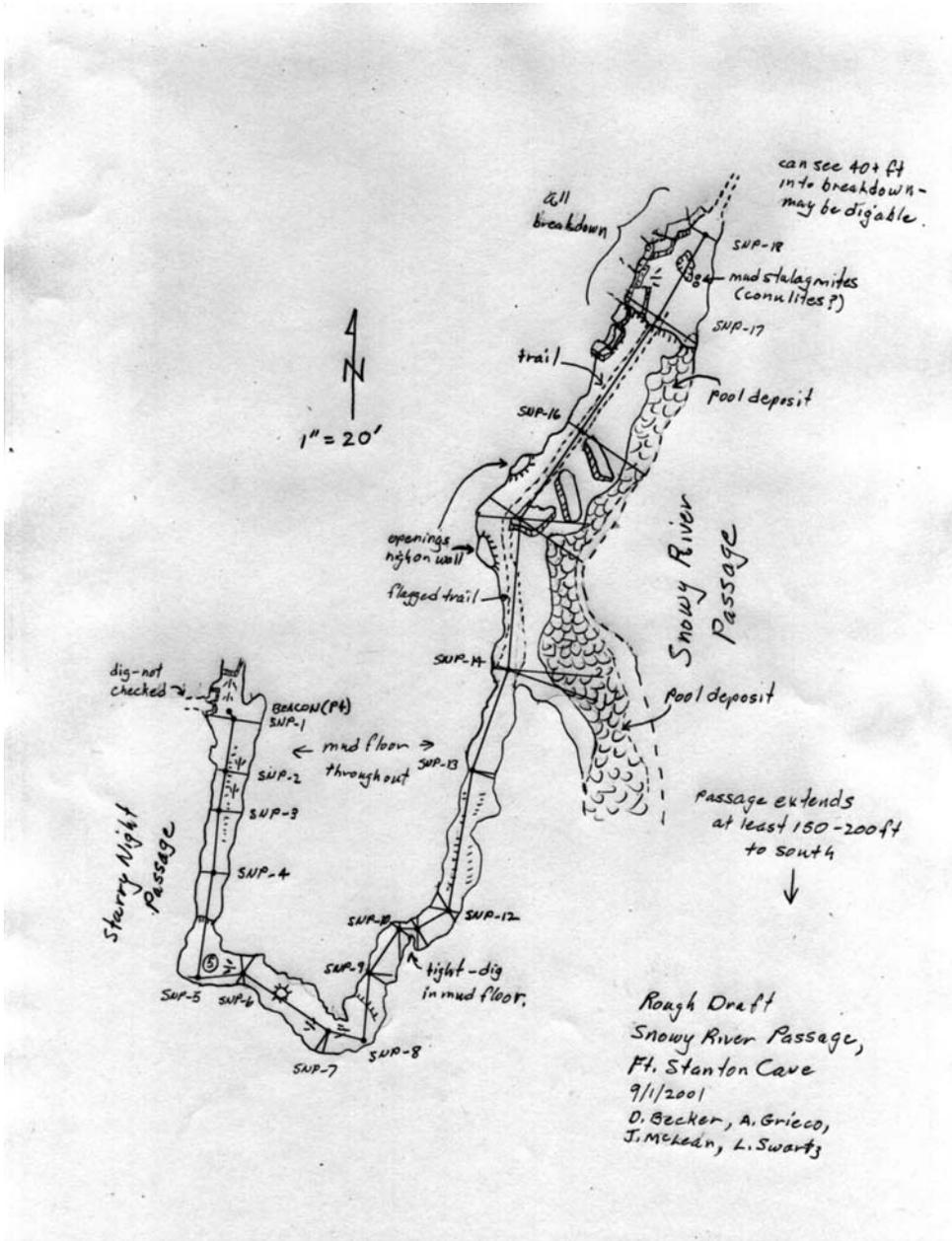


U.S. Department of the Interior, Bureau of Land Management  
Roswell Field Office, Roswell, New Mexico

