

# CANYONS & CAVES

A Newsletter from the Natural Resources Offices  
Carlsbad Caverns National Park

Edited by Dale L. Pate

Issue No. 1

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This newsletter is produced to provide up-to-date information on resource management projects, research and expedition summaries, and resource stewardship policies. Both surface and cave resources will be covered in this new expanded newsletter.

## RESOURCE NEWS

THANKS go out to Bob Lofton and Wes Able for their efforts in turning off the lights in the Lunch Room/Pump Room area in Carlsbad Cavern.

WELCOME to Diane Dobos-Bubno who has accepted the resource management intake trainee position with surface resources. Diane will EOD in late May. She comes from Golden Gate National Recreational Area where she has been working in Interpretation.

HOORAY for Harry Burgess! He recently accepted a Term Appointment in the Cave Resources Office that could last for up to 4 years.

CONGRATULATIONS to Nancy Favour who has accepted a permanent 7/9 position as the GIS Specialist at Organ Pipe National Park. Nancy has built our GIS program from scratch - We'll miss her.

**REMINDER:** Visitors asking questions about the location of caves (such as Lechuguilla Cave) or archeological sites (such as Painted Grotto) should be referred to either the surface or cave resources offices. Employees should never give out locations to the specific resources. Both the Archeological Resources Protection Act of 1979 and the Federal Cave Resources Protection Act of 1988 mandate that federal land agencies protect these resources by placing limits on who can receive location information and exempts the divulging of locations from the Freedom of Information Act. In following this mandate, the Park has recently requested the U.S. Geological Survey to remove all cave and archeological site locations in the park from all maps they produce.

**BAT GUANO FOR SALE:** The Gardenville Fertilizer Company of San Antonio, Texas sells bat guano in various quantities. They mine guano from Bracken Bat Cave located near San Antonio which is owned by Bat Conservation International. For prices and more information, their phone number is 1-800/788-8256.

**THE WORLD'S LARGEST UNDERGROUND ROOM** - On December 28, 1980 members of a British-Malaysian Speleological Expedition to Sarawak, a province of Malaysia located on the island of Borneo, discovered **lubang Nasib Bagus (Good Luck Cave)**. In January 1981, while surveying the cave, expedition members stumbled upon an immense chamber. This chamber, named the Sarawak Chamber, measures 700 meters (2,300 feet) long, up to 450 meters (1,500 feet) wide, and averages 100 meters (330 feet) high. This is by far the largest underground room that has ever been discovered.

MORE ON THE EARTH'S MAGNETIC REVERSALS - It is thought that when a reversal in earth's magnetic field occurs, the field collapses for a relatively short period of time the earth has no magnetic field at all. When the field is reactivated, it then is reversed.

## **PRESCRIBED FIRES & VEGETATION PLOTS - WHAT ARE THEY FOR?**

by Pat Mulligan

The park has been carrying out prescribed fires for four years now. With the planned burn in April of this year, we will have reduced fuels between the developed and undeveloped areas of the park, making it safer to allow naturally ignited fires to burn in the wilderness. Fires also have a profound effect on plant communities, and the surface resource management office has been paying close attention to these effects for many years. The most recent work has been the fire effects plots put in by the resource office over the last four years. These are starting to tell us some good information, but first some history.

Gary Ahlstrand worked as a research ecologist for the NPS cooperative studies unit at Texas Tech. University in Lubbock from 1978-1981. During this period his primary project was research on fire in the Guadalupe. Several projects were undertaken, ranging from fire history in the high Guads to the effects of fire on seed germination for selected Guadalupe shrub species. The end product of this work was a 170-page publication entitled "Ecology of Fire in the Guadalupe Mountains", available in the headquarters library. This work has become a primary reference for ecological goals and predictions for our prescribed fire program.

