Canyons & Caves

A Newsletter from the Resource Management Offices
Carlsbad Caverns National Park

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Edited by Dale L. Pate
Thanks to Paula Bauer, Bill Bentley & Diane Dobos-Bubno

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Look for Issues of *Canyons & Caves* at the following websites: **http://www.caver.net/** Once there, go to the Canyons & Caves icon. Bill Bentley has placed all issues on his personal website. **http://www.nps.gov/cave/** Thanks to Kelly Thomas, the first thirteen issues can be downloaded as a PDF file from the park website.

RESOURCE NEWS

ZELDA CHAPMAN BAILEY has recently been chosen as the Interim Director for the National Cave & Karst Research Institute. Ms. Bailey comes into the position from the Water Resources Division of the U.S. Geological Survey and will serve as Interim Director for a two-year period.

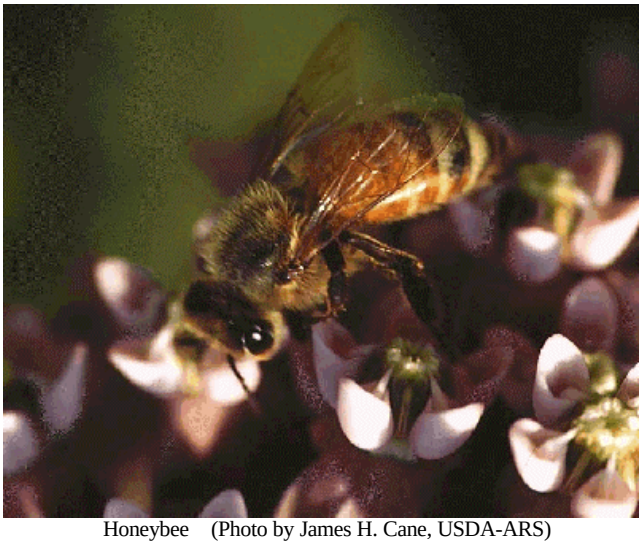
LECHUGUILLA CULVERT REPLACEMENT PROJECT Though slow, this project is making progress. Unable to obtain a commercial helicopter due to major fires throughout the western states, permission was finally gained to use a military helicopter to transport culvert pieces and other equipment and gear to the Lechuguilla Cave entrance. Four temporary employees were hired to help speed the process of constructing the new culvert. Those hired are Mark Fritzke, Mark Andrich, Dennis Hoburg, and Andy Armstrong. Jason Richards and Mark Bremer round out this core group that has done much of the recent work.

A Military Helicopter Ferries Culvert Pieces To The Lechuguilla Cave Entrance. (NPS Photo by Fred MacVaugh)

INSECTS

by Myra Barnes

Insects seem to be such a nuisance. They can sting, bite, spread disease, and eat the foundations from under our houses. Why do we need so many insects? We need them because they provide more ecosystem services than any other group of animals. The food on our tables, flowers in our gardens, and wildflowers and flowering shrubs depend on pollinators, which are primarily insects. In the Chihuahuan desert, termites are essential for nutrient cycling and the decomposition of dead plants. The abundance and diversity of plants at Carlsbad Caverns are facilitated by termites, ants and other small invertebrates that turn and aerate the soil. When rain does fall, water and nutrients can penetrate the soil more quickly. Insects form the base of many complex food webs. They are an important source of food for birds, reptiles, amphibians, fish, mammals, and other insects. Over the past few weeks several species of insects, especially bees and termites, have drawn particular attention at Carlsbad Caverns National Park.



Honeybee (Photo by James H. Cane, USDA-ARS)

AFRICANIZED BEES

We have enjoyed the benefits of honeybee pollinated agricultural crops and honey from man-made hives for so long that we often assume that honeybees are native to the US. However, the first honeybees were brought over by Europeans. Native solitary bees and bumblebees, along with other insects, pollinated our native flowering plants. However, large orchards or hundreds of acres of agricultural crops that all flower at the same time need more pollinators than are found naturally. Hives of European bees are moved around to pollinate crops and produce honey that can be removed for sale. In 1957, African honeybees were

imported into Brazil for an experimental breeding program. Unfortunately, the African bees escaped and interbred with European bees. African and European honeybees are the same species and readily hybridize. Since the genetic makeup of any individual or colony reflects the genes found in the queen and her mate, there is considerable variation between honeybees, depending on the number of African genes passed on from the parents. It may require up to 70 measurements plus biochemical analysis to determine if a bee is Africanized (has some African genes). Africanized bees were first reported in Carlsbad in 1992. They are now common throughout the southwest. Over 90% of the bees found away from man-made hives in southern New Mexico, Arizona and Nevada have been identified as Africanized.

