



CANYONS & CAVES

A Newsletter from the Resources Stewardship & Science Division

Issue No. 31

Winter 2003



Initially released in New Mexico as a game animal, the first Barbary sheep was spotted in Carlsbad Caverns National Park in 1959. An article on Barbary sheep in the park by Donna Laing starts on page 3. This photo was taken on February 16, 2000 in the Slaughter Canyon area. (NPS Photo by Dale Pate)

Edited by Dale L. Pate
Proofreading: Paula Bauer

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Look for Issues of *Canyons & Caves* at the following websites:
<http://www.nps.gov/cave/pub-pdf.htm> Thanks to Kelly Thomas and Bridget Einfeldt all issues can be downloaded as a PDF file from the park website.
<http://www.caver.net/> Once there, go to the Canyons & Caves icon. Bill Bentley has placed all issues on his personal website and can also be downloaded as PDF files.

Address: 3225 National Parks Highway, Carlsbad, New Mexico 88220

RESOURCE NEWS

CONGRATULATIONS to Chuck Barat, former Chief of the Resources Stewardship & Sciences Division. Chuck has been chosen for the newly created Deputy Superintendent position at Carlsbad Caverns National Park. Renee West and Dale Pate will share the duties of Acting Chief until a new chief is chosen and is on duty.

THE LAST OF THE COTTONWOODS – The Mission 66 program placed 12 3-bedroom apartments directly on top of Carlsbad Cavern in the early- to mid-1960s. About 15 cottonwoods trees were planted throughout the apartment area to provide shade and other benefits to the park residents. These non-native trees were water hogs and out of place on

top of the juniper and cactus-lined ridge they had been planted on. In conjunction with the Carlsbad Cavern Resource Protection Plan and in anticipation of removing the Mission 66 apartments, a decision was made to remove the cottonwoods and a few other non-native trees. The removal process was phased in over a few years to keep bird disruptions, particularly woodpeckers, to a minimum. In October 2003, the last of the cottonwoods were removed from the housing area.



A contractor removes the last cottonwood from the housing area. (NPS Photo by Dale Pate)

CHRISTMAS BIRD COUNT PRELIMINARY REPORT –

The final results for the 40th Carlsbad Caverns NP Christmas Bird Count are just in, with a total of 89 species counted. Among the unusual species reported on the December 14 count were the first-ever records for Anna's hummingbird and the non-native Eurasian collared-dove. Also unusual were 10 species of ducks, a merlin, and an orange-crowned warbler, and the fact that no one saw a northern harrier. According to compiler Steve West, this year we reported the highest-ever Caverns count numbers for several species, including wood duck, ladder-backed woodpecker, sora, Chihuahuan raven, rock wren, canyon wren, Bewick's wren, ruby-crowned kinglet, spotted towhee, northern cardinal, and the exotic house sparrow. Nearly 30 wild turkeys were counted at Washington Ranch and Rattlesnake Springs; at least 10 species of mammals were also recorded, including non-native Barbary sheep.

LONGFELLOW'S BATHTUB – The Cave Research Foundation (CRF) made great strides in their efforts to remove

mud, rocks, and other debris from Longfellow's Bathroom over the Thanksgiving 2003 holidays. This pool in the Big Room of Carlsbad Cavern had initially been partially filled with mud and debris when the trail was constructed through this area, presumably in the 1930s or before. In 1997, our maintenance staff replaced this filled area with a bridge. With some already in the pool, the amount of mud and debris increased significantly during the removal of the fill. Over the last few years as the water level have decreased from less water dripping into the pool, the CRF have been concentrating on removing mud. Though there is a ways to go, their efforts have made a big difference in how the pool looks.



CRF members, Georganne Payne, Frank Everitt, and Barbe Barker clean red mud and debris from the shallow section of Longfellow's Bathtub. (NPS Photo by Dale Pate)

WELCOME TO HILDY REISER Dr. Hildy Reiser has been selected as the National Park Service's Chihuahuan Desert Network Inventory and Monitoring Program Manager. The Chihuahuan Desert Network (CHDN) is one of 32 networks established as part of the Natural Resource Challenge to monitor critical indicators of park ecosystem health and viability. The CHDN consists of Amistad National Recreation Area, Big Bend National Park/Rio Grande Wild and Scenic River, Carlsbad Caverns National Park, Fort Davis National Historic Site, Guadalupe Mountains National Park, and White Sands National Monument.

NEW BIOLOGY STAFF – *Kelly Fuhrmann*, the most recent addition to the Biology Branch, recently transferred from Lava Beds National Monument to the Resources Science and Stewardship Division at Carlsbad Caverns National Park. Kelly began his NPS career as an SCA at Lava Beds and became the Monument's biologist with interests focused in the fields of wildlife management, wilderness management, fire management, and cave management. He received his bachelor's degree in ecology and master's degree in natural

resources management from Prescott College in Arizona. Welcome, Kelly!

In the last issue of this newsletter, we said goodbye to summer biotech *Donna Laing*. Now we're happy to have her back again. Donna is working for us this winter as a volunteer, contributing her wildlife and field expertise and her knowledge of the park. We really appreciate it, Donna!

CIVILIAN CONSERVATION CORP (CCC) – For an excellent source of information about the CCC program throughout the United States check out the following website: <http://www.cccalumni.org/index.html>

NEW MEXICO WILDLIFE LICENSE PLATE – Beginning in October 2003, New Mexico wildlife supporters can order a new license plate featuring a Gambel's Quail. Revenues generated will support the Share with Wildlife program helping "species-in-need." Species-in-need include a wide variety of wild animals—mostly non-game—bats, chipmunks, jackrabbits and other small mammals, many species of birds, lizards and snakes, and a host of others.

