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 2017

Fall Field Season To Begin Soon

The arrival of the monsoon season in the Chihuahuan Desert brings welcome rain and slightly cooler temperatures to the region, and also preparations for the upcoming autumnal field season in the Chihuahuan Desert Inventory & Monitoring Network (CHDN) office. Field staff have returned to Las Cruces after spending their summers working for other networks or pursuing other adventures. They are beginning to check equipment and finalize itineraries and logistics before heading into the parks. Crews will be monitoring exotic plants and uplands vegetation and soils in network parks between September and December.

We held the network's Technical Committee and Board of Directors Meetings at Amistad National Recreation Area in March. To learn more about this meeting and to read an overview of the network and its Board of Directors and Technical Committee, please see pages 2 - 3.

This issue of the *Chihuahuan Sun* continues with features from previous issues. Page five has a profile of Lehmann lovegrass, an exotic plant present in Chihuahuan Desert parks. This issue's Park Spotlight is on the Guadalupe Ridge Trail that connects Carlsbad Caverns and Guadalupe Mountains National Parks. We also added a short feature on hanging gardens, a type of spring found in CHDN parks.

I continue to welcome your feedback, input and suggestions for future issues of our newsletter. You may contact me at marcia_wilson@nps.gov or 575-646-5294. I hope that you find this issue informative and perhaps helps you learn something new about CHDN monitoring programs.

-Marcia Wilson, CHDN Program Manager

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Claret cup cactus in bloom in Guadalupe Mountains National Park

Overview of the Chihuahuan Desert Network

The Chihuahuan Desert Network is one of 32 NPS inventory and monitoring networks. Networks facilitate basic inventories, conduct long-term monitoring and deliver key scientific data to park managers and partners.

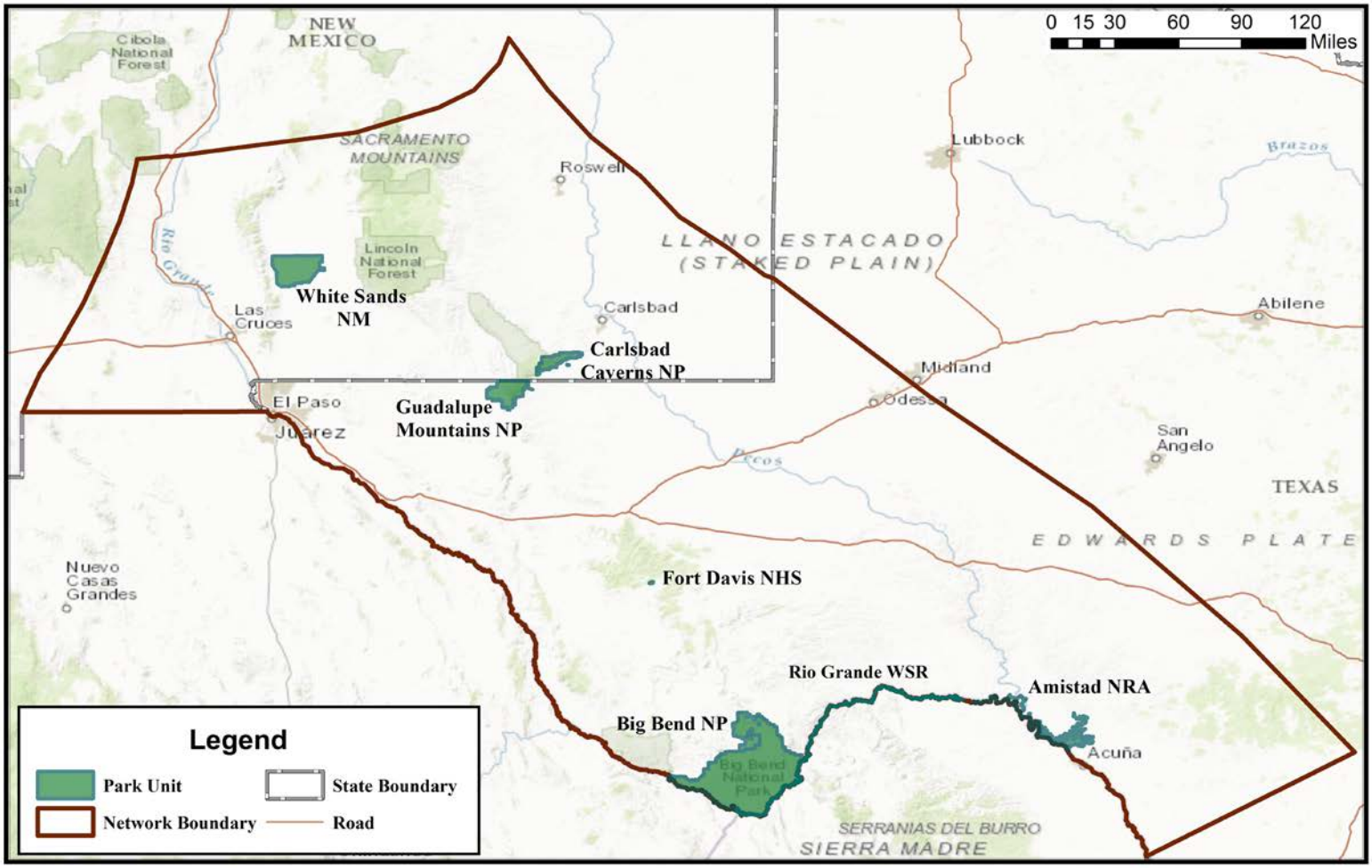
CHDN is comprised of seven national park units, located throughout the diverse landscapes of west Texas and southeast New Mexico. Network parks include Big Bend National Park, Rio Grande Wild and Scenic River, Guadalupe Mountains NP, Amistad NRA and Fort Davis National Historic Site in Texas. White Sands National Monument and Carlsbad Caverns NP are in New Mexico.