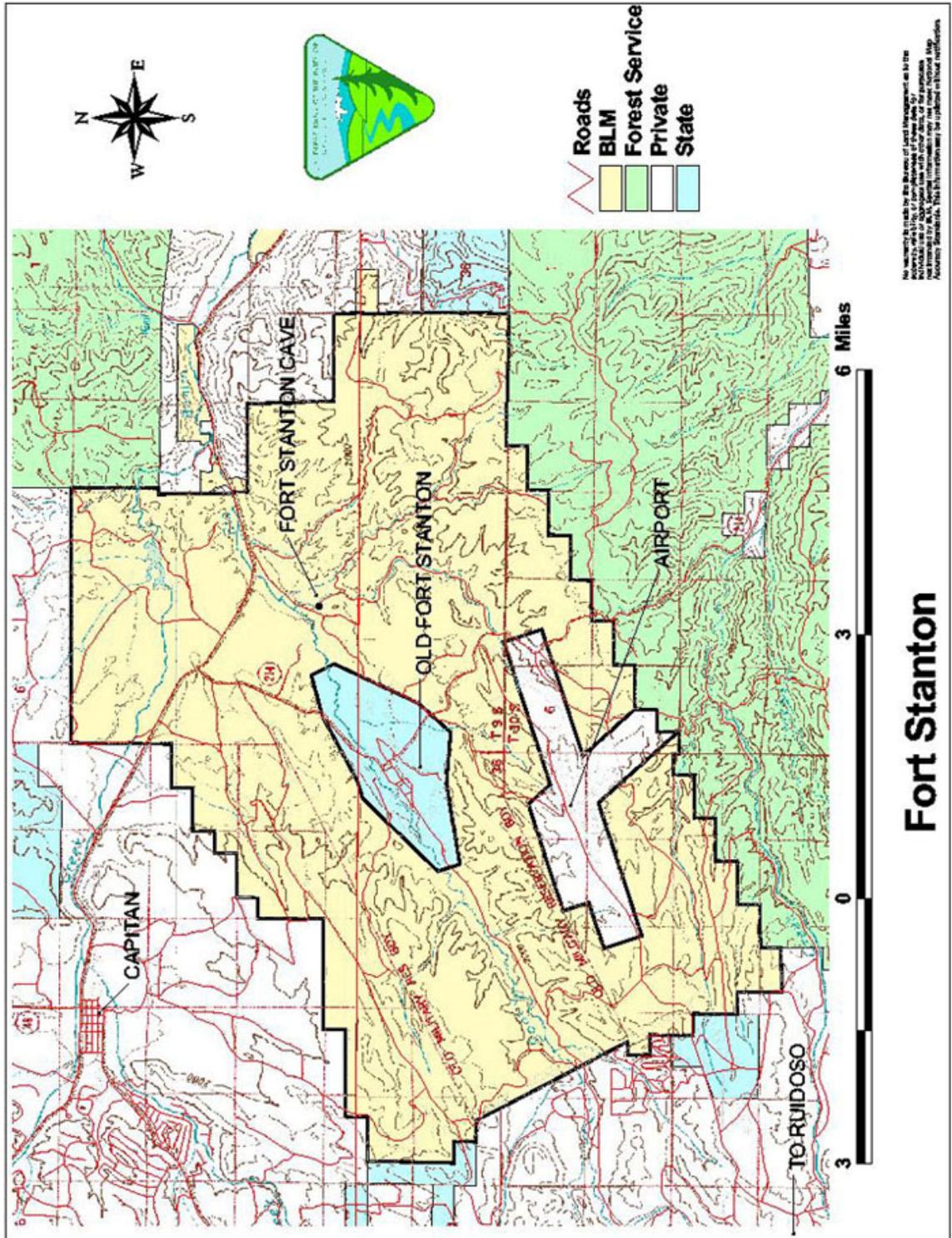
Environmental Assessment Number NM-060-2003-113