BARBARY SHEEP AND CARLSBAD CAVERNS NATIONAL PARK

by *Donna Laing*

Carlsbad Caverns National Park is host to a large, non-native mammal, the Barbary sheep. Clearly stated in the *General Management Plan* (1996) is the park's desire to remove this species and reintroduce the native desert bighorn sheep. For the past four decades this has been a park goal. However, Barbary sheep are *still* in the park and in *increasing* numbers. Why? How did they get here, why are they still here, why get rid of them, what management attempts were taken in the past to remove them, and what are we doing about them now? In an attempt to answer these questions, I reviewed all documents regarding the Barbary sheep issue accumulated in the biology branch office. In addition, I searched the park's archives to fill in gaps. The following is what I found out.

A BIT OF BARBARY SHEEP HISTORY

The Barbary sheep (*Ammotragus lervia*), a.k.a. aoudad, is native to North Africa. Their indigenous environment ranges from the Atlas Mountains in northwestern Africa eastwards across the arid mountains and canyons of the Sahara Desert to Egypt.⁸ This ungulate experienced a dramatic range expansion during the later half of the 1800s when individuals were captured and transported to Europe for residence in zoological gardens. From there, Barbaries immigrated to North America around 1900, also bound for zoological parks. In the United States, their spread was rapid, becoming established in zoos and private ranches throughout the country. By 1940 New Mexico hosted its own population of these North African sheep. Joe McKnight obtained surplus zoo-stock for his private game ranch in Picacho, NM. Since then wild, free-ranging populations quickly became established throughout New Mexico. First, animals from the McKnight ranch began escaping into the countryside in 1943. By 1950 the New

Mexico Department of Game and Fish (NMDGF) saw fit to introduce Barbaries into several areas in the state—thinking this drought-resistant exotic might be a desirable substitute for New Mexico's beleaguered native sheep—in areas native bighorn sheep did not inhabit or were extirpated.⁵ Closer to home, the Guadalupe Mountain population was established via the southward dispersal of annual escapees (1943–1979 and beyond?) from the aforementioned McKnight ranch located in the Hondo Valley.³ The year 1959 marks the first recorded sighting of Barbary sheep in Carlsbad Caverns National Park.



A Barbary Sheep, *Ammotragus lervia*. Photo borrowed from the Texas Parks & Wildlife Department by Glen Mills)

THE ISSUE

In a letter dated May 11, 1959, Carlsbad Caverns National Park superintendent wrote the director of the NMDGF regarding Barbary sheep. The letter states, "On May 8, 1959, an adult male Barbary sheep was observed in North Slaughter Canyon ... Since this animal is an exotic, it will be necessary to remove it from the park to comply with National Park Service conservation practices."¹ So began the Barbary sheep issue in Carlsbad Caverns National Park.

It has been the intent of Carlsbad Caverns National Park (hereafter, park) to remove Barbary sheep from parklands with the ultimate goal of reintroducing the native desert bighorn sheep (*Ovis canadensis mexicana*). The pressure to do so is

written in Park Service management policy. The National Park Service is charged by law to protect, manage, and perpetuate natural ecosystems on lands and waters within National Park System areas and to manage the resources of the system to maintain and perpetuate their inherent integrity. To carry out this mandate, current *National Park Service Management of Exotic Species* policy states that:

“All exotic plants and animal species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if 1) control is prudent and feasible, and 2) the exotic species interferes with natural processes and the perpetuation of natural features, native species or habitats.... High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controllable.”

The presence of Barbary sheep has been deemed a threat to the ecological communities and native wildlife species occurring in the park. Scientists have concluded Barbary sheep are an ecologically aggressive species based upon their rapid dispersal rate and successful colonization of virtually any rough terrain. More specifically, they are reproductively prolific, thrive on low-quality forage, and exhibit significant dietary overlap with native ungulates (i.e., mule deer and desert bighorn).⁷ While Barbaries are known to live sympatrically (i.e., occurring together) with several native North American ungulates, including the mule deer, the scientific community believes Barbary sheep would outcompete the native bighorn sheep. The Barbary sheep’s nearest ecological counterpart in North America is the desert bighorn. In addition to having greater fecundity (ability to produce offspring) and forage overlap, Barbaries could further threaten the survival of desert bighorn through parasite and disease transmission.⁶ For these reasons it is necessary to eliminate Barbaries from historic desert bighorn habitat before reintroduction efforts are initiated.



A Bighorn sheep (*Ovis canadensis*). Photo borrowed from The Smithsonian Book of North American Mammals edited by Don E. Wilson and Sue Ruff.

What happened to the park’s desert bighorn? Historically, desert bighorn occupied numerous mountain ranges in New

Mexico. During the mid-1900s and on into the 1980s, declines were noted in many populations. At present, desert bighorn have been extirpated from several areas of the state including the Guadalupe Mountains. Around the park and the rest of the Guadalupe, declines and their eventual extirpation are attributed to the expansion of large-scale domestic sheep and goat ranching operations in the 1930s, disease transmission from domestic sheep and goats, and illegal harvest.¹

BARBARY SHEEP AND PARK MANAGEMENT

The first reference mentioning the park’s concern over Barbary sheep is found in that May 11, 1959 memo. On May 13, 1959, the NMDGF director issued a permit to the park giving permission to “destroy or capture any Barbary sheep present in Carlsbad Caverns National Park” by “any method”, “Permit to remain in effect until all sheep removed from the Park.”¹ No record was found regarding what became of this single ram.

The next mention occurs in 1965 when multiple Barbary rams were seen 25 miles northwest of the park boundary. This prompted a park biologist to write, in a draft document dated August 1965, “This rapid southward movement and the favorable habitat of Carlsbad Caverns National Park makes its early immigration into the Park highly likely. This species might well thrive in the area, seriously upsetting the ecology, virtually precluding successful restoration of the native Mexican [desert] bighorn sheep.”¹ The report went on to say that an understanding with the NMDGF and U. S. Forest Service is needed regarding how far south the sheep will be allowed to extend and the means of removal to keep this exotic from extending into the park.