The literature has been reviewed on semi-desert grassland fire ecology which includes an ecological history of our region. It is well documented that before European settlement, this area (meaning the Trans-Pecos region of West Texas and southern New Mexico) was an arid grassland with small areas of shrub dominance, much different than the mesquite and creosote bush domination that is present now. The boundaries of the Chihuahuan Desert have taken a great leap north in the past 100 years. The primary causes of this desertification have been grazing livestock, fire suppression, and water table lowering due to irrigation agriculture. The arid grassland that was here did not have much resiliency or tolerance for disturbance because of the climate and limited resources for replenishment. It couldn't put up with increased grazing pressure like the plains of Montana or other tallgrass prairie states. Those areas can rebound much better because of better soils and more precipitation. The grasslands around here just couldn't put up with it; the system broke down and the door for shrub invasion was opened wide. I have a collection of literature on these subjects for anyone interested.

Changes within the park have been less severe, primarily due to the ruggedness of the Guadalupe, making them less attractive to grazing animals and their owners; also because of the gradual removal of all livestock since the park was established. Still, there has been a general increase in the dominance of shrubs such as juniper and catclaw and of succulent plants such as lechuguilla and prickly pear. The major ecological goals of prescribed fire and of allowing natural fires to burn in the park is reduction of cover by these plants and increase in grassland dominance. A large portion of the park has had fire in it in the last fifteen years, and one of Nancy Favour's current projects is digital mapping of all past fires in the park. This way we can see what has burned since 1980, or since 1970, etc. The park is currently a mosaic of fire-impacted areas, and the habitat diversity that results from this is a desirable situation. We are not very far behind in seeing fire completely return to its natural role in the park's lands.

So research has been done on the effects of fire within the park, and we know what will happen when an area is burned. Shrub and succulent dominance will decrease and grasses will benefit. What we are not sure of is how much and how fast. The fire effects plots that are currently in place in the park are designed to tell us if we are meeting these goals and also to show any unexpected changes in the plant community. They also track the relative abundance of grasses and changes in abundance of other woody

species besides juniper. Much data is recorded about each plot. Besides all of the vegetative community inventory data, we also record slope, elevation, aspect, topographical description (wash, canyon, ridgetop, mesa, etc.), exact location, and past fire history. Because of this information, the plots are also used as fire behavior observation points during the actual execution of the fire. Observations are done so that Tim (our Fire Management Officer) can check the accuracy of fire behavior predictions and fine-tune them if necessary for the next time.

Plots are installed and inventories completed before the fire. Then the plots are visited immediately post-burn to assess burn severity, and after that are re-inventoried at one, two, three, five, and ten years post-burn. So far we have six plots that have had third year readings, three that have had second, ten that have had first, and we have installed five more in the burn planned for this April. These five may be the last plots installed for the park, even if we have more prescribed fires. Twenty-four plots should be enough to get a statistically valid data set for our observations after all the plots have had third year readings. A thorough analysis of the data will tell us if more are needed. It's a little early to do a full analysis right now because only six plots have been read to three years. Many fire effects take three or more years to become noticeable. However, we did complete a summary report and preliminary data analysis this March. The results are within the boundaries of what we expected. Shrub and succulent coverage has seen a dramatic decrease in burned areas, and a concurrent increase in grass abundance and vigor has taken place. For visual evidence of this, we have photo-documented the plot areas along with the inventories and these records are available in the resources office. But a better way is to go check it out yourself. Take a drive on the loop road. For the first mile, you are driving alongside the burn that is three years old and where the oldest plots are (On the left side of the road). A little further down are some small burns, also on the left side, near the water tanks. These burns are two years old, as is the large one near the Rattlesnake trailhead on the right side. Just look across the road from each of these fires and you can see the difference.

## **MEXICAN FREE-TAILED BAT MONITORING**

by Bill Route

Staff from Surface and Cave Resources have been working with Jim Werker and Val Hildreth-Werker of Southwest Photography Inc. to develop a long-term monitoring program for the Mexican Free-tailed bats that roost in Carlsbad Cavern. Our method of choice is to use infrared photography as a means of estimating the relative abundance of roosting bats on the ceiling of Bat Cave. Fifteen permanent photo points are now in place and a complete set of overlapping photographs have been taken of the ceiling. These overlapping photos, taken before the bats arrived from Mexico, will be compared to photos with bats present. The photos will provide an estimate of the "area" of cave ceiling covered by roosting bats. This area estimate can then be compared directly between years and will be used as an "index" to population trends.

