**Carlsbad Caverns National Park**
**Carlsbad, New Mexico**

National Park Service
U.S. Department of the Interior

# CANYONS & CAVES

## A Newsletter from the Resources Stewardship & Science Division

**Issue No. 41** **Fall 2009**

Sara Urtz on the traverse leading to the Mystery Room in Carlsbad Cavern. (NPS Photo by Dale Pate)

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Proofreading: Paula Bauer, Kathy Elmore

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All issues can be downloaded as a PDF file from the park website **http://www.nps.gov/cave/planyourvisit/brochures.htm**
**Address: 3225 National Parks Highway, Carlsbad, New Mexico 88220**

## RESOURCE NEWS

**NEW OFFICE LOCATIONS –** With the removal of the west pod of 3-bedroom Mission 66 apartments imminent, several RS&S offices have been relocated to make way for seasonal and volunteer housing. The Division Chief's new office location is within Building 61, just one door over from the old office in Building 60. Building 61 continues to house the Cultural Resource Office and the park's GIS office. The

Cave Resources Office has been completely removed from Building 58 and relocated to Building 60.

**REPLACING THE WOODEN BARRIER IN LEFT-HAND TUNNEL –** Work has begun on replacing the wooden barrier that keeps the casual visitor from wandering out of the Underground Concessions area into the recesses of Left-Hand Tunnel in Carlsbad Cavern. This barrier is mostly made of solid panels of wood and is being replaced by a stainless steel barred fence and gate. The new structure will not degrade into the cave and will allow air currents in the area to return to a more natural condition.

A new stainless steel barrier starting to take shape. (NPS Photo by Dale Pate)

**COMMENTS ON ARTICLE FROM C&C 40 –** The following was received from Lee Skinner after reading the article ***A New Miracle Mile at Carlsbad Caverns*** by John Barnett. Thanks to Lee for the information.

"*I enjoyed the Guadalupe Room article in issue #40 of Canyons and Caves. I was 3rd to see the Guadalupe Room on the discovery date and Pete Lindsley was 4th in the survey team. I was also the one who gave the room its name. Bob Willis at first thought the he had re-entered the Main Corridor, until he noticed that he couldn't see the trail!*"

## LAGOON ROAD HYDROSEEDING CONTRACT ASSESSMENT

**Steve Ross, Biological Science Technician**

**NPS photographs by Steve Ross except where noted**

On June 23 and June 24, 2009 a CAVE revegetation contract for hydroseeding of native grasses was completed. Hydroseeding commonly involves the application of seed in an aqueous solution followed by an application of mulch. The contract involved hydroseeding a narrow, linear disturbance that was created during recent installation of the CAVE sewer line. Some hand broadcasting of seed was necessary along a steep (escarpment) portion of the sewer line disturbance. The location of these seeding projects is shown in figure 1.