Sensational stories in the media portray the Africanized bee as an aggressive bee that attacks people in huge swarms for no reason. However, the Africanized bee can be more accurately described as 'protective' rather than aggressive, compared to a European bee. Both bees defend their nests but larger numbers of Africanized bees defend a larger area around the nest. People have harvested honey from African honeybee nests for thousands and possibly tens of thousands of years. The bees respond by mounting a vigorous defense when their nests are threatened by people or wildlife. Many of the injuries and deaths from Africanized bees occur when people intentionally or accidentally disturb a nest. However, a few serious stinging incidents have been reported when people were walking over 100 yards from a nest that was out of sight.

Since the Africanized bees are here to stay, how can we learn to live safely with them? While foraging for food or water away from the nest, neither Africanized nor European bees are likely to sting unless someone swats, corners or threatens them. We do need to be more vigilant and alert for possible nests. Honeybees can nest in any sheltered area, such as caves, rock crevices, tree cavities, under picnic tables, culverts, under bridges, abandoned equipment, or foundation cracks. Nests are often out of sight but large numbers of bees or bees flying into an opening are reasons for caution. Bees in the backcountry away from main trails will be left alone. Both Africanized and European bee nests in visitor or employee use areas or near main trails will need to be removed. Although European bees defend their nests with smaller numbers of bees, they still pose a risk to children, the elderly, or anyone with an allergy to stings. There is actually more venom in a European than an Africanized bee sting. If someone is allergic to bee stings, it doesn't matter which type of bee it is. The Park's four EMTs and twenty First Responders have been trained to administer the Epi-Pen (epinephrine) to anyone with symptoms of an allergic response after a bee sting.

Bees have been observed visiting the entrance of Slaughter Canyon Cave for many years with more bees observed in 1996 than this year. Since Africanized bees have been reported in Carlsbad since 1992, we have probably been living with Africanized bees at Carlsbad Caverns for years without incident. Just as we are vigilant for rattlesnakes, scorpions, or other venomous animals, we need to be aware of the presence of bees.

TERMITES

Unlike honeybees, termites are native to Carlsbad Caverns National Park. They have been an important part of the ecosystem for millions of years, removing dead vegetation from the surface, recycling nutrients, and redistributing the soil. Unfortunately, they do not differentiate between dead plants lying on the ground and the wood supporting our buildings. With the assistance of symbiotic bacteria in their guts, termites are able to digest cellulose in wood. An established termite colony can produce tens of thousands of workers. When conditions are favorable, the winged reproductive form, called **alates**, is produced. Thousands of alates (flying termites) emerge within a few minutes from a hole in the ground or wood, or they may build a dispersal tube up along a structure. Less than 1% of alates survive to start a new colony as most are eaten by birds, reptiles, and mammals. Swarms of alates are common after rainfall in the spring and fall. Unfortunately, in the past few weeks, large swarms of alates have emerged in the bathrooms of two of our historic buildings and residents of other buildings also report seeing some termites.

Reproductive Termites (Photo by Jim Kalish, UNL Entomology)

Since termites need moisture, we often unwittingly provide especially attractive habitats for them. When rainfall flows down slope or off roofs and is trapped by buildings, the ground can remain damp for months. Since there is little ventilation under the stone buildings, small plumbing leaks can supply a continuous source of moisture. Controlling termites at Carlsbad Caverns is complicated by the desire to protect the historic appearance of the buildings and the fairly steep slope that drains down toward the cavern. Conventional termite eradication treatments that include drilling into a building at frequent intervals or saturating the ground with chemicals would not be appropriate here. It will be a challenge to develop a termite control plan for historic buildings over the cavern in an area where termites are indigenous and widespread throughout the area.