The Chihuahuan Desert is the most biologically diverse desert in the Western Hemisphere. Some distinctive habitat types in the Chihuahuan Desert include yucca woodlands, playas and gypsum dunes. Each park contains a rich and varied array of natural and cultural resources. These parks and their partners are dedicated to understanding and preserving the region's unique resources through science and education.

The CHDN office is located on the campus of New Mexico State University in Las Cruces. Program Manager Marcia Wilson and the field staff work out of the Las Cruces office. Data Manager Mark Isley is based in Austin, Texas and Ecologist Cheryl McIntyre is duty stationed with the Sonoran Desert Network in Tucson, Arizona.

Please feel free to stop by the office to say hello when you are in Las Cruces. The office is on campus at 3655 Research Drive, Genesis Building D.

Chihuahuan Desert Inventory and Monitoring Network



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CHDN Board of Directors & Technical Committee

The primary responsibility of CHDN is to implement an inventory and monitoring program in support of network parks. The network has a Board of Directors and a Technical Committee for network coordination and collaboration and to oversee the I&M program.

The Board of Directors provides oversight of network activities in carrying out the Natural Resource Challenge in CHDN. Due to the small size of the network, the board is permanent and is comprised of the Intermountain Regional I&M Program Manager and the superintendents of the network's park units. Ex-officio members of the board include the CHDN Program Manager, the Desert Southwest Cooperative Ecosystem Studies Unit (DSCESU) Research Coordinator, and the Chair of the Technical Committee. The Board of Directors incorporates the involvement and input from the scientific community and utilizes contributions from subject-matter specialists as needed.

Chihuahuan Desert Network staff from left to right: Ecologist Ben Cooper (Tucson Audubon Society), Program Manager Marcia Wilson, Biologist/GIS Analyst Missy Powell (NMSU Water Resources Research Institute), Exotics Crew Lead Jonathin Horsley, Springs Crew Lead Megan Podolinsky. Not pictured: Ecologist/Physical Scientist Cheryl McIntyre, Data Manager Mark Isley, Uplands Crew Lead Tim Pine, and Administrative Assistant Leslie Aills.