The paper trail ran dry at this point, not to resurface until the mid-1970s with the report of sheep seen by park ranger Robert Turner.³ Even in the 1972 Master Plan for the park (approved 1975) is there no mention of Barbary sheep. In 1977 there was a reemergence of concern regarding the imminence of a Barbary sheep population in the park. A series of memos was swapped between the park superintendent and the regional director and associate regional director. The superintendent pressed the imminent arrival or possible existence of a population of Barbary sheep in the park, potential ecological impact of the species, and need to remove them now before the issue escalates into “the need for an expensive and widely publicized offense later.”¹ The superintendent also stated the need for cooperation with the NMDGF. In return, the regional office acknowledged and concurred with the park’s concern over Barbary sheep and urged “swift and conclusive action.”¹ Regional office meetings with NMDGF resulted in the state’s support for the “immediate elimination Barbary sheep on Park Service lands” and they will “effect an intense hunt of Barbary sheep north of the park this fall [1977] in an attempt to considerably reduce the total population.”¹

The management action decided upon by the park was to locate the animals by helicopter and shoot them. In September of 1977 a helicopter reconnaissance was scheduled and four Barbary sheep were observed; due to rifle malfunction only one Barbary was shot.¹



Though out of focus, this photo shows a Barbary ram as he descends a steep canyon wall in the Slaughter Canyon area. (NPS Photo by Dale Pate)

Concurrently, in 1977, the scientific community stepped up involvement in the Barbary sheep issue. Research was ongoing, a report on *Distribution of Auodad in Southeast New Mexico* by Dr. C. D. Simpson of Texas Tech University surfaced, and research proposals were submitted. The final management pulse of '77 was found in a memo from the park's resource management specialist to the superintendent dated December 28. This document highlighted the need for gathering "hard data on their [Aoudad] potential impact" and "incorporate that data into a defensible Auodad Management Plan."¹

Park records note two Barbary sheep were killed in 1978.

Action picked up in 1979. The park continued communications with NMDGF and affirmed NMDGF's "interest and cooperation" in the removal of Barbary sheep in the Guadalupe Mountains; the park also asked for, and received, renewed written approval from the state to remove Barbaries from the park.¹ Internally, the park prepared an *Environmental Assessment* for the Barbary sheep management program, concluding removal of the sheep was desirable and the "most humane, economical, and feasible option available...is through direct reduction by shooting."¹ Though funding was insufficient for a significant reduction effort, four Barbary sheep were killed this year. NMDGF moved through the year by a) soliciting public input into proposals to remove Barbaries from the Guadalupe Mountains, b) solidifying their position on removal through a confirmed sighting of desert bighorn in the Guadalupe, and c) greatly expanding hunting opportunities in the Guadalupe in an attempt to reduce the Barbary sheep population.⁴ Meanwhile, the scientific community rallied: Texas Tech University, Lubbock, hosted a Symposium on Ecology and Management of Barbary Sheep in November.

Information was sparse concerning Barbary sheep during the 1980s, though the decade did start with a bang. On January 8, 1980, NMDGF hosted a public input meeting in Carlsbad. On

the subject of Barbary sheep, public sentiment was for totally eradicating Barbaries through increased hunting pressure. Apparently, whatever management strategies NMDGF was executing appeared to be effective and earned this comment from the park superintendent in 1985: "Thanks to your cooperation these animals have not become a significant problem yet. We appreciate your concern and help in preventing the spread of these animals into Carlsbad Caverns National Park."¹ The park made its own efforts as well; of the 12 animals reported being seen in the park in the 1980s, 4 were shot. Barbary sheep continued to show up in the park's *Resources Management Plan* (1984 and 1987) as a threat to native wildlife and must be "controlled through direct reduction by shooting."

Apparently, an escalating mountain lion issue at the time took the wind out of Barbary eradication. The 1984 *Natural Resources Management Plan* prioritized and allocated funding for various projects. Mountain lion research and management was the number one resource-programming project with \$49,000 funded in 1983 and \$55,000 allotted for 1984. At the same time, Barbary sheep management had a priority status of 22 with respective funding of \$500 and \$0.

By the 1990s, the result of the past decades of desultory management efforts was manifest. A park *Environmental Assessment* (circa 1993) revealed: "Barbary have become firmly established in the park's rugged canyons, it is extremely costly and difficult to remove them." Evidently, NMDGF's effort at reducing the Barbary population in the Guadalupe Mountains in the 1980s was not successful and opportunistic shooting by park personnel was ineffective. The last park animals removed by direct reduction occurred in January 1993, with five Barbary sheep shot. The realization that previous management efforts did not produce the desired result of eradicating Barbaries from the park sparked a change in course; the superintendent wrote to a reporter from the local newspaper, *Carlsbad Current-Argus*, in fall of 1995: "Currently we are not shooting Barbary sheep. We may in the future, but we would re-evaluate the problem before doing so."¹



Part of the Slaughter Canyon herd as they begin their descent into a canyon. (NPS Photo by Dale Pate taken on November 1, 2003.)

TODAY

Today, there is an estimated herd of 50 Barbaries in Slaughter Canyon with additional singles or pairs scattered throughout the park.¹ The park's current *Resource Management Plan* continues to maintain the aim of reducing the Barbary sheep population and desire to reintroduce desert bighorn. This document acknowledges the 1979 Barbary sheep plan was never fully carried out and is now outdated. At this time, the park's biology staff is re-evaluating the issue. A two-year study is beginning this winter to gather data to determine the distribution and abundance of Barbaries in the park, population demographics, and the effect this exotic has on water and vegetation resources. This data gathering is the preliminary step towards compliance with NEPA (National Environmental Policy Act), the country's environmental policies designed to conserve and protect our nation's resources. Since early removal efforts weren't "*swift and conclusive*" and we did not heed early warnings, the issue has escalated into that predicted "*need for an expensive and widely publicized offense later.*"¹

The process the park is entering into now could be a long one. The country's political and emotional atmosphere has changed significantly since the 1970s. The park can no longer go out and shoot Barbaries with only the blessings of NMDGF. The park must now do an in depth analysis of any proposed action that may have a significant effect on the environment. In the current political environment the "*simple*" removal of an exotic species from federal lands guided to re-establish natural functions and processes (e.g., the National Park Service) is not so easy.