DISCOVERY AND DOCUMENTATION PROCEDURES IN  
FORT STANTON CAVE NATIONAL NATURAL LANDMARK

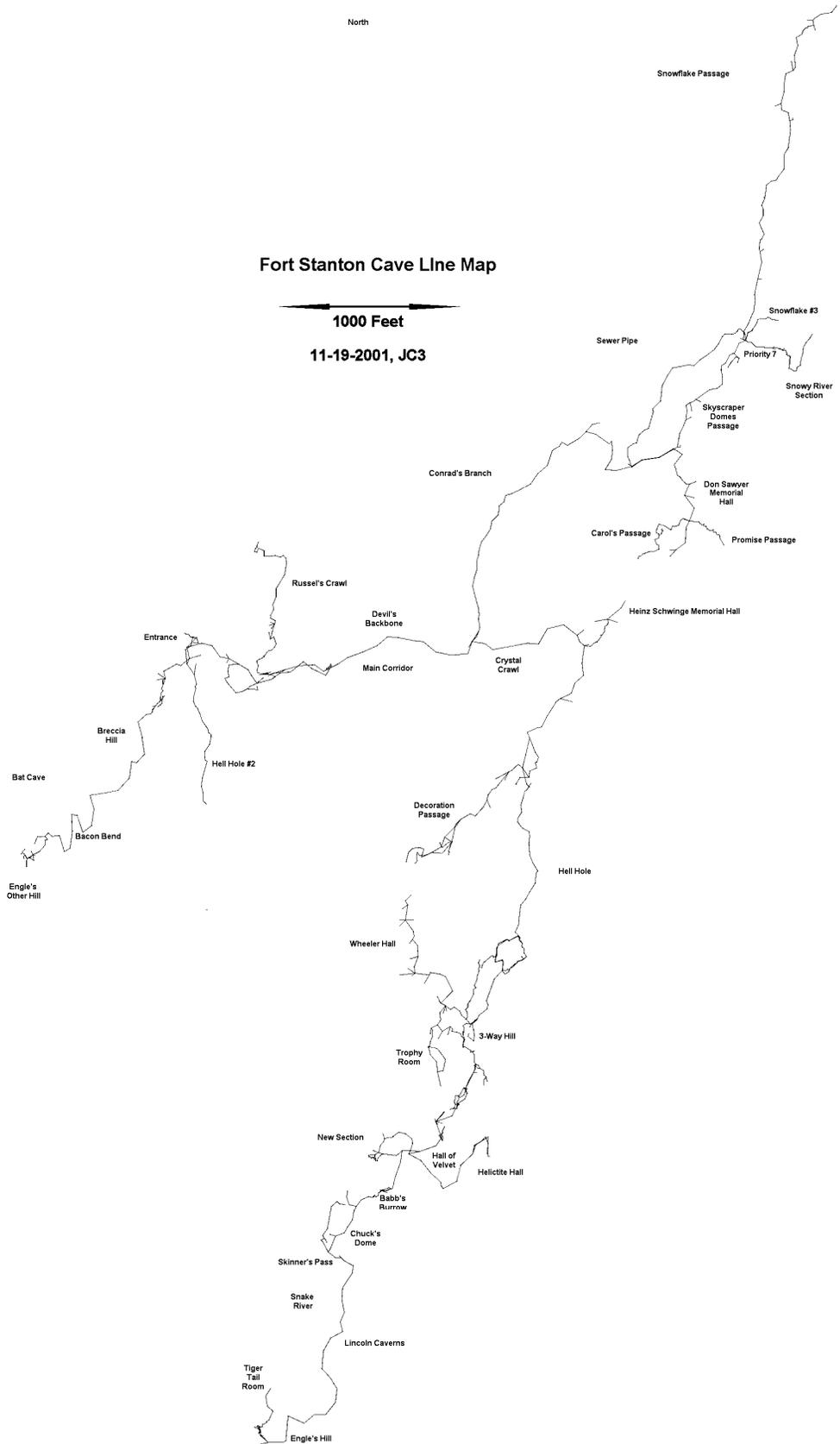
Prepared by Mike Bilbo, Outdoor Recreation Planner/Cave Specialist



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MAP 1: Fort Stanton ACEC



Map 2: Fort Stanton Cave

## **I. INTRODUCTION**

### **Background**

The BLM is responsible for managing cave resources on public lands. Caves provide recreational and scientific research opportunities. In this respect, Fort Stanton Cave (FSC) National Natural Landmark has been the focus of numerous research projects over the years (Map 1).

On September 1, 2001, a Cave Research Foundation (CRF) team, working in Priority 7 passage under a cave dig permit issued by the Roswell Field Office (RFO), Bureau of Land Management, discovered new passage. The team consisted of John McLean, Lloyd Swartz, Andrew Greico, and Don Becker. The initial survey, recorded 360 feet of new, pristine passage, and what seemed to be an unbroken pool deposit of white calcite, the Snowy River Formation, that continues for possibly hundreds of feet.

### **Need For The Proposed Action**

Fort Stanton is a National Natural Landmark and standard procedures are needed to document newly discovered resources throughout the cave. In the case of the Snowy River Formation, some researchers feel it may be a rare example of such a long and unbroken calcite formation. Steps need be taken to protect and inventory this new passage, the mineralogy of the passage, and habitat that are beyond what was initially surveyed. Under the current situation, there is no protection for Starry Nights and Snowy River passages, the mineral formations in these passages, and any associated habitats.

In the past, when new sections of Fort Stanton Cave were discovered and passages surveyed and explored, there had been a general lack of scientific research and resource inventories accomplished. This environmental assessment addresses gathering preliminary scientific data and establishes the discovery and documentation procedures as survey and exploration gets underway. Any future discoveries in Fort Stanton Cave would follow procedures developed in this EA. The procedures addressed in this EA would help protect resources in new discoveries by ensuring these resources are scientifically documented before any adverse impact or alteration occurs.