We plan to calculate this index twice a year; once in late May just before young are born, and then again in late August after young take wing. Initially, each estimate will involve retaking a complete set of 15 photographs 5 days in a row. Photographs will then be scanned and analyzed by computer and an average of the 5 estimates calculated for each of the May and August sessions. By repeating the 15 photo-points 5 times each, we will get a measure of statistical precision which is important for future trend analysis. The two different time periods will help us evaluate the return rate of bats from Mexico (May) and recruitment of young to the population (August).

This project is being funded by the Adopt-A-Bat program and by National Park Service Intermountain Field Area Science funds.

As an aside, Dr. Donald Clark has been provided Adopt-A-Bat funds to conduct an analysis of the historical (1930 to 1988) concentrations of DDE (the principal breakdown product of DDT) in dried

museum specimens of free-tailed bats from Carlsbad Caverns. The results should help verify or refute the role of DDT in the population decline that occurred in the 1950's and 1960's.

## **RABIES VACCINE**

by Dale Pate

In anticipation of working in Bat Cave, four employees of RM & VP have just completed pre-exposure vaccinations for rabies. The vaccine (HDCV) is a sterile, stable, freeze-dried suspension of rabies virus that is harvested from infected human diploid cells. After harvesting, the strain is concentrated by ultra-filtration and is inactivated by beta propiolactone. Three doses of HDCV of 0.1 ml are given intradermally in either arm on three separate occasions. **Intradermal** means they use short needles for the injection and less vaccine as opposed to **intramuscular** which is the use of longer needles, which most everyone is familiar with. Studies have shown that using this vaccine with these methods, 100% of all subjects tested produced adequate rabies antibodies. For those who get the pre-exposure vaccinations, every two years the titer (amount of rabies antibodies) should be checked and a booster of the same vaccine given if the number of antibodies has dropped. Though the pre-exposure vaccinations do not eliminate the need for additional therapy after a possible rabies exposure, it does mean that fewer doses of vaccine will be required to prevent the victim from getting rabies.

## **HALL OF THE WHITE GIANT STAGED RESCUE**

by Jason Richards

Once again, Lorie Hardin allowed herself to be wheeled into being wrapped into the cocoon of a sked, and be literally dragged, bumped, twisted, passed, crawled over and lowered by rope for a five hour, six minute ordeal. At 8:30 AM, the call came to the cave resource office from Doug Ballou that a visitor (Lorie Hardin) had fallen and possibly broken her leg in the passage that leads to the Hall of the White Giant, thus starting a very successful mock extrication.

This mock rescue was not announced and thoroughly planned like the Spider Cave mock rescue last year, however, it was every bit as successful. I must commend each and every one of the participants for their teamwork, patience and expertise in a well-done SAR exercise.

The passage where the extrication took place has two vertical chimneys and several tight areas. Matlock's Pinch, and a short area beyond Matlock's Pinch, is extremely tight and requires well thought out twisting, raising and lowering of the sked to get it through. Since the Hall of the White Giant is a weekly tour given to visitors, this SAR practice was very beneficial, as an accident in this passage is quite probable. Many questions on the logistics of such an extrication were answered. If and when a real rescue from this area should occur, we will be ready and our prior knowledge from this practice will be invaluable.

I wish to thank everyone that participated, you truly worked as a team. Special thanks definitely go to division chiefs and supervisors for their cooperation in arranging the necessary personnel to make it happen.

Someday...perhaps, we'll do another.

## **CARLSBAD CAVERN GROUND SLOTH**

by Dale Pate

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In 1947, the remains of a fossil vertebrate skeleton were discovered in Lower Devil's Den. Under the supervision of Dr. Eric Reed, Regional Archeologist for the NPS, these remains were removed and shipped to Dr. C.L. Gazin, Curator of Vertebrate Paleontology at the Smithsonian Institution in Washington, D.C. The remains were identified as belonging to the Pleistocene ground sloth, *Nothrotherium sp.* (This classification has since changed to *Nothrotheriops sp.*). The remains were then shipped back to the park and stored in the museum collection. With the discovery of these remains, it was thought that the bones had been washed into the cave during a much wetter period in time.