The NEPA process encourages thorough evaluation of a proposed action as well as contemplation of reasonable alternatives. At first impulse, it may seem a cut and dried topic, Barbary sheep are exotic and do not belong in a national park. What would you rather see while hiking in Slaughter Canyon, a herd of North African sheep, or a herd of native desert bighorns? Unfortunately, the issue isn't this straightforward. National Park Service policy states that: "*High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controllable.*" Is it a reasonable proposition to eliminate Barbary sheep from the park? Past attempts proved unsuccessful, but could a focused, concerted effort by the park, state, and surrounding land managers and land owners be effective? Also, consider the possible subsequent reintroduction of desert bighorn; it would undoubtedly be an expensive endeavor and one that may further compromise our mountain lion population (often lion removal and bighorn reintroduction go hand in hand). Since Barbary sheep are the closest ecological counterpart to the desert bighorn, would maintaining them be so harmful (providing their numbers wouldn't exceed that of a desert bighorn population)? Obviously, the issue is complex and will require careful consideration. What will be the park's direction at the close of the NEPA process, to keep or eliminate Barbary sheep in Carlsbad Caverns National Park?



Photo of Desert Bighorn Sheep in their natural habitat (not in Carlsbad Caverns National Park) and borrowed from an article titled "Desert Bighorn Sheep" by H.E. McCutchen, National Biological Service and found at the following U.S. Geological Survey website: www.biology.usgs.gov

Thanks to Emily Buehler (CAVE Cultural Resources) for assisting in searching through the park archives and finding key references to Barbary sheep.

LITERATURE CITED

¹Carlsbad Caverns National Park archived records, also on file in the Biology offices; various documents from 1959 to 2003.

²Department of Game and Fish, New Mexico State. 1980. Memo from Andy Sandoval to Walt Snyder, April 22.

³Dickenson, T. G., and C. D. Simpson. 1979. Dispersal and establishment of Barbary sheep in the southeast New Mexico. Proceedings of the symposium on ecology and management of Barbary sheep. Department of Range and Wildlife Management, Texas Tech University, Lubbock.

⁴Morrison, B. L. 1979. History and status of Barbary sheep in New Mexico. Proceedings of the symposium on ecology and management of Barbary sheep. Department of Range and Wildlife Management, Texas Tech University, Lubbock.

⁵Ogren, H. A. 1965. Barbary sheep. New Mexico Department of Game and Fish, Santa Fe.

⁶Seegmiller, R. F., and C. D. Simpson. 1979. The Barbary sheep: some conceptual implications of competition with desert bighorn. Report to the National Park Service.

⁷Simpson, C. D., L. J. Krysl, D. B. Hampy, and G. G. Gray. 1978. The Barbary sheep: a threat to desert bighorn survival. Desert Bighorn Council 1978 Transactions.

⁸Valdez, R. No date. Auodad. New Mexico State University, Las Cruces. (Overview paper with extensive bibliography; on file in Carlsbad Caverns National Park's biology offices.)

CARLSBAD CAVERN EXPLORATION AND SURVEY SUMMARY JULY 2002-DECEMBER 2003

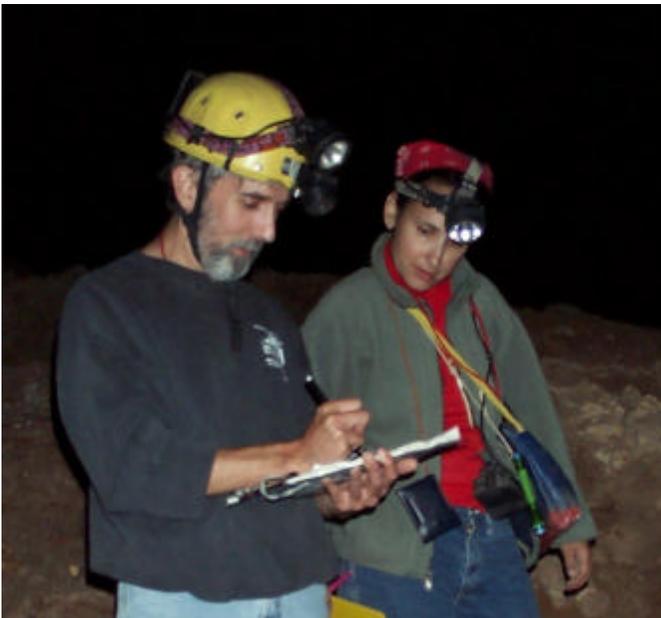
by Stan Allison

Carlsbad Cavern's official length is 30.9 miles with a depth of 1,034.8 feet. A resurvey of Carlsbad Cavern was officially started in 1995 and has accumulated a total of 23.71 miles of survey. A total of 1.42 miles of new survey was accomplished during the July 2002-December 2003 time period. Seven tenths (7/10) of a mile of additional survey were added from entering previously un-entered surveys into the database from 1993-1996.

BIG ROOM

Kathy Lankford and Dale Lankford finished their three year long effort to survey the Middle Earth area which is located under the Top of The Cross area in the Big Room. Accompanied by Jimmie Worrell and Kelly Holladay they surveyed 5 shots, 58.3 feet on a May, 2003 trip. Over the three year project they surveyed 293 shots, 4,197.7 feet in 21 trips. Stan Allison is nearly finished with a digital map of Middle Earth which was a pleasure to draw thanks to the excellent notes and data this team produced. Another five or six survey trips should complete the survey of passages associated with the Big Room.