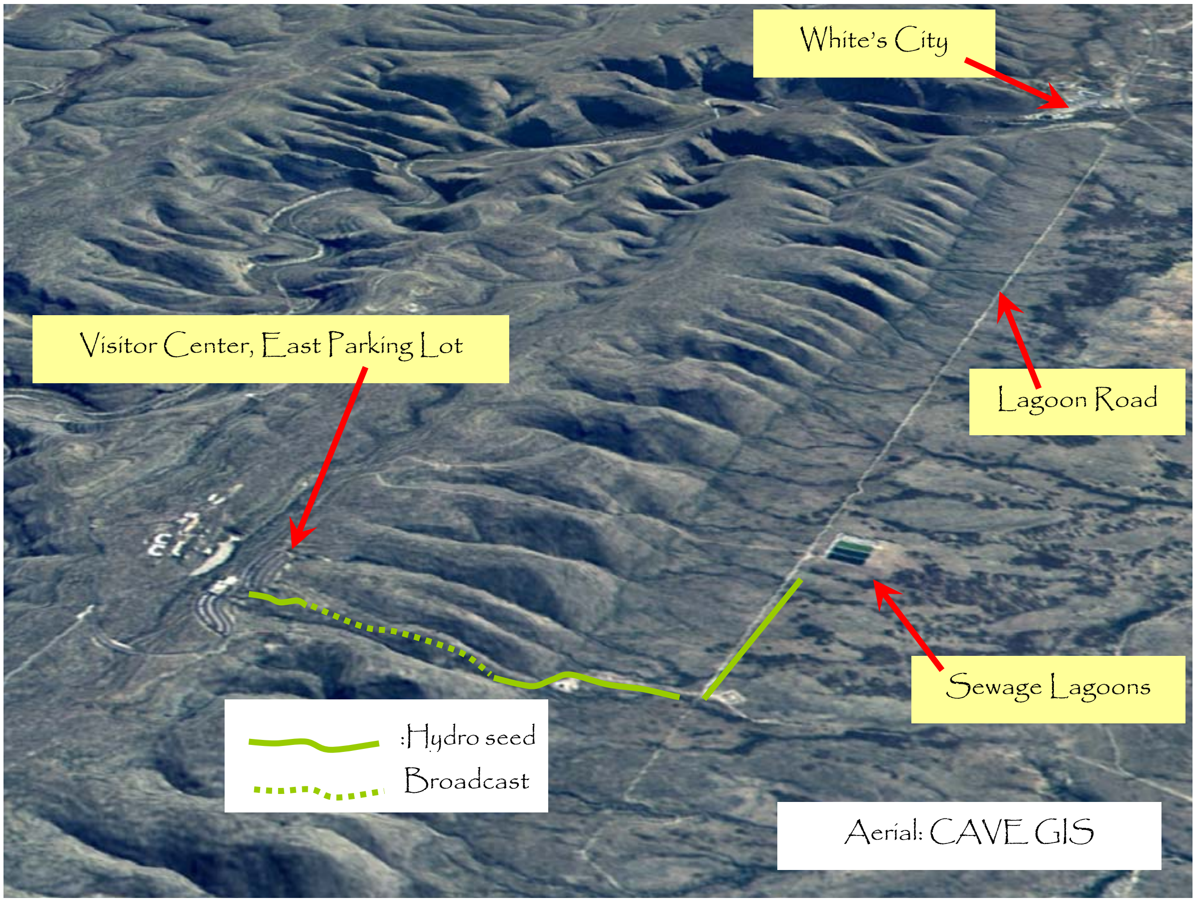



Figure 1: Location of sewer line seeding projects.

**CONDITIONS JUST PRIOR TO COMMENCEMENT OF THE SEEDING CONTRACT**

It was noticed that significant regeneration of native grasses and some native forbs had taken place prior to the scheduled seeding contract. Figures 2-5 provide documentation of pre-contract native grass regeneration.


Figure 2: Looking east - Lagoon Road disturbance on January 23, 2008.
(NPS Photo by Meredith Gosejohan)

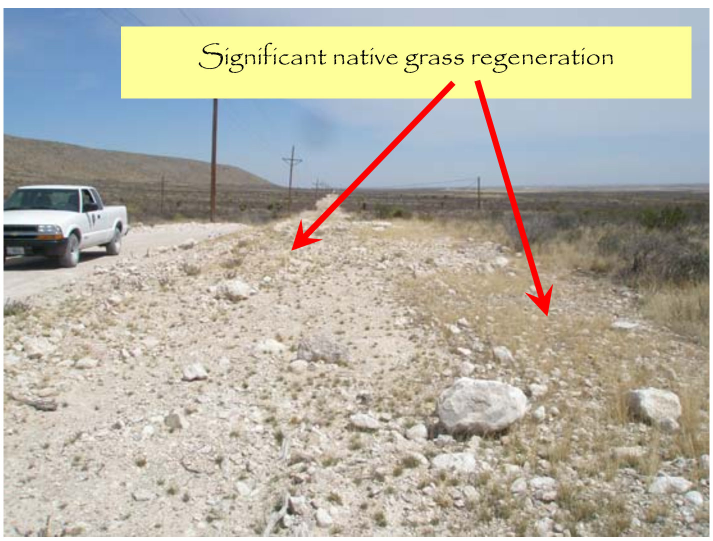



Figure 3: Looking east - Lagoon Road disturbance on March 23, 2009.
(NPS Photo by Meredith Gosejohan)

| DATE | Precip. |
|---|---|
| 6/25/2009 | 0.01 |
| 6/27/2009 | 0.1 |
| 6/28/2009 | 0.07 |
| 6/30/2009 | 0.07 |
| 7/4/2009 | 0.62 |
| 7/5/2009 | 0.14 |
| 7/6/2009 | 0.53 |
| 7/7/2009 | 0.12 |
| Total: | 1.66 in. |

Figure 6: Rainfall data from immediately after the seeding.

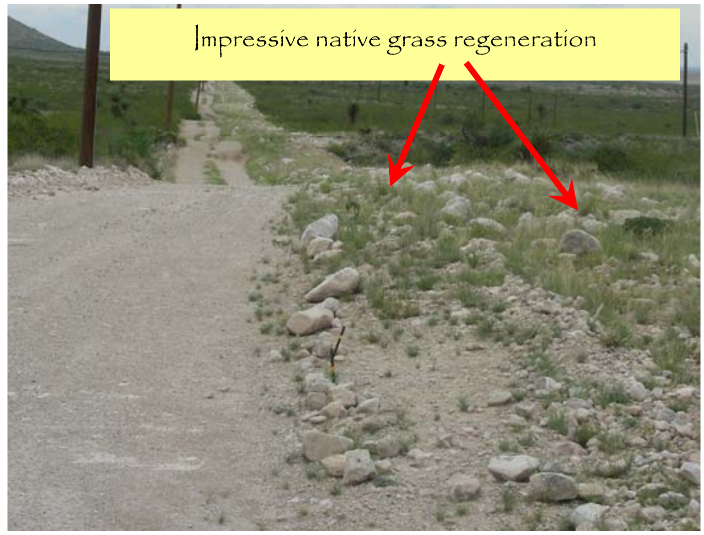



Figure 4: Looking east - Lagoon Road disturbance on June 17, 2009.