The network's Technical Committee provides assistance and advice to the Board of Directors and serves as the network's scientific and operational body. This committee is composed of resource managers from network parks, as well as scientists from both inside and outside the agency. The Technical Committee provides leadership to conduct the I&M program, establishes strategies to best meet the I&M and related resource needs of parks, coordinates logistics for CHDN field crews, interprets I&M data and provides management recommendations to park superintendents.

Both of this year's Board of Directors and Technical Committee meetings took place at Amistad NRA in March. The meeting's first morning involved a scoping workshop for Inventories 2.0. The purpose of the workshop was for the network parks to identify their top natural resource inventory needs for the next round of inventories. The Technical Committee meeting provided updated information on the vital signs monitored in the network and each park presented their natural resource plans for the upcoming year. The Board of Directors meeting reviewed the network's annual report, status of protocols, the budget and staffing.

The annual meeting for Fiscal Year 2018 will take place at Big Bend NP in February 2018.

The CHDN annual meeting at Amistad NRA in March

Exotic Plants Monitoring

Spring 2017 Monitoring Results

Exotics monitoring took place in Big Bend NP, Carlsbad Caverns NP and Guadalupe Mountains NP in March and early April 2017. A total of 1,403 blocks were surveyed along roads and trails, covering a total distance of 70.15 km (43.8 mi). Roads and trails are vectors along which invasive nonnative plants can spread. High priority roads and trails are monitored for the presence of exotic plants every eighteen months. Surveying in both the fall and spring on a rotational basis tracks the seasonality of certain species. Some exotic species are only found in the spring and some only in the fall.

The two most dominant species during spring monitoring were buffelgrass (C*enchrus ciliaris*) and horehound (*Marrubium vulgare*). Buffelgrass is native to Africa and promotes wildfire in the Chihuahuan Desert, thereby altering native plant communities. It was found in 5.9% of all blocks. Horehound can form monocultures and is very difficult to control and was present in 4.9% of monitored blocks. No new species of invasive plants were found within CHDN parks during the season.

The exotics crew, under the direction of Crew Lead Jonathin Horsely, will be monitoring this fall in the five CHDN parks that are part of the exotic plants monitoring protocol. Look for them on roadsides and trailsides in Amistad NRA, Big Bend NP, Carlsbad Caverns NP, Guadalupe Mountains and Fort Davis NHS starting in September.

Park	Distance Surveyed	# of Species	Most Common Exotic Species Detected - Spring 2017 Monitoring
Big Bend NP	22.0 km	5	Buffelgrass, Lehmann lovegrass, yellow bluestem
Carlsbad Caverns NP	19.6 km	11	Yellow bluestem, horehound, Malta star-thistle
Guadalupe Mountains NP	28.55 km	10	Common mullein, horehound, redstem filaree

Species identified include buffelgrass (*Cenchrus ciliaris*), yellow bluestem (*Bothriochloa ischaemum*), Lehmann lovegrass (*Eragrostis lehmanniana*), horehound (*Marrubium vulgare*), Malta star-thistle (*Centaurea melitensis*), common mullein (*Verbascum thapsus*) and redstem filaree (*Erodium cicutarium*).

The Foothills Trail in Guadalupe Mountains NP

Exotic Plants & Uplands Monitoring

Uplands Field Season Ahead

CHDN field crews will be out monitoring plots for the terrestrial vegetation and soils protocol in four parks beginning in September for their seventh year of field work.

Uplands Plot in Big Bend NP

Under the direction of Crew Lead Tim Pine, the uplands crew will be monitoring 19 plots in Big Bend NP, seven plots at Carlsbad Caverns NP, 11 plots at Guadalupe Mountains NP and six plots at White Sands NM.