INSECTS ARE BENEFICIAL

Insects are the most abundant creatures on earth. Not only are there more species of insects than all other animal species combined, but the biomass of insects would far outweigh the total weight of all other animals. Without their vital ecosystem services, such as pollination and nutrient cycling, most of our plants could not survive. All insects are beneficial to the ecosystem as a whole. Unfortunately, a few see people or our possessions as a food source. That annoying fly hovering around your lunch would make a good lunch for a lizard. Mosquitoes and termites are included in the diet of many birds and we can thank bees and

other pollinating insects for most of the fruits, vegetables, and nuts we enjoy. Tent caterpillars and webworms are the preferred food resource for rare Yellow-billed Cuckoos. Nesting success is much higher at Rattlesnake Springs in years when these native caterpillars are abundant. Remember, our own Bat Flight is a massive nightly quest for insects.

Birds And Other Animals, Such As The Yellow-billed Cuckoo, Prefer Tent Caterpillars And Webworms At Rattlesnake Springs. (Photo courtesy Kern River Preserve, Audubon – California)

RECENT CAVE RESEARCH, RESTORATION AND SURVEY

by Dale Pate

During the last few months, the Cave Resources Office has overseen and participated in a number of projects in Carlsbad Cavern and Spider Cave. The role that volunteers have played in these projects cannot be overemphasized. Volunteers have been essential to the successful completion of a number of these projects. Thanks to all who have been involved and special thanks to Barbe Barker. Everyone's efforts have been greatly appreciated. I have tried to mention everyone by name and I apologize if I missed anyone.

RESEARCH

Spider Cave Microclimate and Speleogenesis - A study by Richard Hazlett and Michael Queen, both from Pomona College (California) was initiated this year in Spider Cave. This study has two main goals: (1) develop a microclimate model for the cave that would include temperature, humidity, CO2 and radon fluxes, and (2) interpret the speleogenesis of the cave based upon mineral chemistry. Drs. Hazlett and Queen, along with three senior students, were in the park from August 13 – 25 to begin their studies.

Pomona College Folk, (From Left To Right): Daniel Morgan, Garrett Miller, Alexandria Plank, Richard Hazlett and Michael Queen.

Continuing Geomicrobial Investigations in Spider Cave – Mike Spilde, Jim Werker and Jed Holme collected 6 samples from Spider Cave on July 22 for a continuing project to investigate corrosion residues found in Spider and Lechuguilla Caves. Penny Boston and Mike Spilde returned to Spider Cave on August 14 to collect more samples in their search for microbial metabolic activity from various features including the moonmilk found in the cave.

Photomonitoring the Mexican Freetailed Bats – Begun in 1996 with funds from the Adopt-A-Bat program, this project uses infrared photography to document the bat roost 3 times each summer. Jim and Val Werker developed this program and visited the park from June 2-5, July 13-23 and August 24-28 to photograph the bat roost. For an excellent update on this project by David Roemer, see *Canyons & Caves No. 17,* page 9.

Continuing Bat Research – Ken Geluso and Troy Best continued their studies of Mexican free-tailed and fringed myotis bats from July 1 – 8. With Keith Geluso, Lisa McWilliams and 5 other graduate students (sorry, I don't have their names at this time), Drs. Geluso and Best captured bats at the entrance to determine a male/female ratio for the colony this summer and to also see if juveniles or pregnant/or lactating females were present. In a continuing effort to study the foraging range of the Mexican free-tailed bat colony, they mist-netted over various water sources from 30 to 50 miles away, placing small transmitters on captured bats and were successful in detecting some of these same bats in Bat Cave. In an attempt to place light-tags on *Myotis thysanodes* (fringed myotis) bats in Left-hand Tunnel in a confirmation study to see which entrance the species may be using to enter and exit the cave, the group was surprised to catch mostly *Myotis velifer* (cave myotis). The group's final study was to capture bats at Rattlesnake Springs to look at species diversity.