Mike Lace recently completed a working draft of the plan view of the Big Room. This map was made using the excellent survey notes sketched on numerous evening trips by Mike and Pat Kambesis from 1998 to 2001. Pat Kambesis is in the process of digitizing Mike's working map to make the final map of the Big Room. To see the detailed working draft of the Big Room, make arrangements to drop by the Cave Resource Office where it is stored.



Mike Lace and Pat Kambesis survey in the Big Room.

LOWER CAVE

The Cave Research Foundation (CRF) continued their work in Lower Cave surveying 166 shots, 2,833.5 feet in 21 trips. At the current rate of survey, Lower Cave will probably be completely surveyed in approximately two more years. Trip participants are listed in no particular order: Kevin Glover, Kevin Justus, Lois Lyles, Frank Everitt, Barbe Barker, Sherry McClure, Tim Kohtz, Mike Dallith, John Brook, Brian Alger, Steve Heinen, Susan Alger, Greg McCarty, Jennie McDonough, Chris Beck, Chris Thornley, Jimmie Worrell, Ed Knetsch, Kelly Holladay, Meredith Turnbough, Jacqui Bills, Jim Reif, Angie Langolf and Phyllis Boneau.

LEFT HAND TUNNEL

Paul Burger coordinated 12 survey trips in Left Hand Tunnel to continue his effort to produce a final map of the entire Left Hand Tunnel area with its 6.8 miles of surveyed passages. Anchored to his drafting table by a bum knee, Paul made much progress in drafting the Left Hand Tunnel area. A nice working map of the area can be seen in his office. These 12 survey trips produced 181 shots and 2,458.4 feet of survey. The survey of Left Hand Tunnel is probably about 90% complete barring any major new discoveries. Survey participants are listed in no particular order: Paul Burger, Tracy Copp, Christa Schneider, Tom Dotter, Tish Gance, Amy Bern, Ed LaRock, Mike Behn, Evan Anderson, Darla Taylor, Stephanie Juth, Shane Fryer, Amy Bern, Christa Schneider, Tracy Copp, Jay Snow, Abby Snow and Karla Wittenburg. CRF also assisted with the following personnel working in Left Hand Tunnel: Brian Alger, Susan Alger, Greg McCarty, Kelly Holladay, Tonia Harper, Pam Masset and Kevin Glover.

NEW SECTION

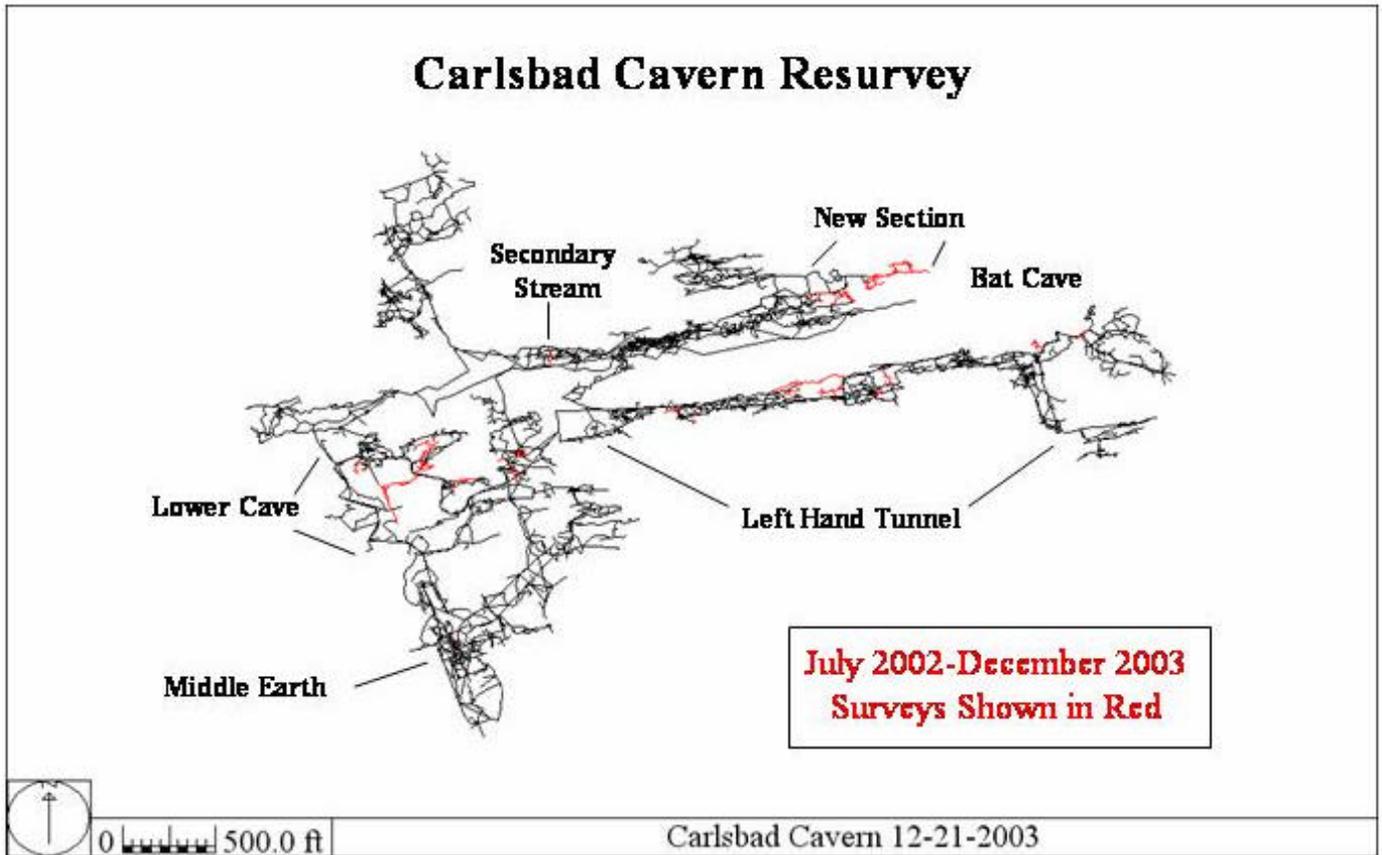
Robin Barber started leading survey trips to an area near the Hall of the White Giant in June 2003. Accompanied by Diana Tomchick, James Overfelt and Will Harris they surveyed 99 shots, 1,623.6 feet in 4 trips. Dan Montoya resumed leading trips to the F-Fissure with Deb Rivera, Blake Jordan, Sam Bono and James Overfelt producing 52 shots, 579.3 feet of survey in 2 trips. Much survey remains to be done in the New Section.