Uplands monitoring collects information on several high-priority vital signs in the CHDN, including vegetation cover, species/life form frequency, soil aggregate stability and cover for soil and biological soil crust. This information is used to ascertain broad-scale changes in vegetation and soils in the context of ecological drivers, stressors and processes. The permanent monitoring plots in each park were determined through a random spatially-balanced sampling design that utilizes stratification. Strata are based on elevation and soil rock-fragment classes, with soil rock-fragment classes being a proxy for water availability for vegetation and infiltration.

Because plots are monitored on a five-year rotation, the crew will mostly be revisiting plots that were established in 2012.

A Common Invader: Lehmann Lovegrass

Lehmann lovegrass (*Eragrostis lehmanniana*) is a drought-tolerant bunchgrass native to south Africa that is widespread in the Chihuahuan Desert. It is found in all CHDN parks, mostly along roads and trails. The species is also a threat to parks in the Sonoran Desert Network west of the CHDN.

The species was introduced to the southwest in the 1930s for range restoration efforts. Lehmann lovegrass is highly competitive with native grasses and displaces them and can reduce species diversity in areas where it is present. It can also overtake creosote shrublands. This perennial bunchgrass grows in dense tufts, produces very large numbers of seeds that remain viable for many years and readily spreads. However, it is mostly restricted to areas with sandy or sandy loam soils where temperatures rarely dip below freezing.

Where present, Lehmann lovegrass alters the natural fire regime, as do other nonnative grasses now found in the Chihuahuan and Sonoran Deserts, such as buffelgrass (*Cenchrus ciliaris*) and yellow bluestem (*Bothriochloa ischaemum*).

Lehmann lovegrass infestations are very difficult to control. Plants may be handpulled if care is taken to remove as much of the root stock as possible. Repeated close mowing or herbicide application can also be effective.

Lehmann lovegrass in Big Bend NP

Chihuahuan Oases

Springs Monitoring

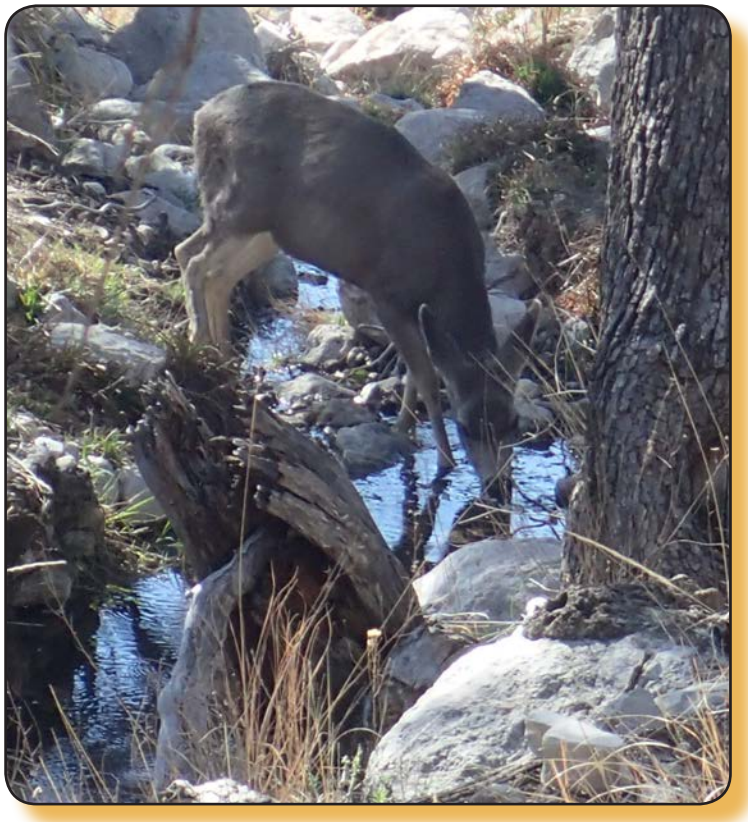
Water is a vital resource in any ecosystem, but it is especially precious in the Chihuahuan Desert where water is scarce. Springs provide needed waterholes for native wildlife, support riparian vegetation and provide habitat for rare species such as pupfish. CHDN monitors selected springs to determine their status and long-term trend using four modules (see the next page for more information).