In 1959, more vertebrate bones were found "upstream" from the original site and were also identified as *Nothrotheriops sp.*, possibly even the same individual. Photographs were evidently not taken of either of these sites when initially discovered.

In 1985, Carol Hill and David Gillette relocated the Lower Devil's Den site, but the 1959 site was not found. The remaining in-situ bone fragments were carefully studied. These bones were lying on top of the silt and there appeared to be no silt packed into the bone marrow. These factors led the researchers to believe that the bones were not washed into cave by an active stream as was first thought.

The bones from the Lower Devil's Den area were dated by two methods: the Carbon-14 method and the Uranium-series dating method. The Carbon-14 method yielded a date of >29,700 years before present (ybp). The Uranium-series dating method yielded a date of 111,900 ybp. Calcite crystals, which had grown inside the bone marrow, were dated at 58,000 ybp. As of 1985, this date of 111,900 ybp was the oldest absolute date ever obtained for this species. More detailed information can be obtained from a paper by Hill and Gillette titled "Bones of the Pleistocene Ground Sloth NOTHROTHERIOPS IN CARLSBAD CAVERN, NEW MEXICO".

## AIR QUALITY PROJECTS IN THE GUADALUPES

by Nancy Favour

Air quality is a resource issue that is receiving increasing attention nationwide. Especially in national parks, "clean air" and its counterpart, excellent visibility are treasures that many Americans expect to find when they visit a national park. Unfortunately, many things threaten to make two hundred-mile vistas something only in the memories of old-timers.

A decisive step towards protecting air quality came with the amendments to the Clean Air Act in 1977. Selected areas, designated as Class I, were to be protected from existing and future manmade air pollution. Included in the Class I areas are national parks and national wilderness areas larger than around 20 square kilometers. In 1987, the Interagency Monitoring of Protected Visual Environments (IMPROVE) program grew out of a five-year old NPS visibility monitoring program. IMPROVE, composed of the four federal land management agencies, the Environmental Protection Agency (EPA), and three regional-state agencies, contracts the work to universities and private research organizations.

Of some 68 IMPROVE sites, the closest to Carlsbad Caverns National Park is Guadalupe Mountains N.P. Other relatively nearby sites include Big Bend NP, Gila Wilderness (USFS), Bandalier National Monument, and Chiricahua National Monument, Arizona. At the GUMO site, four machines suck air into specialized filters twice a week. Each filter is designed to trap different particulates. The particulates collected include ammonium sulfate, organic carbon, soil, ammonium nitrate, zinc, lead, selenium, and bromine. Weekly, the filters are replaced and sent to University of California at Davis for analysis. This data is summarized once a year and a report is sent to the park.

In addition to the filtering project, GUMO also hosts a device, which measures the light transmission properties of the atmosphere both day and night. This instrument, known as a transmissometer, has two main components, a light source (transmitter) and a light detector (receiver). The basics of the operation are that the transmitter sends out a light beam for ten minutes each hour. The

receiver gathers this light and outputs a calculation of how much light is "lost." This measurement tells the percent transmission of the atmosphere. Using the path distance of the light beam, visual range can be derived. The visual range, usually expressed in kilometers, is how far one hypothetically could see on a flat earth.

Some may remember the air quality instruments that used to sit in Carlsbad Caverns residents' yards. These instruments, called nephelometers, read the color difference between the sky and a target, measuring to what extent a point source was obscured. Today, the transmissometer is able to incorporate "the light scattering and absorbing properties of the atmosphere along a selected sight path," --thus taking into account a much greater swath of atmosphere than a single point. Easy access to high points with a clear line of sight to the desert floor, and more extreme wind conditions made GUMO a better site for the transmissometer and filter station. However, the excellent applicability of these instruments to Carlsbad Caverns is obvious and should be a tremendous resource for any researcher of air quality.