SECONDARY STREAM

Vivian Loftin, Rae Nadler-Olenick and Walter Olenick wrapped up their survey of a previously unexplored area of the Secondary Stream Passage in March 2003. They surveyed 11 stations, 116.9 feet in a single trip. The area they discovered in 2001 resulted in 830.9 feet of virgin cave survey. This is the largest new discovery in Carlsbad Cavern since the mid 1990s and seems to be completely explored.

BAT CAVE

Paul Burger and Stan Allison continued their survey of Bat Cave on two survey trips in December 2003. A total of 11 shots and 742.7 feet of survey was accomplished. 1, 447.7 feet have been surveyed in Bat Cave to date and it appears that the Bat Cave survey is at the halfway mark.



Map produced using COMPASS and PowerPoint software
Stan Allison

NPS MISSION AIDED BY PARK VOLUNTEER PEGGY JUSTICE

by Bob Hoff

Peggy Justice began her National Park Service career as a Clerk Typist (Cashier) on September 21, 1961. During her 34-year NPS career, she served in a number of positions at the caverns, each with increasing responsibility: Clerk Steno, Administrative Clerk, Personnel Assistant, and Personnel Management Specialist. When she retired from the Carlsbad Caverns National Park (CAVE) personnel office on December 31, 1995, Peggy turned her dedication, discipline, and work ethic for the National Park Service into another avenue (or perhaps, more appropriately, "down memory lane"). She became a CAVE Volunteer-in-the-Parks volunteer, working with the Park Historian (me), and with others, in the Cultural Resources branch of the Division of Resource Stewardship and Science at the caverns.

Since she wanted to work at home, I asked Peggy to type some historical resources onto disks so that the valuable historical information would be computer-accessible. Peggy was eminently qualified to do this work, combining her eye for

detail, her ability to accomplish long tasks, her personal knowledge of CAVE history, and her excellent proofreading skills. The advantages for having computerized primary historical resources are several. For starters, other researchers, interested readers, park ranger interpreters, and I can find the location of needed specific information by using keyword searches to scan the contents of historic documents. Keyword searches are so much quicker and more efficient than using the pre-computer traditional technology of "thumbing through an historical document," hoping to catch sight of the needed information. Peggy's long volunteer hours at her keyboard have benefited many of us.

For me, as CAVE's park historian, another major advantage of having primary historical resources computer-accessible is that when I am answering an inquiry about CAVE history, I can "cut and paste" information from the original documents to send to the person requesting the information as actual "first-hand examples" of people and events from the past. In some cases, where copyright restrictions don't apply, I can send the whole historic document. Also, I can cut and paste historical information from original documents to use for writing a park history newsletter, or a newspaper article, or history training material for our Park Ranger Interpreters, or

for researching and preparing an historical talk. For any of us who have computer access to these original historical resources, hopefully we can help our audiences—be they readers or listeners—to better “see” history through the eyes of the people who actually participated in what they are talking about.

Over the last seven years Peggy’s typing efforts—her long and patient and productive hours at her computer keyboard—have saved time for other cultural resource employees, Park Ranger Interpreters, and me to more quickly and widely share original cultural resources information with visitors and other people. Why is it important to share our park’s cultural resources knowledge with visitors and other people? Many of us think it is important because sharing of cultural resources information (as well as the natural resources information from our other park offices—for example, geology, bats, flora, fauna, i.e. the natural environment information etc.) supports achieving the National Park Service Mission. Simply put, to help carry out the National Park Service Mission, the CAVE Cultural Resources office wants to help visitors enjoy and understand the park’s cultural and natural resources. The premises of the NPS Mission are these:

- If the visitors enjoy and understand these cultural resources, we expect that they will appreciate them.
- If the visitors appreciate these cultural resources, hopefully they will join the NPS efforts to preserve them for the enjoyment and understanding of future generations.

Peggy’s efforts in “computerizing” CAVE’s historical resource have directly helped us to better achieve the National Park Service Mission for several categories of “visitors,” (or CAVE cultural resources information “consumers”) such as the following:

- The visitors—including individuals, families, school groups, adult groups etc.—who go on the tours, hear the talks, or ask Park Ranger Interpreters cultural resource questions.
- The newly hired caverns’ Park Ranger Interpreters who enter on duty and must learn and study the park’s history in order to conduct tours, give talks, and answer visitor questions.
- The visitors who visit our park’s web site at <http://www.nps.gov/cave/home.htm>.
- The authors writing about the caverns, the college students doing term paper assignments and the parents calling or writing to get information for their children’s school assignments.

What are some of the valuable historical resources that Peggy has electronically made accessible for us so far?

- A nearly 300-page rough draft transcription of an oral history interview of an employee who served 25 years here and retired as the Management Assistant.
- Chronologies of verbatim entries, organized topically, from over 70 years of CAVE Superintendent Reports and Logs.
- The 1925 manuscript of early caverns explorer Willis T. Lee’s 1924 expedition here and his two 1920s

articles published in the *National Geographic* magazine; also the expedition diary kept by Lee’s son, Dana.