Between February and April 2017, the CHDN field crew monitored 32 springs in five parks under the direction of Megan Podolinsky, Springs Crew Lead.

The field season began in early February with two tours in Big Bend NP. The crew monitored 15 springs in Big Bend this year, including one spring that was dry at the time of the visit. Big Bend NP contains a wide variety of springs, including tinajas, rheocrene (springs flowing into a channel) and hanging gardens (see page 6).

Springs are integral to the lush riparian areas found in Guadalupe Mountains NP. The crew monitored six springs in the park, one of which that was dry. Three springs were monitored at Carlsbad Caverns NP, including one that was found to be dry. Water samples from three springs in each of these parks were collected to be sent for laboratory analysis to evaluate the field water quality analysis that the network has been conducting.

Megan Podolinsky taking water quality readings at Horseshoe Tinajas



Mule deer drinking from a spring in Guadalupe Mountains NP

Four of the five springs monitored at Amistad NRA were all accessed by park boat operated by Amistad NRA staff. Reservoir levels impact CHDN's ability to monitor springs at Amistad because some springs are under water at high lake levels. Lake level was low this year and the crew was able to monitor at all planned sites.

The crew monitored three springs at White Sands NM and were accompanied in the field by park geologist Jonathan Knapp.

The crew also scouted 33 additional springs to evaluate whether it would be appropriate to add to the CHDN protocol. These "sentinel springs" will be springs that will be monitored every year. Selection of sentinel springs will be based on a set of criteria rating their ecological, cultural and historical significance.

Springs Monitoring Modules

The CHDN springs monitoring protocol includes four modules or components.

Water Quantity: Three measures estimate the amount and timing of surface water.

Persistence of springs: The persistence of springs (presence of water on the surface) is an important determinant of spring communities. CHDN utilizes temperature sensors to infer the presence of surface water on a daily basis. These data are used to estimate the number and continuity of wet and dry days during the year.

Spring flow: Crews measure spring flow (discrete discharge) during each visit to a spring. The amount of flow is controlled by aquifer characteristics, climate, and groundwater recharge. Discharge is also a component of core water quality (see below).

Wetted extent: To estimate the amount of surface water present, crews measure springbrook length and average springbrook width and depth. For springs without springbrooks, crews measure length, width and depth of pools.

Water Quality: Two vital signs characterize the quality of surface water.

Core water quality parameters: Core water quality parameters include water temperature, specific conductance, pH, dissolved oxygen and total dissolved solids. This monitoring is consistent with the service-wide NPS Water Quality Monitoring Program.

Water chemistry: Water that is chemically "harsh" can favor tolerant animals. CHDN measures the concentrations of chloride, calcium, magnesium, potassium, and sulfate. CHDN also measures alkalinity – the ability of water to neutralize acid.

Site Condition: Site condition provides information about the status of a spring. The presence of wetland plants and invasive plants and animals is noted. Crews assign a severity class to types of anthropogenic (e.g., hiking trails) and natural disturbance (e.g., windthrow). Repeat photo points provide context and help interpret change in quantitative data.