The proposed action is a result of discussions among the staff of the BLM Roswell Field Office, the dig party, the Cave Research Foundation (CRF), the National Speleological Society, Southwest Region (SWR), and other interested parties. In the case of the Snowy River Passage, which would be the first area documented following the procedures in this EA, the discussions began the day of the discovery and would continue until the proposed action is implemented, and the results of the science teams have been evaluated.

### **Conformance With Land Use Plans**

The Proposed Action is consistent with the 1997 *Roswell Approved Resource Management Plan and Record of Decision*, 43 CFR 1610.5 and BLM MS 1617.3.

This environmental assessment is consistent with other plans:

*Fort Stanton Area of Critical Environmental Concern Final Activity Plan*, NM-060-2000-0141, U.S. Department of the Interior, Bureau of Land Management, Roswell Field Office, Roswell, New Mexico, March, 2001

*Fort Stanton Habitat Management Plan*, #BLM-NM-6-WHA-T5, 02/16/90.

*Fort Stanton Cave Management Plan*, 9/19/88.

### **Relationship To Statutes, Regulations And Other Plans**

The Proposed Action is consistent with the following statutes, regulations and plans:

*The Federal Land Policy Management Act, 1976.*

*The National Environmental Policy Act, 1969.*

*The Federal Cave Resources Protection Act, 1988.*

BLM Manual 8380 - *Cave Resources Management*, 1987.

BLM Manual Handbook 8381-1, *Cave Inventory, Evaluation and Classification*, 1987.

*Fort Stanton Cave Bat Cave Dig*, Environmental Assessment No. NM-066-98-014, U.S. Department of the Interior, Bureau of Land Management, Roswell Resource Area, Roswell, New Mexico, January 31, 1998.

Memorandum of Understanding Between the U.S. Department of the Interior, Bureau of Land Management; The National Speleological Society; and the Cave Research Foundation, 12/31/81.

*Cave and Karst Management Plan for Carlsbad Caverns National Park*, 9/26/95.

43 CFR 8365, Rules of Conduct.

43 CFR Subchapters B - *Land Resource Management* (2000), and H - *Recreation Programs* (8000).

*The Roswell District Search and Rescue Plan* NM-060-8361-86.

## II. PROPOSED ACTION AND ALTERNATIVES

### PROPOSED ACTION

The Proposed Action would establish best management practices for the discovery, resource protection, and documentation of the Starry Nights and Snowy River passages as well as any other subsequent discoveries in Fort Stanton. These best management practices are detailed in Appendix 1, which includes techniques needed to mitigate impacts associated with entry into and inventory of new cave passages or features. Appendix 1 also contains safety requirements for those engaged discovery, exploration and inventory of new cave passages and features. All individuals and teams would follow the best management practices found in this environmental assessment, and those found in the Bat Cave Dig EA. Using the best management practices of the Proposed Action, entry, inventory and resource protection would fall under the following actions:

#### *Assessment Action*

An assessment team would be assembled with scientific and photographic elements in order to identify biota and geological resources that may occur in a new passage or feature, and determine how to proceed with survey and documentation. Samples and photographs would be taken by qualified individuals and then analyzed. The organization of this science team would be as follows:

- Cave Biologist
- Geologist (mineralogy, hydrology, structure, etc.)
- BLM Representative
- Conservation/Restoration person
- Photodocumentation person

#### *Inventory and Documentation Action*

An inventory and documentation team would work in conjunction with the assessment team. The team(s) would include surveyors, inventory persons and photographers.

#### *Environmental and Resource Protection Actions*

To maintain natural atmospheric conditions, an environmental closure, somewhat duplicating airflow conditions prior to discovery, would be constructed at the selected permanent new passage entrance. This closure would be replaced following each entry and exit.

If necessary a gate would be constructed between the new passage or feature and the established recreation passages in order to preserve and protect any new resources such as those in Snowy River or Starry Nights passages. Until such gate is in place, recreational caving would be done under the auspices of the Cave Guide Program and remain open to NSS/CRF members for project work.

## **No Action**

Under this action the current management would continue and the passage would be left open for recreation to any party with a permit. Formations found may be damaged and potential inventories and scientific studies compromised by the impacts of humans traveling through new sections.