## **DEER COMPOSITION COUNT**

by Bill Route

This past January I flew with Bryan Nygren from the New Mexico Department of Game and Fish (NMGF) to survey the deer herd in the park. Each year NMGF conducts deer composition surveys all over the state to determine if buck:doe and fawn:doe ratios are stable, declining, or increasing. These ratios are important indicators of herd health and can alert managers to impending crashes or cyclic interruptions in deer populations.

Mule deer are an important species in the Chihuahuan desert ecosystem. They are the primary prey of mountain lions and ultimately provide lots of carrion to turkey vultures and other scavengers. Deer also alter much of the habitat through their continuous selective browsing. Therefore, knowledge about deer population fluctuations is important for our overall understanding of the park ecosystem.

In just over one hour we counted, mapped, and classified 204 mule deer in 53 groups in the park. We found high concentrations of deer in and around the 1995 prescribed burn along the north boundary. We found fewer deer along the Guadalupe Ridge and along Yucca Ridge, but as we flew the south face of the escarpment, we again encountered lots of deer. The only other notable observation was of 15 javelina (the previous day NMGF saw a mountain lion).

So how's the deer herd doing? Well, Bryan, who's done a lot of deer surveys around the state, kept on saying "MAN CAN YOU GUYS GROW DEER HERE!"

We estimated that for every 100 does, there were approximately 32 bucks and 46 fawns, which is higher than other areas adjacent to Carlsbad Caverns. Buck:doe ratios were considerably higher than surrounding areas no doubt because there is no hunting in the park. Fawn:doe ratios were also higher, but not by much. The slightly higher fawn:doe ratios may be attributed to habitat. It's important to keep in mind though that this is just one year in time. These data will be of greater value after we've done the survey for several years. After about three years we will be able to determine trends - and when contrasted with trends in weather (e.g. precipitation), or catastrophic events like large fires - we will be better able to predict what will happen to the deer herd.

## **MORE ON LECHUGUILLAN MINERALS**

by Harry Burgess

As was mentioned in previous newsletters, there are many different minerals that have been identified in Lechuguilla Cave. The following is a short description of several of these minerals, some of

which may also be found in Carlsbad Caverns and other caves of the area.

**Alunite:**  $KAl_3(SO_4)_2(OH)_6$ . Hydrated potassium aluminum sulfate. This semi-hard mineral usually occurs in granular or compact white, yellowish, gray, or red masses. The crystalline form is hexagonal and the occurrence is rare. This mineral can be used for the production of alum and some potash fertilizers.

**Aragonite:**  $CaCO_3$ . Calcium Carbonate. This semi-hard mineral appears as small, elongated, prismatic crystals that are colorless, white, or yellow. It is a polymorph of calcite, differing primarily in its crystalline structure. Aragonite is considered to be unstable in normal conditions, often reverting to calcite over time. It is found in the skeletons of some species of marine animals, and in many caves where the stable environment allows the growth of these less common crystals.

**Barite:**  $BaSO_4$ . Barium Sulfate. A fragile, semi-hard mineral with perfect prismatic cleavage. Though not metallic, barite is very heavy, which is an important identifying feature. It is a white or blue-gray mineral that usually occurs as the result of the presence of nearby ore deposits.

**Celestite:**  $SrSO_4$ . Strontium Sulfate. Colorless to sky-blue, this mineral occurs in crusts and linings on the walls of the cave. Most carbonates (limestone, dolomite) contain a measurable level of strontium, and when affected by sulfuric-acid dissolution, celestite can precipitate. The celestite appears as crystal coatings and has been reported to be anywhere from 1 cm to .8 m in various caves in the U.S.