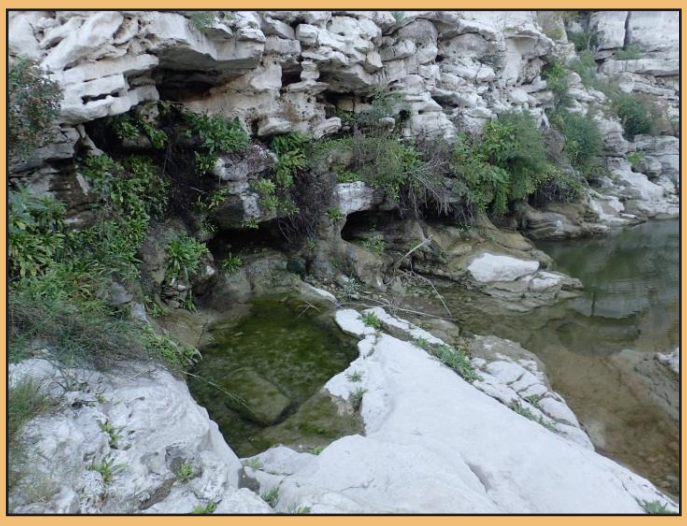
Site Characterization: Site characterization provides information for interpreting quantitative data about springs. Site characterization includes identification of spring type, a site description, a vegetation community description and a site diagram. The site diagram sketches the spring environment and measurement locations.

Indian spring in Amistad NRA

Dynamic Springs

Springs in Chihuahuan Desert parks are dynamic, and vary greatly from year-to-year, season-to-season and even day-to-day, depending on weather conditions, whether there has been recent runoff in a drainage and other variables. When the field crew monitored this spring in 2014, there was only a small pool (left). But during monitoring in 2017, two larger pools were present along with more sediment in the plunge pool (right). Springs monitoring uses repeat photography from photopoints, along with other data collection, while assessing long-term change.

Hanging Gardens



Hanging gardens are one of the many different types of springs present in Chihuahuan Desert parks. Hanging gardens are, as their names imply, springs or seeps that emerge from cliff-faces and are adorned with vegetation growing on vertical or overhanging surfaces. Hanging gardens usually form at the boundary between an impermeable rock layer or horizon and a higher permeability unit above it. Because groundwater cannot penetrate the impermeable layer, it travels laterally until it emerges on a cliff face. Alcoves or overhanging cliffs are generally present at hanging garden springs because of increased erosion due to the presence of water.

Hanging gardens are relatively inaccessible, but are important water sources for birds and bats in the Chihuahuan Desert. A wide variety of vegetation including maidenhair fern, rockmat, mosses and forbs are found in hanging gardens. Hanging gardens are present in Big Bend NP and Amistad NRA.

2017 Survey in Big Bend National Park

Landbird Monitoring

Moez Ali from Tucson Audubon Society conducted landbird surveys at Big Bend NP during the month of April, recording a total of 3,430 individual landbirds from 60 species along the park's grassland transects. Overall, Moez reported noticeably higher bird activity than observed last season.

The most common species seen in the grasslands included cactus wren, northern mockingbird, black-throated sparrow and pyrrhuloxia that were seen on nearly every survey point. Scaled quail, verdin, black-tailed gnatcatcher and mourning dove were more numerous during the surveys and elsewhere in the park compared to last season.

Ten species of upland raptors, an impressive number, were recorded during the surveys, some perhaps migrants, as high-soaring Cooper's hawks, sharp-shinned hawks and northern harriers were observed. Local breeding resident raptors with active nests included American kestrel and red-tailed hawk, with a Swainson's hawk seen engaged in courtship display flights.

Interesting observations during monitoring included a single peregrine falcon in open desertscrub (likely a migrant), an adult male breeding-plumaged yellow-headed blackbird, a lone singing gray vireo (a migrant in the foothills of the Chisos Mountains where it breeds at higher elevation), territorial varied buntings, numerous singing clay-colored sparrows (irregular migrants and locally rare) and a vocal yellow-breasted chat in sparse open desertscrub unusually far away from riparian habitat.

Landbird monitoring by the CHDN only took place in Big Bend NP this year because the network currently has an ongoing statistical assessment of the landbird sampling design at CHDN parks. The initial analysis of the protocol indicated that only the grasslands strata at Big Bend NP had a sufficient number (20) of transects to use in analyses. The dataset collected at Big Bend in 2017 will be used for density and occupancy analyses. All of the data will be incorporated into synthesis reports for CHDN, the Southern Plains Network, and the Sonoran Desert Network.