Fringed Myotis Bat Counts – In a long-term project to monitor the colony size of fringed myotis bats, Stan and Gosia Allison counted an average of 363 bats flying out of Left-hand Tunnel on the evening of June 22. The count made the previous year on June 19, 1999 was 270 individuals. Work done by Drs. Geluso and Best later in July indicated that more than one species of bat are living in the back reaches of Left-hand Tunnel during the summer months. Debbie Buecher and Myra Barnes used an infrared video camera and lighting system in Left-hand Tunnel to test the possibilities of determining numbers of bats flying out of that area each evening. Their results were encouraging and may be an excellent way to track numbers of bats roosting in various areas of the cave.

Bat Observations – Myra Barnes, a wildlife biologist recently hired by the park, began making visual observations 2 to 3 times a week with a night vision scope using infrared illumination of the Mexican free-tailed bats as they leave their roost. Begun on September 12 and continuing until the last of the colony leaves for the winter, Myra's observations include when the bats begin to fly and their dispersal patterns from the time they leave the roost to the time they leave the cave.

RESTORATION

May 27-28 – Numerous members of the Cave Research Foundation (CRF) Memorial Day expedition worked on several restoration projects in Carlsbad Cavern. Major cleaning efforts began near where the Texas Trail joins the main trail in the Big Room and in the Dome Room, a small room visible from the main trail in the Big Room. In addition some cleaning of flowstone was accomplished in Lower Cave. Participants for these restoration efforts were Barbe Barker, Michael Bromka, Ron Grogan, Lois Lyles, John McIntyre, Rae Nadler-Olenick, Georganne Payne, William Payne, Sherie Pennebaker and Sondra Sage.

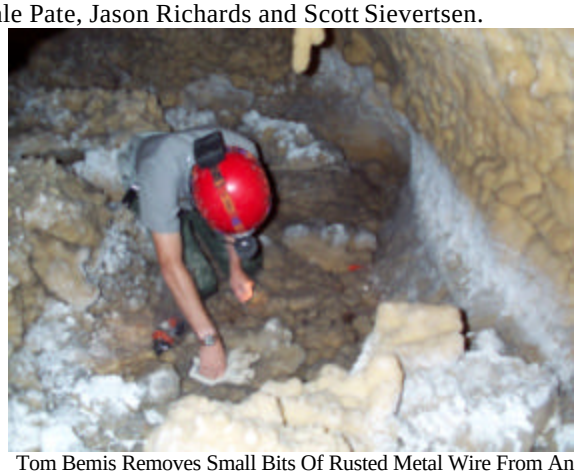
June 12-16 – The yearly CRF/NSS Restoration Camp focused on two areas in Carlsbad Cavern this year. Crews continued the removal of muds from the Texas Trail area of the Big Room and the removal of rubble from the Old Lunchroom area on the edge of the Big Room. Restoration efforts were by the following: Barbe Barker, Bill Bentley, Brad Blackburn, Michael Bromka, Brian Coffey, Frank Everitt, Walter Feaster, Roseanne Larson, John McIntyre, Dorothy Mladenka, Donna Mosesmann, Scott Stark and Ed Woten.

September 2-3 – Restoration was a major focus of the CRF Labor Day expedition to Carlsbad Cavern. The Dome Room, the Texas Trail area in the Big Room and the Guadalupe Room were the main areas worked in. The restoration crews consisted of Barbe Barker, Don Becker, Sonia Boyd, Tim Boyd, Hal Elless, Frank Everitt, Kevin Ferguson, Ron Grogan, Kevin Justus, Tracy Knetsch, Ken Lakins, Pam Massey, Georganne Payne and William Payne.

Pam Massey Cleans Flowstone In The Big Room Near The Texas Trail Area. (NPS Photo by Dale Pate)

September 23 – A group from San Antonio began a clean up of a flowstone and dry pool area outside the tunnel that leads to the lower portion of the National Geographic Pit in Lower Cave in Carlsbad Cavern. This area had been covered with lots of dirt and a number of large rocks. The rocks and dirt were moved to a nearby impacted area. The area promises to be very beautiful once it is restored. Participants in the restoration were as follows: Christi Bennett, Don Cooper, Steve Gutting, Matt Gutting, Andrew Herzig, April Herzig, Frank Herzig, Ann Murphree, Libby Overholt, Joe Ranzau, Connie Sisney and Roy Wessel.