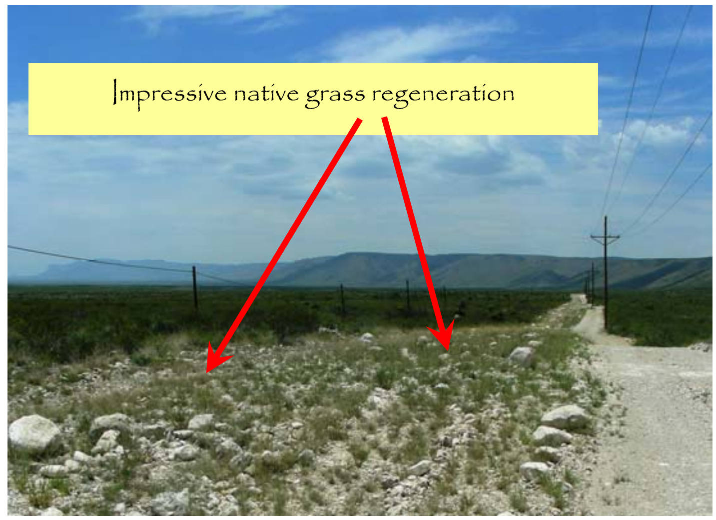
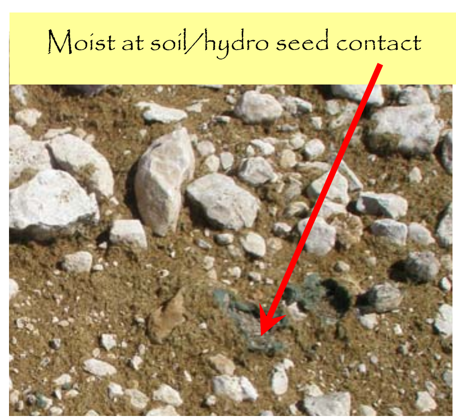



Figure 5: Looking west - Lagoon Road disturbance on June 17, 2009.

**CONDITIONS 17 DAYS AFTER SEEDING CONTRACT**

On July 11, 2009 a number of observations were made by Steve Ross and Shelly Tucker along a traverse from the Visitor Center parking lot to the water system pump house (base of escarpment/terminus of Lagoon Road). Moisture associated with the hydroseed application was supplemented by natural rainfall (Fig. 6) and provided favorable conditions in at least one factor of the germination equation – a moist seed bed (Fig. 7).

Figure 7: Hydroseed conditions on July 11, 2009.



In fact, a few grass seedlings had germinated and were seemingly vigorous (Fig. 8). Further investigation revealed a concern with varying thickness (from ½ inch to over 4 inches) of organic mulch applied atop the hydroseed mixture. Additionally, the distribution of hydroseed mixture and mulch was discontinuous due to the presence of numerous rock fragments at the soil surface throughout the seeding areas (Fig. 9).

Figure 8: Germinated grass seed on July 11, 2009.


Figure 9: Hydroseed conditions as of July 11, 2009.

Mulch may have become redistributed during rainfall events following the hydroseeding although this supposition is not supported by continued existence of mulch atop rock fragments in adjacent areas. In any event, varying mulch thickness/distribution may be less of a concern to germination than is well-spaced rainfall events and seed-soil contact.

**CONDITIONS 35 DAYS AFTER SEEDING CONTRACT**

On July 29, 2009 additional observations were made by Steve Ross. Near the visitor center parking lot the germinated grass seedlings observed on July 11 were no longer visible (presumed mortalities), no new grass seedlings were observed and the mulch – no matter the thickness - was dry. The soil at the mulch-soil contact was also quite dry. The site appeared largely as it did on July 11 (Fig. 9).

The hydroseed area east of the water supply pump house appeared much like the area mentioned above. No grass seedlings were found (Fig. 10), the mulch and the soil below the mulch-soil contact was dry (Fig. 11) and the soil, in general, had a surface crust (Fig. 11).


Figure 10: Hydroseed Conditions as of July 29, 2009.

