is a publication of the Chihuahuan Desert Inventory & Monitoring Network. All photos in this document are courtesy of the National Park Service unless otherwise noted.

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