1998 to 2000 - Over a two-year period, the Cave Resources Office staff in conjunction with the Cultural Resources Office staff identified and removed 63 historical objects along the main trail in Lower Cave. These objects were mostly composed of wood, cloth, paper, iron and glass. A few of the items were impossible to identify. All items were photographed, surveyed, then removed and either placed into the park museum or discarded. Participants in this project were: Stan Allison, Tom Bemis, Jeff Denny, Dave Kayser, Dale Pate, Jason Richards and Scott Sievertsen.



Tom Bemis Removes Small Bits Of Rusted Metal Wire From An Old Pool Basin In Lower Cave. (NPS Photo by Dale Pate)

RESURVEY OF CARLSBAD CAVERN

The resurvey of Carlsbad Cavern has continued over the last few months with several different groups working in the cave. The total length of resurvey for the cave is now 18.5 miles. In addition, the drafting of the Carlsbad Cavern map has begun with some pencil drawings completed for portions of Left-hand Tunnel, the Guadalupe Room and the Main Corridor. As well as resurvey, these teams also provide us with inventories of these resurveyed areas. A brief synopsis of these surveys is as follows:

May 20-25 – Brian Chartier, Susan Herpin, Kelly Holladay, Dale Lankford, Kathy Lankford and Jimmie Worrell surveyed approximately 1000 feet beneath the Big Room in Middle Earth.

May 27-28 – Chris Beck, Aaron Birenbiom, Tim Kohtz, David McClung, Walt Olenick and Tony Troutman in two teams, surveyed about 700 feet in Lower Cave during the CRF expedition over the Memorial Day weekend.

June 4 – Stan and Gosia Allison and Paul Burger pushed a high lead in the Polar Regions on the edge of the Big Room surveying 125 feet. Footprints indicated that others had accessed this area, but it had never been surveyed or inventoried.

July 22-23 –Jennie McDonough, Dan Montoya and Debbie Rivera surveyed about 250 feet in the F-fissure area of the cave.

August 11-19 – Pat Kambesis and Mike Lace spent a number of evenings sketching floor detail and drawing cross-sections in a portion of the Big Room.

Pat and Mike Survey In The Big Room. (NPS Photo by Dale Pate)

August 26-27 – Erik Niemeyer, Curtis Patillo, Pat Roberson and Joel Tracy surveyed about 400 feet in the Remarkable Crack area of the cave.

September 2-3 – During the Labor Day CRF expedition, Kevin Glover, Kelly Holladay, Kevin Justus, Ed Knetsch and Ken Lakins surveyed over 400 feet off of the Long Loop in Lower Cave.

EXOTIC WILDLIFE

by Myra Barnes

Next to habitat loss, exotic species are the second biggest threat to biodiversity and natural resources. Most introduced species do not survive or can only survive with human intervention. However, some species have enjoyed spectacular success. Russian thistles (tumbleweeds) are rolling across the west. Kudzu vines are covering over houses and everything else in their path across the south. Zebra mussels are clogging up water systems in the Great Lakes and beyond. Some species, such as livestock and most agricultural crops, were intentionally introduced and survive best with the help of humans. Other species were imported for sport, landscaping or an attempt to find 'better' plants or animals than those indigenous to our country. Global trade and cross country distribution by truck, rail, air and water has made it easier for undesirable species to hitchhike to places far from their native habitats. Regardless of their origin, every introduced species has the potential to replace or compete with native species.

Over tens of thousands of years, predator-prey interactions and competition have shaped natural communities. In what is often called an 'arms race', as predators develop better hunting skills, the prey animals that survive will be those that are fastest, more maneuverable or better able to hide from predators. Plants develop thorns or toxic chemicals to deter foraging animals. Defenses against predators or herbivores develop slowly over a long period of time in response to gradual changes in speed and agility or browsing pressure. When a plant or animal is moved, it may end up in a place where it has few or no predators and is able to outcompete or displace native species. Sometimes introduced species, like the bullfrog, eat our native frogs, fish and other species. Often the detrimental effect of introduced species on native species is more subtle and not immediately apparent.