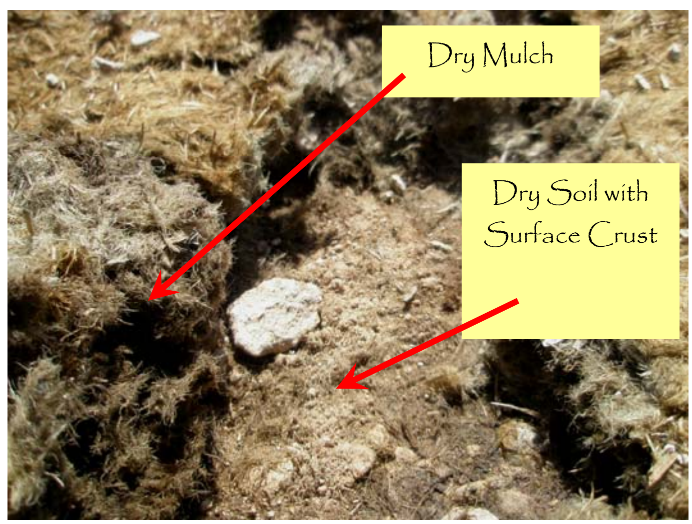



Figure 11: Hydroseed conditions as of July 29, 2009.

The section of sewer line disturbance along the more E-W oriented portion of Lagoon Road was mulched more lightly than the two just-discussed areas. This section had experienced the densest regeneration of native grasses prior to the hydroseeding (Fig. 5) and it was therefore decided that a heavy mulch application should be avoided (so as to avoid possible smothering of these already-existing grasses).

Several observations along this approximately 1 mile of section yielded no sign of post-hydroseed grass germination even in areas of natural water accumulation.

### CONDITIONS 90 DAYS AFTER SEEDING CONTRACT

On September 22, 2009 a number of observations were made by Steve Ross and Pat Wharton along a traverse from the visitor center parking lot to the water system pump house (base of escarpment/terminus of Lagoon Road). No evidence of germinated grasses from the hydroseed contract of June 23/24 were observed. The native grasses that had become well established prior to the contract were thriving and had produced seed.

### COMMENTARY

Initial signs of relative success of this hydroseeding contract include good post-seeding rainfall and some early germination. While it has more recently been noted that those early seedlings as well as any subsequent germinated seeds are absent it is also true that the vicinity has received encouraging rainfall (totals and distribution – Fig. 12) and that dormant seed may germinate later on. Additionally, upcoming over-winter freeze-thaw cycles (though not entirely predictable or frequent) may “frost-in” seed that may then germinate during the next growing season. Empirical evidence alone – our observations of impressive natural germination of native grasses on these disturbed sites – indicates that the applied seed itself may well germinate despite (rather than due to) the hydro seed media and mulch.

| | |
|---|---|
| 6/25/2009 | 0.01 |
| 6/27/2009 | 0.1 |
| 6/28/2009 | 0.07 |
| 6/30/2009 | 0.07 |
| 7/4/2009 | 0.62 |
| 7/5/2009 | 0.14 |
| 7/6/2009 | 0.53 |
| 7/7/2009 | 0.12 |
| 7/18/2009 | 0.02 |
| 7/21/2009 | 0.04 |
| 7/22/2009 | 2.14 |
| 7/28/2009 | 0.05 |
| 7/30/2009 | 2.25 |
| 8/15/2009 | 0.01 |
| 8/18/2009 | 0.03 |
| 8/24/2009 | 0.17 |
| 8/25/2009 | 0.34 |
| 9/3/2009 | 0.07 |
| 9/7/2009 | 0.03 |
| 9/9/2009 | 0.62 |
| 9/12/2009 | 0.04 |
| 9/14/2009 | 0.18 |
| Total: | 11.75 |

Figure 12: Rainfall data

### THE NEED FOR ON-GOING OBSERVATIONS AND DOCUMENTATION

On-going observations will reveal the ultimate success or failure of this sort of seeding at CAVE. It is acknowledged that hydroseeding is not recommended for areas such as ours that receive annual rainfall of less than 20 inches (Greg Fenchel, Los Lunas Plant Materials Center, personal communication and Colorado Department of Natural Resources, 1998). It is also noted that hydroseeding does not necessarily ensure the good seed-soil contact that is particularly important to successful native grass seed germination in the Chihuahuan Desert. We therefore have an interesting case study on a number of counts and should take this opportunity to fully observe and document our outcomes in the spirit of making the best decisions possible on similar future projects at CAVE.