- Historic caverns Place Names file
- Some other historical articles, booklets, and short books
- A 1998 former CAVE Employee Reunion **Memory Book** for 110 employees, including biographies, pictures, layout, printing, and correspondence with the subjects, completely her own project.

Peggy’s wonderful efforts and contributions have occurred from 1996 to present as she has quietly worked behind the scenes in CAVE Cultural Resources as a steadfast, loyal, and productive employee. Part of our job in Cultural Resources is to promote interest in and enjoyment in our park’s wide and varied history and to encourage support for historical preservation so that future generations may benefit from the enjoyment, appreciation, and understanding of these resources that we hold to be dear today.

A giant tip of our Stetsons and a sincere thank you to Peggy Justice—thanks for making history sources more vivid, interesting, and convenient to access. We appreciate your efforts for the good of the many.

WHERE DO INSECTS SPEND THE WINTER?

by Renée West

How *do* insects survive winter, especially in harsh climates? One strategy is to avoid it altogether—with migration. Even though there is not a lot known about how most insects make it through winter, there are lots of interesting stories.⁷ Like most North American birds, several kinds of insects migrate seasonally. The most famous insect migration is accomplished by the monarch butterfly. Another migration example comes from those ubiquitous miller moths that pass through the Carlsbad area in late spring, migrating between their summering grounds in the high Rockies and their breeding areas in the Great Plains where they survive underground as caterpillars.

But all those mosquitoes and black flies up north in the Alaska tundra don’t migrate; they and all the others who stay have to have strategies to survive. Even here in our temperate warm desert, there are cold winter nights. Given the huge diversity of insects in the world, it’s not surprising to learn they have a wide variety of strategies for overwintering.

Different species of insects overwinter in different life stages. Some wait it out in the egg stage; some pass the winter in intermediate stages, such as nymphs, larvae, or pupae; and many hibernate as adults.⁵ [You may remember that insects mature through stages from eggs to adults through the process called metamorphosis. There are many variations on the theme, but basically, insects that go through simple metamorphosis mature through stages called instars, or nymphs. Bedbugs (remember them from the 2001 investigation of seasonal quarters?) are one such species, maturing through several instars that look a lot like the adults. Alternatively,

those insects with complete metamorphosis develop through stages called larvae and pupae. In the case of a butterfly, the larval stage is known as a caterpillar, while the pupal stage is the chrysalis or cocoon.]

Dragonflies and stoneflies live all winter as nymphs in streams and actively feed, even under a covering of ice. Insects that spend winter as larvae use various ways to keep from freezing, including burying themselves in leaf litter or soil, or having a type of 'antifreeze' (glycerol) in their bodies to replace the water.⁵ Praying mantids overwinter as eggs in those brown egg cases you sometimes see on branches and buildings. Some moths spend the winter as pupae in their cocoons. Even insects that winter as adults vary their tactics. Some find places to huddle overnight and are active during the day, like some paper wasps and butterflies.

Orchard mason bees are shiny blue-black medium-sized bees that come out in early spring and pollinate the early-flowering trees, especially fruit trees, algeritas, and redbuds. In spring, the solitary bee females lay eggs in holes and cracks in rocks and wood, even in concrete and siding on houses. Over the summer and fall, each egg inside its separate chamber matures through the stages of larva and pupa, feeding on the pollen its mother placed there. Then it matures into an adult, but instead of flying away, it goes into a dormant state in its insulated nest and survives the winter not using any energy.³

Bumblebees are social bees, but they have a very different life cycle from the large social honeybee colonies. Young bumblebee queens hatch in late summer, are fertilized by males, and overwinter in small holes in the ground that they dig for themselves. Then in spring, each queen emerges and begins to form a new colony of her own by laying the already fertilized eggs. When her worker daughters hatch, they help her gather more pollen so more eggs can be laid. Only a few new queens will survive to carry on next year.²

As you can see, bees are diverse in their approaches to winter. Within other insect groups there is also lots of variation. Not all butterflies use the same tactics or schedule. Even within a single species, there are differences depending on the climate where individuals live. The species range maps that appear in butterfly books¹ (maps that show where they live) also mention how many generations each species has per year in different locations. For example, individuals of the same species may hatch only one generation in Montana but two or three in southern New Mexico and Arizona.

And what about those Alaskan mosquitoes? As you might guess, there are several different species, and a variety of strategies. Most ride out winter as larvae or pupae, but the snow mosquito (largest of the bunch) spends winter as an adult, under the snow or leaf litter. Besides the 'antifreeze' strategy mentioned above, Alaskan insects also have a process called 'supercooling' wherein their body temperatures can go lower than the freezing point without freezing. Of course, there is a certain low temperature at which even this can't protect the insect and it will die. That's why there are so many more mosquitoes (and other insects) following mild winters than really cold ones.⁶

Even though we can't see most of them, overwintering insects are everywhere around us. If you look around, you can probably find several different insects waiting out winter, or feeding and flying on warm days. There are little white cocoons on leaves, odd brown bumps on branches -- lots of things to see if you're looking. And all that leaf litter and organic 'debris' around the bases of plants is a great harboring place for insects.⁴ They'll be back soon, playing their crucial roles in maintaining the ecosystem.

REFERENCES AND FURTHER FASCINATING READING:

¹Glassberg, Jeffrey. 2001. *Butterflies Through Binoculars: The West: A Field Guide to the Butterflies of Western North America*. Oxford University Press, New York.

²Griffin, Brian L. 1997. *Humblebee Bumblebee: The life story of the friendly bumblebees and their use by the backyard gardener*. Knox Cellars Publishing, Bellingham, WA.

³Griffin, Brian L. 1999. *The Orchard Mason Bee: The life history, biology, propagation, and use of a North American native bee*. Knox Cellars Publishing, Bellingham, WA.