Realizing the seriousness of the problems posed by exotic species, Congress allocated money for the removal of introduced plant species in our national parks. Over a million dollars has been budgeted for the Exotic Plant Management Team based at Carlsbad Caverns. While their task is formidable, addressing the question of exotic wildlife removal is much more controversial. The recent appearance of a Spanish goat that took up residence on a steep rocky slope near the entrance road in Walnut Canyon is a good example of the difficulties and cost involved in exotic animal removal.

What difference does one goat make? One male goat probably isn't a significant threat to the ecosystem in Carlsbad Caverns. However, 40-50 Spanish and dairy type goats have been living in the Serpentine Bends area northwest of the park for about 50 years. Goats can eat almost anything and they forage on their hind legs more often and higher up in trees than native species, such as mule deer. Since goats require water to drink, they are more likely to concentrate their feeding activity around the same springs that our native wildlife depends on. Water and quality forage near water sources are probably the most important factors limiting native wildlife abundance and distribution at Carlsbad Caverns.

Spanish Goat In Walnut Canyon. (Photo © Steve West)

Barbary sheep were introduced into New Mexico as a game animal in the 1950's. Hunting reduced native desert bighorn sheep below a viable population size prior to 1950 throughout most of their range in New Mexico but the presence of Barbary sheep prevents the reintroduction of bighorns to Carlsbad Caverns National Park. Barbary sheep, native to North Africa, are socially aggressive toward bighorns, can survive on lower quality forage, have a higher reproductive rate and can transmit diseases to bighorns and deer. Removal of Barbary sheep from the park was limited to a few animals between 1979 and 1993. At least one breeding herd of more than 20 animals, including lambs, was observed several times this summer in Slaughter Canyon. Singles, pairs and small herds have been reported from most areas of the park at some time in the past year. The diet of Barbary sheep also overlaps with desert mule deer. Later this year a research project will be initiated to estimate the abundance and distribution of Barbary sheep at Carlsbad Caverns National Park. Foraging and water use patterns will be analyzed to determine if Barbary sheep displace mule deer or other wildlife from any areas of the park.

The Barbary Sheep, An Introduced Species. (Photo by Glen Mills and courtesy of Texas Parks & Wildlife)

A Desert Bighorn. (Photo courtesy of the Nevada Wildlife Federation)

The Chihuahuan desert is the second most diverse desert in the world. Carlsbad Caverns National Park protects a valuable example of this important ecosystem. Like any complex technical or natural system, an ecosystem functions best when all of the parts are present. Protecting our native species and the reintroduction of extirpated species, like the desert bighorn, requires protection of natural ecosystem processes. The reduction or elimination of introduced plants or animals improves habitat quality and removes competitors that directly influence native species through predation or indirectly through competition. Introduced wildlife are often attractive animals that are interesting to watch but they are not compatible with our natural ecosystem and native species. Removal of exotic animals and the reintroduction of native species would be a long and complex process but the sight of desert bighorns bounding over the rocks in Slaughter Canyon and other areas in Carlsbad Caverns National Park would be an outstanding reward.

HIGH SCHOOL STUDENTS GET DOWN AND DIRTY

by Paul Burger

Carlsbad Caverns National Park has partnered with Carlsbad Senior High School (in conjunction with the Chihuahuan Desert Lab Program) to teach students about the impacts of human development on caves and groundwater. As part of this program, a group of students have been sampling pools in Carlsbad Cavern. The students used field-testing equipment to take temperature, pH, nitrates, and dissolved oxygen measurements. They learned how to use the equipment without contaminating the water and how to maintain good field notes.

Pools were chosen to represent those that have been impacted heavily by visitation as well as some that have not been impacted. The Carlsbad Environmental Monitoring Center generously volunteered time, personnel and equipment to analyze the water samples for major ions and trace metals. The chemical analyses of these pool waters allowed the students to see what the impacts of visitation have been.