# A BRIEF CULTURAL HISTORY OF CARLSBAD CAVERNS NATIONAL PARK, EDDY COUNTY, SOUTHEAST NEW MEXICO.

***David W. Kayser***
(Modified September 23, 2009)

**Brief Cultural History:** For more than 10,000 years, people have passed through, lived in, and worked in the eastern Guadalupe Mountains. Cultural resources at Carlsbad Caverns National Park include prehistoric and historic archeological resources, historic structures and features, districts, landscapes, and ethnographic resources. In the mountains, plains, and canyons, materials have been found denoting the presence of ancient Paleo-Indian cultures. Ample evidence is found in the caves, rock shelters, and canyons of people from the Archaic and Late Prehistoric periods. During historic times the Guadalupe Mountains were the well known homeland of the Mescalero Apache people. Other Native American peoples of the historic period also are known to have used the Guadalupes at certain times for various purposes. Early Spanish explorers traversed the area during the 16$^{th}$ and 17$^{th}$ Centuries. Other Euro-Americans of later Spanish and Mexican Periods also passed through or very near the area. A major 18$^{th}$ and 19$^{th}$ Century road from El Paso to San Antonio and other locations lies just to the south of the park. Anglo-American settlers began moving into the area in the late 1800's, established farms and ranches in the canyons, and at the base of the Guadalupe escarpment. The early 20$^{th}$ century brought guano miners to the area's caves and the establishment of a major National Park and the development of the surrounding area.

Archeological sites and certain natural features also have sacred and historic meaning for contemporary Indian peoples. Both the Mescalero Apache and the Ysleta del Sur Pueblo view much of the park landscape as spiritually active, containing certain sites and natural features that are vital to the continuation of their religions. Although the Apache left few traces on the landscape the remains of their mescal pits and camps show a long association with this area. Apache groups most likely created some of the pictographs in the park. The Ysleta have traditionally visited neighboring mountains and deserts to gather medicinal herbs, and they also express a strong affinity for the pictographs at Carlsbad.

There are some 250 archeological sites recorded for some 4000 acres (ca. 10 %) of the ca. 46000 acre park. Most of the acreage inventoried conforms to modern intensive survey standards. Much of the site information, recorded in the 1950s and 1960s, has poor locational data and very limited detail and usefulness. It is expected that future systematic surveys will locate many more sites, increasing scientific data available to the park for resource management, research, interpretive programs, and ethnographic associations.

Many prehistoric sites in the Guadalupe Mountains and Escarpment area have been damaged or destroyed by bioturbation, relic hunting, vandalism, looting, cave exploration, oil and gas exploitative activities, and road building. Many of the pictograph sites are fading and damaged by spalling rock faces. The sites in the park have been more protected from man-caused damage and commercial impact, but do require identification, recording, and evaluation for proper management.

**Paleo-Indian (ca. 8000 B. C. and greater):** Prehistoric human use of the Carlsbad area dates back to at least 8,000 B.C. Two of the five significant Paleo-Indian sites in southeastern New Mexico are found in the Carlsbad area. The two sites are caves containing Pleistocene animal remains associated with hearths and early lithic tools. Local collectors and archeologists working in the sand dune areas along the Pecos River have found diagnostic Paleo-Indian artifacts. There are numerous lithic scatters across the park, and three can be directly attributed to the Paleo-Indian period as diagnostic artifacts have been found. Three basal fragments of Midland points, a late Paleo Indian projectile point type, were recently found in the park. Other Paleo Indian tools, four crescent scrapers and one blade scraper, of types associated with the Paleo Indian Clovis projectile points have also been found in the park.

**Archaic (ca. A.D. 750- 8000 B.C.):** During the Archaic period, ca. 8000 B.C. to perhaps A.D. 750, the Carlsbad area was sparsely populated by small groups most likely seasonally whose subsistence focused on gathering plants and hunting small game. Well preserved remains of their foodstuffs, household items, tools, and weapons have been discovered in the park. Some of the pictographs in the park are often associated with Archaic people. A number of Guadalupe Mountains Archaic style color pictographs have been found deep within one cave. These dark zone pictographs are extremely rare, and this cave is one of very few in North America where they have been found. The Paleolithic and Archaic sites are very significant and hold great potential for determining faunal and climatic change in the region. Additionally, the sites should provide insights into a poorly known period of early human history in the region.

**Late Prehistoric or Ceramic Period (ca. A.D. 750-1450):** Between A.D. 750 and 1450, people occupying this area are generally classified as culturally reflecting an eastern extension of the Jornada branch of the Mogollon. Other researchers (Wiseman per.com.; Katzs per. com.; Kayser n.d.; others) see this area as a cultural interface amidst the Southern Plains, Trans-Pecos, Northern Chihuahua cultures, and Jornada Mogollon groups. Elements of all or any combination of these cultures may be present at a site. Ceramics do suggest that the people participated in a trade network outside of the local area. Other data indicated that they employed a mixed subsistence strategy of hunting, gathering, and riverine agriculture. Remains left by these prehistoric groups include lithic and ceramic scatters, sites in caves, ring middens, and open campsites that may represent special activity areas or seasonal use, and possible habitation sites and villages. Pictographs of this period appear in a number of areas, and some are among the most elaborate and well preserved in the Southwest. Ring middens make up perhaps two-thirds of the sites within the park. Ring middens (also known as midden circles, sotol pits, or mescal pits) are doughnut-shaped structures of burned rock, ash, and occupational debris. Some ring middens have subsurface cooking pits. Others do not. There is considerable variation in these sites, and they present a complicated problem concerning their use, age, and origins (Greer 1965). However, it is generally assumed that their major use was in roasting and preparing mescal plants (agave) or sotol bulbs for food.