## LECHUGUILLA RESEARCH

**Update on Bat Identification Project** - The collection phase of Pat Jablonsky's Chiropteran studies is complete. Out of approximately 100 bat skeletons known in Lechuguilla Cave, skulls from 50 have been collected for identification. Thirty skulls have been collected from the Southwest Branch, 11 from the Western Borehole, 7 from the Entrance corridor or the North Rift area, 1 from the Near East, and 1 from the Far East. Twenty-six (slightly over half) of all the bats skulls collected have been identified as *Myotis ciliolabrum*, a species that has been collected in the Park only once by Ken Geluso in 1992. This indicates that *Myotis ciliolabrum* was more common in the Park in the past.

**Hydrochemistry of Lechuguilla Cave** - This research effort is led by Helen Dawson and Michael Queen. Sampling and analysis of pools located around camps and other pools will be accomplished for the evaluation of the effect of people on the water quality of these areas. This hydro-chemical analysis will compliment the microbial research by Larry Mallory and Diana Northup. Of special concern will be nitrate and sulfate values, which may indicate man-induced pollution.

**Determination of the Age of Lechuguilla Cave by Clastic Sediment Magnetostratigraphy** - This project led by Dr. Ira Sasowsky and Edward LaRock will date the deposition of fairly deep sediments found within the Deliverance Passage (Southwest Branch) by paleomagnetic and possible uranium-series dating methods. The hope is to use this collected data and the results from previous research (such as the paleomagnetically reversed sediments found in Lower Cave) to construct a geologic history of the cave and its relation to Walnut Canyon and other surface features.

## HANTAVIRUS

by Dale Pate

The following information is taken from an article titled "Hantavirus: A History" written by Jeff Power found in the February 1996 issue of the NSS News on page 68.

The Genus Hantavirus is a member of the Family Bunyaviridae. This family consists of four

genera of virus' that infect vertebrates. These genera are *Bunyavirus*, *Phlebovirus*, *Nairovirus*, and *Hantavirus*. Severe or fatal human infections from this family of virus' have been documented in Asia, Eastern Europe, Africa, and of course the United States.

During the Korean War of 1950-1952, thousands of United Nations troops developed an unknown disease. Fatality rates averaged 5 to 10%. The cause of this disease remained a mystery until 1978, when a virus named Hantaan was isolated in Korea from a field rodent. There are five viruses found throughout the world that are from the genus, *Hantavirus*. The *Muerto Canyon Hantavirus* was discovered in May 1993 near the Four-corners section of the Western United States. At the time of the initial outbreak in 1993, the region was suffering a plague of deer mice. Since this time, there have been other human cases where other rodents, including chipmunks, were found to be the carrier. The *Hantavirus* does not affect the rodents; however, the infected rodent is continuously shedding the virus in its saliva, urine, and feces. The virus is transmitted by aerosolized (airborne) excreta and has two main routes of entry into the human body. These are through the respiratory tract, including eyes, and through the skin. A bite from an infected rodent could transmit the virus, but is not the primary route of infection. There has been no evidence of human to human infection.

### CALENDAR OF EVENTS

Apr. 1-June 30	Cowbird Parasitism Survey - Rattlesnake Springs
Apr. 15-29	Window for Rattlesnake Canyon Prescribed Burn
Apr. 22-May 3	Mountain Lion Transects
Apr. 29-May 3	Film Crew with Burrid Productions - Carlsbad Cavern
May 11-12	New Mexico Restoration - Lois Bergthold
May 17-20	Northup Science Trip - Lechuguilla
May 19-23	McLean Science Trip - Lechuguilla
May 25-27	CRF Expedition - Carlsbad Cavern
May 28-30	Bat Photo Census - Carlsbad Cavern
June 1-2	Sasowsky Science Trip - Lechuguilla
June 1-July 1	Infiltration Study Continues - Carlsbad Cavern
June 15-22	CRF/NSS Restoration Camp - Carlsbad Cavern
June 29-July 7	Seiser/Holcomb Survey Expedition - Carlsbad Cavern
Aug. 3-10	National Speleological Society Convention - Colorado
Aug. 26-30	Bat Photo Census - Carlsbad Cavern
Sept. 29-Oct. 5	Lint Camp - Pat Jablonsky
Mid October	Mountain Lion Transects
Nov. 28-Dec. 1	CRF Expedition - Carlsbad Cavern