Back in the classroom, the students were given an overview of karst hydrology and of the hydrologic system surrounding Carlsbad Cavern. The students learned how water is transported into the cave and what happens to the water once it reaches the cave pools. The classroom exercises emphasized the negative impacts of the park infrastructure on the cave as well as what is being done to reverse the damage. To put the lab in a broader perspective, the students were given an overview of karst contamination problems around the world.

The samples the students gathered will be used as baseline data to determine how the pool levels and water chemistry changes with time. This will allow the park to monitor the effects of removing infrastructure and how long it takes for an arid karst system to recover from surface impacts.

THE LIVING DESERT: LECHUGUILLA

by Gavin Emmons

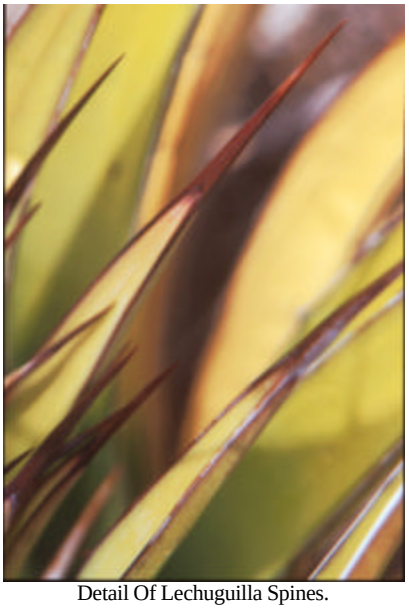
The following photographs provide a glimpse into one of the Chihuahuan Desert's most common plant species – *Agave lechuguilla.* The lechuguilla may be best known for its needle-sharp spines that inflict numbing pain on unwary hikers, but the complex beauty of the leaves, stalks, and flowers that provide necessary food sources for insects give testimony to the importance and elegance of this hardy agave. (All photos are NPS photos and were taken by Gavin Emmons from June to September 2000.)

Dried Lechuguilla Spines And Stalks.

Flowering Lechuguilla Blooms.

Cone-nosed kissing bug feeding on flower bud.

Juniper Hairstreak Feeding On Flowering Blooms.



Detail Of Lechuguilla Spines.

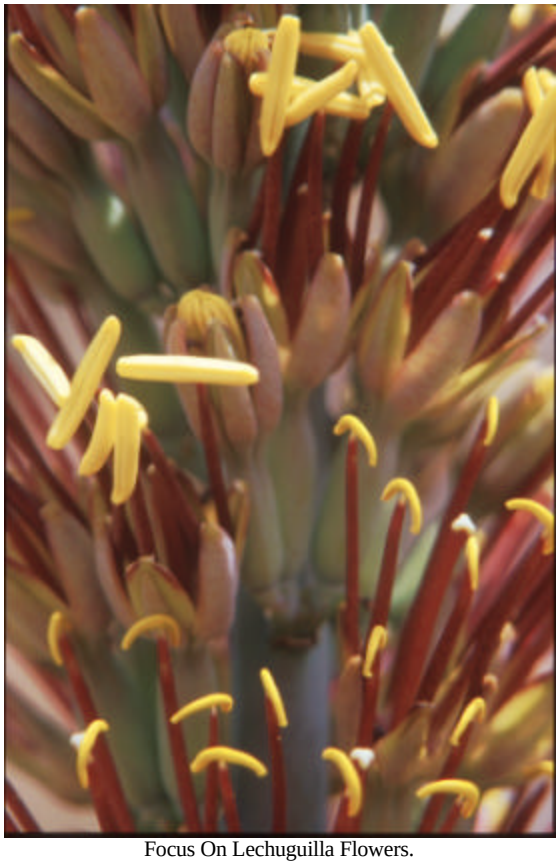
Beetle Clinging To Budding Lechuguilla Stalk.

Cone-nosed Kissing Bug Feeding On Lechuguilla Flower Blooms.

Detail Of Lechughuilla Spines.

Focus On Flowering Bloom With Stalk Overhead.

Aerial Detail Of Lechuguilla Spines And Leaves.



Focus On Lechuguilla Flowers.

Buds On Lechuguilla Stalk Prior To Flowering.

Lechuguilla Growing In Limestone Crevice.