**Apache (ca. A.D. 1550-1880):** Spanish conquistadors reported numerous pueblo-dwelling groups along the middle Rio Grande including Isleta Pueblo in the mid-1500s. In the Pueblo Revolt of 1680, residents of this pueblo either fled to or were forcibly removed to the El Paso area, where the community now known as Ysleta del Sur was formed. This group has strong ties with areas in the Guadalupe Mountains and Carlsbad Caverns. Historic records document that the Seven Rivers Apaches were occupying areas from the Pecos River to the Guadalupe Mountains during the mid-1600s, 1700s, and 1800s. By the mid-1700s the Apache were raiding Old Mexico settlements while fighting the Spanish on the west and south and the Comanches on the east. In the warmer months the Mescalero Apache hunted game and raised corn in the flatlands, retiring to lowland stream drainages in the Guadalupe and adjacent highlands in the winter. In the mountains, the Apaches constructed semi-permanent rancheria villages and corrals for their horses. The Apache people used many of the natural resources found in the Guadalupe Mountains and Carlsbad Cavern areas. Several other groups including Zia Pueblo, Isleta Pueblo, Hopi, and Comanche have oral traditions telling of specific places within the park.

**Euro-American (ca. A. D. 1536- present):** Early Spanish explorers traversed the area during the 16th and 17th Centuries. Euro-Americans of later Spanish and Mexican Periods also passed through or very near the area. A major 18th and 19th Century wagon road from El Paso to eastern Texas settlements such as San Antonio lies just to the south of the park along the Black River. Another major east-to-west road along the Delaware River is still further south. A short-lived peace during the latter part of the 1700s was broken by Spanish campaigns against the Apache early in the 1800s. Spanish and later Mexican soldiers entered the mountains and probably the park in search of the Apache. During the mid to late 1800s, numerous American military expeditions mounted all-out campaigns against the Mescalero Apache. The American soldiers pursued them and destroyed their food supplies, weapons, and rancherias. In turn, the Apaches raided ranches for livestock and provisions, disappearing into the Guadalupe Mountains when pursued. During the Civil War, General Carelton promoted a policy of total extermination of the Indians. Eventually the Mescalero were forced onto reservations. There are some indications that skirmishes between the U.S. military and the Mescalero Apache during the 1860s may have occurred in canyons within or close to the park.

Texas cattle drovers established trails such as the Slaughter cattle trail during the 1860s. Many open-range cattle camps are found across the area. Drought, overgrazing, fencing, and the railroad marked the transition from open range to homesteads in the 1880s. The Henry H. Harrison and Washington Ranch at Rattlesnake Springs are good examples of the Homestead Era. Both ranches used ditch irrigation systems and earthen water tanks for orchards, cropland, and cattle and goat pasture. Numerous remains of other homesteads and water control systems are found throughout the park generally near spring water sources. Henry Harrison, who homesteaded Rattlesnake Springs in 1880 developed the spring, built an irrigation system for his fields, constructed an adobe home, and planted trees and orchards. The system still functions today.

The early part of the 20th century in the park area was the period of extensive guano mining. Many thousands of tons of fertilizer were removed from several of the caves. The history of guano mining in this region is superbly illustrated by well-preserved historic artifacts and features such as a partially completed mine tunnel and well-preserved machinery found in one cave complex. A significant extensive historic archeological site of the guano mining industry surrounds one entrance to one cave.

Area homesteaders in the 1880s called Carlsbad Caverns the "Bat Cave". At the turn of the century, explorer Jim White built trails, ladders, and other facilities to help visitors experience "Bat Cave". White also guided visitors through the dark passages to the magnificent rooms and formations by lantern light. In the 1920s, electrical lighting and access into the cave were improved resulting in a proliferation of schemes to encourage even more tourists.

Most development at the caverns since 1926 has been focused on tourism. In the early years the guides stayed in an assortment of tents and tarpaper shacks adjacent to the cavern entrance. In the late 1920s and early 1930s, the Rangers built sturdy limestone structures in the Pueblo architectural style on the north slope of Bat Cave Draw. A building contractor added the finely crafted limestone Superintendents Building and elevator shaft house in the mid 1930s. The CCC constructed solid adobe residencies and other buildings in the late 1930s and early 1940s. Other building were added or remodeled during the 1960s.