Creative Commons Don Faulkner

Cactus wren

Bird Notes

- Loggerhead shrikes were detected in a wide variety of habitats, mostly observed feeding recently-fledged juveniles.
- Greater roadrunner seemed quite common throughout the park, and several nests were observed with eggs or with young.
- 40 additional species were observed as incidental sightings in riparian habitats not recorded on the upland surveys. Vermilion flycatcher, northern cardinal, summer tanager, white-winged dove, golden-fronted woodpecker, common ground-dove, Bell's vireo, yellow-breasted chat and house finch were frequently tallied.
- Nocturnal species such as great horned owl, lesser nighthawk and common poorwill were recorded in low numbers on the surveys were but were commonly detected at night in suitable breeding habitat.

Guadalupe Ridge Trail

Carlsbad Early College High School Completes Field Projects Along Trail

In May 2017, the National Park Service, U.S. Forest Service (USFS) and the Bureau of Land Management (BLM), along with community organizations from Carlsbad, NM, celebrated the designation of the Guadalupe Ridge Trail (GRT). The Guadalupe Ridge Trail traverses NPS, USFS and BLM lands from Whites City, just outside Carlsbad Caverns, to Guadalupe Peak and is approximately 100 miles long, offering challenges even for experienced backpackers.

Managers from Carlsbad Caverns NP, Guadalupe Mountains NP and the Lincoln National Forest partnered with students and teachers from the Carlsbad Early College High School for field projects in support of the GRT designation as well as providing the students the opportunity to learn real-world skills and application of land management principles. Students at early college high schools earn high school degrees while also receiving credit for up to two years of college classes.

For their curriculum-based projects, students were responsible for documenting trail and resource conditions on three segments of the trail using Global Positioning System (GPS). The students searched for and documented plant and animal species of concern (rare/threatened species as well as invasive species), existing trail infrastructure (such as trail intersections, signage, water bars or stairs), archeological resources, water sources, human impacts (such as graffiti) and areas with hazardous or potentially hazardous trail conditions.

The tasks were designed to strengthen the students' skills with GPS, field documentation and observation, and also to expose the students to some of the challenges land managers experience maintaining trails and facilities for the American public. As a result of their assignments, students quickly gained a new appreciation for resource conservation and visitor management.

The spatial data and attributes generated by the students were assembled into a map suitable for public presentation utilizing ArcGIS. The attribute data were also provided to the land management agencies for planning. The students presented the results of their work at the dedication of the Guadalupe Ridge Trail.

The students did a fantastic job of presenting their findings and interacting with visitors and dignitaries in a professional manner. The students of the Early College High School are a group of highly motivated and intelligent young people. Hopefully some of those students, charmed by their experience on the Guadalupe Ridge Trail, will pursue a career with the NPS or the U.S. Forest Service.

Eric Brunnemann

A student documenting graffiti impacts on a Texas madrone tree (*Arbutus xalapensis*) along the Guadalupe Ridge Trail

Article courtesy of Michael Medrano, Chief, Division of Resource Stewardship & Science, Guadalupe Mountains NP. Photos courtesy of Eric Brunnemann, Superintendent, Guadalupe Mountains NP.