⁴Grissell, Eric. 2001. *Insects and Gardens: In pursuit of a garden ecology*. Timber Press, Portland, OR.

⁵Smithsonian Encyclopedia website: www.si.edu/resource/faq/nmnh/buginfo/winter.htm

⁶University of Alaska Fairbanks Geophysical Institute website: www.gi.alaska.edu/ScienceForum/ASF8/818.html

⁷University of Illinois Extension. Home, Yard & Garden Pest newsletter: www.ag.uiuc.edu/cespubs/hyg/html/200320f.html

INVERTEBRATE NEWS by Renée West

CCNP INVERTEBRATES IN THE NEWS

Keep an eye out for mention of Carlsbad Caverns NP in the next issue of *Park Science* journal. Inside information has it that an article on invertebrates in NPS will include an item (and photo) of the new damselfly species for New Mexico that was found at Rattlesnake Springs this year by Dr. John Abbott.

BUTTERFLIES, FLIES, AND GNATS STILL ACTIVE

A warm day. Birds, flowers, butterflies. But it wasn't spring, summer, or fall. During the Caverns Christmas Bird Count (December 14, 2003), Steve and Renée West encountered a number of active insects as well as plants in flower in West Slaughter Canyon. At one memorable spot, a large red penstemon (*Penstemon cardinalis*) was in full bloom, covered with tubular red flowers. The flowers were loaded with butterflies of various species and colors, avidly digging in for the nectar. This penstemon is one normally prized by

hummingbirds during the spring breeding period. There were other areas where groups of flies buzzed and congregated on plants. Gnats hovered around the birders' faces much of the afternoon. The Wests also saw flowers on Apache plume (*Fallugia paradoxa*), green sprangletop grass (*Leptochloa dubia*), blue grama grass (*Bouteloua gracilis*), rabbitbrush (*Isocoma* sp.), dogweed (*Dyssodia* sp.), and several other species. We're not sure why there's so much flowering, but Renée's theory is that the extremely dry summer combined with a warm winter have delayed flowering for many plants. It's good to see that there are at least some insect pollinators still active for the flowers that need them.

AGING LADDERS ON THE ROUTE TO THE NEW MEXICO ROOM

by Tom Bemis

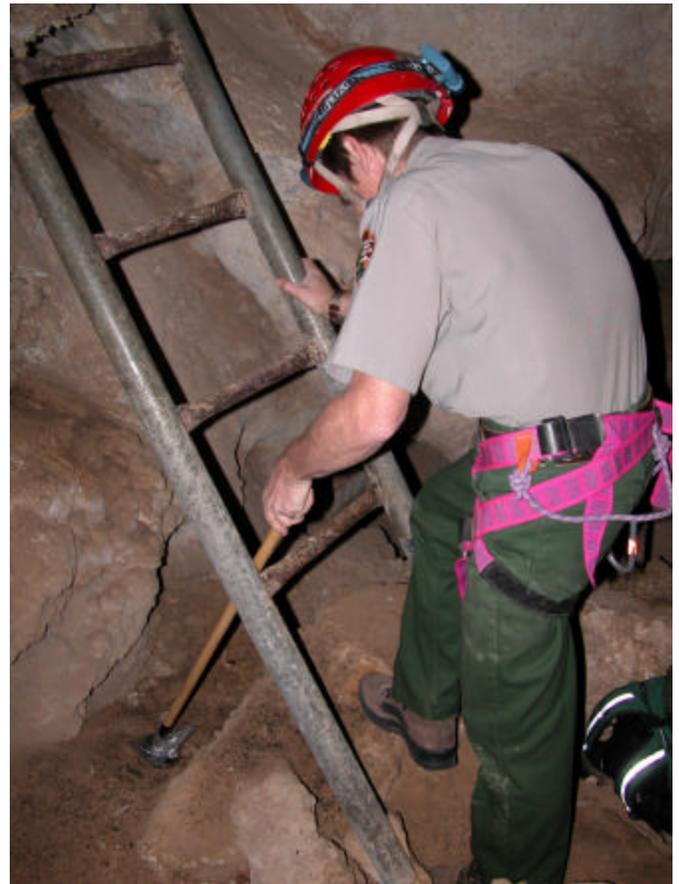
Galvanized pipe ladders that have provided easy access to the New Mexico Room in Carlsbad Cavern for decades have been rusting, depositing large quantities of rust on the cavern floor beneath the ladders. Plans are currently underway to evaluate the corroded ladders and through the compliance process, replace or remove them. Our recommendation to the compliance team will be to replace them with stainless steel ladders. Ladders that are made of stainless steel would resist the corrosive nature of the cave environment and still provide relatively easy access to the New Mexico Room.

The problem of removing the piles of rust beneath the ladders had remained, however. This problem has been solved by using a long-handled magnet to selectively pick up only the iron particles, while leaving the natural cave materials behind.



Old rusting ladder rungs were dumping pounds of rust on cave floors. In addition, old surface dyed webbing, used to hold the ladders in place, was staining the walls and formations. The webbing was replaced with white webbing and the stained surfaces were cleaned with bleach, removing all signs of the dye. NPS photo by Tom Bemis

Two trips, a strong magnet, two plastic bags, and about an hour of work were all that was required for the removal of well over two pounds of rust from the floor beneath aging ladders.



Cave technician Tom Bemis found that a long handled magnet inside a zip-lock bag proved quite effective in removing rust particles from the cave floor beneath the ladders. NPS photo by Jason Richards



Volunteer Nate Skelton assists Tom Bemis in collecting the rust. The magnet was enclosed inside a plastic bag. Inserting the bag into another bag and withdrawing the magnet emptied the rust particles into the second bag while keeping the magnet clean. NPS photo by Jason Richards.

The NPS thanks volunteers Nate Skelton and Aaron Stockton for their help in this project.