The National Park Service acquired Rattlesnake Springs in 1934 for the water rights of the springs. The spring area was subsequently developed by the Civilian Conservation Corps and later used by the military during World War II as a recreational rest camp. More recently, the Park Service further developed the springs area, pond, and ditches, by building a pumphouse, an adobe residence, and managing the vegetation.

**Previous Research:** Summaries of archeological research conducted in the Guadalupe Mountains of southeastern New Mexico can be found in Burns (1967), Riches (1970), Applegarth (1976), Aivazian (1978), Katz (1978), Wilson (1984), Roney (1985), Sebastian and Larralde (1989), Katz and Katz (1994), and Haecker (1994).

Regional archeological investigations began in the late 1920s and early 1930s (Howard 1930 and 1932, Mera 1938, and Roberts 1929). These were general surveys and covered the southern Guadalupe Mountains. Howard and Roberts removed numerous well-preserved perishable articles from caves along the escarpment. Howard reportedly also found Pleistocene mammal bone in association with a possible Folsom spear point. Ayers (1936) described the 1934 excavations at one in the Guadalupe Mountains as uncovering considerable cultural and faunal materials. The upper deposits contained much perishable cultural material. Lower deposits contained a high percentage of extinct mammal remains. Burnet and Bohannan (1937) describe a reconnaissance of cave sites in the Guadalupe Mountains and gave detailed information on what was found in the caves. Ferdon (1946) encountered a hearth associated with extinct mammal remains. Mera (1938) reported on both caves and open sites such as the ubiquitous mescal roasting pits and assumed that cave deposits and mescal pits reflected seasonal occupations. Other investigations done between 1920 and 1960 generally focused on individual sites (Bradley 1959). Spangle et al. (1959) conducted a preliminary survey of the park-, identifying several basic site types, cooking pits, rock shelters, caves, and pictograph areas. Early work selected and focused upon dry rockshelters rich in perishable artifacts resulting in descriptive reports which established material culture baseline data but only a very limited chronological framework for the area. Mera (1938) conducted an archeological reconnaissance of the area and described open sites in the general region of the park. Excavations at one cave (Ferdon 1946) were the first in the region to be conducted stratigraphically. The major accomplishment of the early research was perishable material culture description, and the association of human artifacts with extinct megafauna. In 1948, Lehmer published a synthesis of the prehistoric archeological Jornada Mogollon culture of the area west and south of, but did not include the Guadalupe Mountains. Many researchers, however, noted numerous parallels between the Jornada Mogollon and archeological materials in southeastern New Mexico (Corley 1965). Renewed interest allowed (Spangle et al 1959) to record the majority of sites now known in Carlsbad Caverns National Park. The National Park Service also conducted limited test excavations in a large rockshelter in the Guadalupe Mountains (Gebhardt 1962). In 1965, Greer (1966) conducted a reconnaissance type survey and limited test excavations at a few sites in the park. Sites were recorded, artifacts collected, and several ring middens tested by controlled excavation at several sites. Greer continued to investigate and published a series of papers on midden features (Greer 1967, 1968, 1969, 1975). Burns (1967) summarized the work of others and his own in the Carlsbad area including much local folklore concerning the archeology. National Park Service archeologists excavated another cave (Schroeder 1983) recovering considerable cultural material and climatic data from the Archaic Period. In the 1970s, basic inventory work was concentrated in the Guadalupe Mountains National Park.