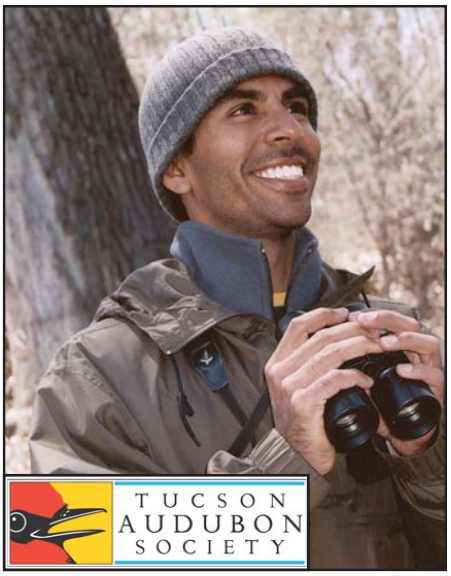
Eric Brunnemann

Students on a segment of Guadalupe Ridge Trail

Introducing CHDN Monitoring Partners

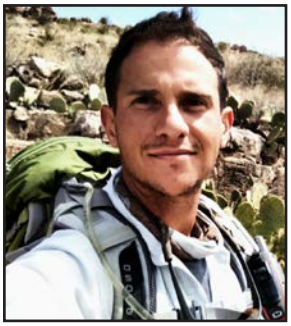
CHDN has agreements with staff from universities and nonprofit or nongovernmental organizations to assist with monitoring certain vital signs in network parks. These agreements enable the CHDN to effectively implement its monitoring program by bringing on staff with specialized expertise and providing the network with additional flexibility.

Moez Ali of the Tucson Audubon Society has been conducting landbird monitoring for CHDN, Sonoran Desert Network (SODN) and Southern Plains Network (SOPN) for ten years. He is an avid birder and tour leader and has been involved in bird research projects with the University of Arizona for five years. He is also working with Kristen Bonebrake of SODN on updating the landbird database for CHDN parks and will be working with the network to develop new bird checklists for Carlsbad Caverns NP and Amistad NRA.



Missy Powell, now working with CHDN as a Biologist/GIS analyst with the New Mexico Water Resources Research Institute, previously worked for CHDN as a biological technician and assistant data manager from 2006 to 2014. She is nearing completion of her Master degree in Wildlife Management from Sul Ross State University. Missy has also worked for Big Bend NP and the Northern Colorado Plateau Network. Given her nine years of experience working for CHDN, she has great institutional knowledge and memory of network operations.

Best Wishes & Many Thanks, David!



David Pinigis will be leaving CHDN after two years at the network. David started out as part of the fields crew, assisting with plant identification and springs assessments, and later worked for Tucson Audubon Society. David quickly became a valuable asset in the field by completing a myriad of tasks and adding to the positive crew dynamic. His work in the office helped improve and maintain data quality due to his attention to detail. Aside from his physical strengths as a hiker and field worker, his large and bubbly personality will make it hard say goodbye. We look forward to witnessing his new adventures in California.

CHDN Crew Leads' Summer Adventures

As they did last summer, the CHDN crew leads spent all or most of the summer working for other networks.

Jonathin Horsley was again on the road, traveling from park to park in SOPN conducting exotic plant monitoring. The highlight of his summer was helping train seasonal resource staff at Pecos National Historical Park on plant identification.

Tim Pine assisted with uplands and river channel morphology monitoring for Northern Colorado Plateau Network (NCPN). Based out of Moab, Utah, Tim spent his summer in the high desert botanizing and going down rivers.

Megan Podolinsky also spent part of her summer working on the uplands crew for NCPN and also traveled to Spain for three weeks in July. ¡Qué divertido!

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CHDN Fall 2017 Monitoring Schedule

Park	Uplands Monitoring	Exotics Monitoring
Amistad NRA	--	9/25 - 9/29
Big Bend NP	9/6 - 9/12; 11/1 - 11/8 11/15 - 11/22; 11/29 - 12/6	9/18 - 9/22
Carlsbad Caverns NP	10/4 - 10/11	10/18 - 10/25
Fort Davis NHS	--	9/11 - 9/14
Guadalupe Mountains NP	9/20 - 9/27 10/18 - 10/25	10/18 - 10/25
White Sands NM	11/29 - 12/6	--

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Safety Note

CHDN recently purchased new Bendix-King P150 radios for field staff use. Safety of the crew during monitoring is their top priority, and these radios will allow network staff to be in direct contact with park staff. CHDN crews have previously used satellite phones and SPOT satellite messengers to communicate with park staff and in case of emergencies. These new radios will give field crews an even better way of being safe while in the CHDN parks!