The Texas Archeological Society began an extensive inventory in the park (Shafer 1970), and continued by P. Katz and S. Katz (1974, 1979) and Katz (1978). Data from the projects, (Katz and Katz 1974; P. Katz 1978) helped to develop a usable chronological sequence based on projectile points. Other researchers (Runyan 1970; Phelps 1974) identified and refined the ceramic sequence. Goodell (1972) analyzed and described the lithics collected during the surveys. Clark (1974) described the rock art in the area. Ice (1974), using students from the Texas Tech Archaeological Field School, conducted surveys along two short highway alignments and located 6 sites. Clark (1974) and Bilbo and Sutherland (1975) investigated, recorded, and interpreted rock art in the Guadalupes. Aivazian (1978) examined the distribution of ring middens in the mountains. Much data and documentation of surface material culture, including burned rock features was collected. Combined, the projects contributed substantial information and allowed the development of a regional chronological sequence. Other research (Riches 1970; Applegarth 1976) concentrated on rockshelters and ring middens. Applegarth (1976) investigated, evaluated, and reported on Archaic and Ceramic components investigated by local amateur groups. Faunal materials from those sites provided useful data on prehistoric subsistence within the region. Initial survey investigation at Brantley Dam Reservoir, on the Pecos River north of Carlsbad, resulted in substantial information (Bousman 1974). Henderson (1976) developed an ethnographically derived subsistence model based on the Mescalero Apache. Further site evaluation and excavations within the Brantley Dam area by Gallagher (1979) resulted in elaboration and modification of the models. Other projects in the Guadalupe Mountains involved sites threatened by development. Beckett et al. (1977), provides detailed descriptions of lithic artifacts from two small lithic procurement sites. P. Katz (1978) reports excavations and radiocarbon dates from a ring midden site in the Guadalupe Mountains. Nordby (1978) inventoried a series of burn plots, part of a nature trail, and a backcountry campsite in the two parks. He included observations and recommendations for testing the effects of controlled burns on cultural resources specific to the parks. Most reports from the Guadalupe Mountains continue to be descriptive in nature. However, Katz and Katz (1974; 1979) present chronological interpretations and Henderson (1976) offered models of subsistence, internal site structure, and site typology. Roney (1985), focusing on the prehistory of upper Rocky Arroyo, Carlsbad Caverns National Park, presents a relative chronological sequence of projectile points and hypothesizes prehistoric subsistence-settlement patterns in this sub-region. Cave excavations by Roney (1985) provided a radiocarbon sequence of dates for projectile point styles spanning the past 3,000 years. During the late 1980s and early 1990s several researchers (Bilbo 1991, 1993, 1995) continued to focus upon the rock art of the region. Haecker (1994) conducted limited testing of a rock ring midden at a site within Carlsbad Caverns National Park. The site adjacent to the visitor center parking lot was in the path of proposed construction activities. Haecker in 1997, 1998, and 1999 also conducted and directed intensive archeological inventories of substantial areas of the park before controlled vegetation burning and will be reported upon in the near future. Kayser and Denny (1998) recorded 2 sites in the area of potential affect of proposed small projects. Wilcox (1998) conducted an inventory and located 16 sites along a project corridor. Wilcox (1999) also inventoried the 80 acres of the separate Rattlesnake Springs section of the park and identified 12 sites. Pecos Archaeological Consultants (Hunt and Martin 1999) intensely inventoried the 110 acres of the Visitor Center and Caverns Historic District Development Concept Plan area located and/or reconfirmed 19 sites. An inventory of an existing road 100 foot wide corridor (Kayser 1999; Kayser and Denny 2000) relocated 8 sites and identified 3 new sites. A Volunteer-In-Park (Kibler 2000) identified a new site along the eastern boundary fence. Another site on the mesa top (MacVaugh 2000) was identified by Surface Resource specialists and recorded by the Cultural Resource Branch of the park. In the spring of 2002 Lone Mountain Archaeological Services, Inc. conducted baseline inventories of five corridors along existing trails or roads and recorded sixteen locations (per.com. Thoras Dye). Specialists from the Resource Stewardship and Science Division at the park also recorded four locations of cultural resources in the spring of 2002. Almost all the sites recently recorded were classified as having plant processing functions. Most of the recent archeological studies at Carlsbad Caverns National Park have been National Historic Preservation Act Section 106 compliance driven inventory. As of mid 2009, approximately 10% of the total area of Carlsbad Caverns National Park has been inventoried and over 100 archeological sites considered eligible to the National Register of Historic Places identified and accurately located by modern GPS units.

**Paleontological Resources:** The Park has significant paleontological resources, including Permian-age limestone reef fossils and extinct Pleistocene-era animal remains. Permian-age fossils, 200-225 million years old, are found in limestone exposures in the caves and canyons. The slightly corrosive nature of the cave air dissolves the softer limestone, leaving highly etched bas-reliefs of gastropods, sponges, calcareous algae, and other Permian fossils forming some of the most beautiful exposures in the world. The Permian marine deposits are important to the park's interpretive story and provide information for scientific interpretation of biogeographic conditions on the North American continent. Pleistocene animal remains, including the large free-tailed bat, horse, camel, giant ground sloth, red wolf, dire wolf, musk ox, bison, cervids, and undetermined antelocaprids, have been found in several of the park caves. It is likely that most of the park's caves were open during the Pleistocene, creating excellent places for animal shelter and conditions for the preservation of now extinct species. Significant paleontological deposits, have been found on adjacent USFS and BLM lands. This suggests that the paleontological deposits in caves and shelters within the park may have significant fossil depth, conceivably containing species predating the Pleistocene. The park's paleontological remains are exceptional resources and provide unexcelled research opportunities.

For staff, this document can be found in the following location on the park network: **P:\Resources Stewardship and Science\CAVE CULTURAL RESOURCES UPDATED FOR FY 2008\A BRIEF CULTURAL HISTORY.doc**