## **III. AFFECTED ENVIRONMENT**

### **Setting**

#### *Cave Significance*

Fort Stanton Cave, one of very few "wet caves" in the Southwestern U.S., was proposed as a National Natural Landmark (NNL) in 1973, with NNL designation awarded in 1975, due to several outstanding biological, mineralogical, geological, hydrological and historical features. These resources include patches of unique and rare gypsum needles, equally rare tabular and starburst gypsum, passages coated with calcite rafts, pristine formation areas of rare cave velvet (macro-crystalline dogtooth spar), and historical names directly associated with the establishment of Fort Stanton in 1855, the Wheeler Expedition in 1877 and the Great Divide Expedition of 1891. At approximately eight miles of mapped passage, Fort Stanton Cave National Natural Landmark is the third longest cave in New Mexico and has the longest history of Euro-American visitation in the state, with exploration beginning in March of 1855, coincidental with the establishment of nearby Fort Stanton by the 1st U.S. Dragoon and the 3rd U.S. Infantry regiments.

#### *Geographical Setting*

Fort Stanton Cave is located approximately 60 miles west of Roswell and 7 miles southeast of Capitan, New Mexico. The cave entrance is situated at the edge of the Bonito Valley, surrounded by rolling foothills and ridges, which extend eastward from Sierra Blanca and the White Mountains, Lincoln County. The mountains, which reach elevations of 10,000 to 12,003 feet, are the eastern-most section of the Basin and Range Province. Fort Stanton Cave is located at the mouth of Cave Canyon, an intermittent tributary of the perennial Rio Bonito, a stream draining the east slopes of Sierra Blanca. The stream (main) passage in Fort Stanton Cave is hydrologically connected to the Rio Bonito, the result of dye tracing in the early 1980's. This accounts, to a large extent, for periodic flooding episodes in the cave. The elevation throughout the Proposed Action site is generally 6,000 to 6,050 feet above sea level and the elevation on the surface at the entry sink edge is 6,111.

## **Affected Resources**

### *Critical Elements*

The following elements have been evaluated and either are not present or are not affected by the proposed action or alternatives in this environmental assessment:

Farm Lands (Prime or Unique)

Floodplains

Invasive, Non-native Species

Minority or Low Income Population Concerns

Wastes, Hazardous and/or Solid

Wetlands or Riparian Zones

Wild and Scenic Rivers

Wilderness

The following resources may be affected by the proposed action or the alternatives in this EA:

Areas of Critical Environmental Concern (ACEC)

Cave/Karst Resources

Cultural Resources

Native American Religious Concerns

Outdoor Recreation

Paleontological Resources

Wildlife Habitat

Threatened or Endangered Species

Vegetation

Visual Resources

Water Quality

Stipulations/requirements are found in *The Roswell Approved Resource Management Plan And Record Of Decision, 1997, Roswell District Conditions Of Approval, Appendix 1*, for the following resources: Streams, Rivers and Floodplains; Caves and Karst; and Visual Resource Management.

Stipulations/requirements are found in Appendix 2, *Surface Use and Occupancy Requirements*, for the following resources: Cultural Resources, Native American Religious Concerns, and Paleontological resources.

Stipulations/requirements are found in Appendix 10, *Rules of Conduct*, for the following resources or elements: Sanitation, Vegetation and Mineral Removal, Pets, Archaeology or Cultural Resources, Special Recreation Management Areas and ACECs (under which is included Cave Resources, General Rules and Rules for Caves within ACECs).

Appendix 11, *Results of Section 7 Consultation*, identifies in Table A11-4 cave-adapted mammals (bats) as BLM Sensitive Species Occurring or Potentially Occurring in the

Roswell Resource Area (Roswell Field Office area of jurisdiction). To afford these species reasonable protection from adverse human impact, the RMP incorporated the annual hibernation closure policy, November 1 to April 15 and protection of identified maternity roosts (Appendix 10).

#### *Areas of Critical Environmental Concern (ACEC) and Cave/Karst Resources*

Fort Stanton Cave and a number of other caves are located within the Fort Stanton Area of Critical Environmental Concern (ACEC). The approximate 25,000 acres of public land within the ACEC contain numerous sensitive natural and cultural resources, yet provide a large variety of recreational opportunities of which caving, ridgewalking (surface searching for caves), and new discoveries are included. To insure preservation of cave/karst resources RMP stipulations and requirements are reflected in the Roswell Field Office recreational and administrative (restoration and research) permit process (Appendix 4). Currently, only Fort Stanton, Feather, Blue Tick and Agogino caves require entry permits. Cavers have coordinated with the Roswell Field Office Cave Program on continued ridgewalking, research and restoration efforts concerning these cave/karst resources.

#### *Cultural Resources*

Prehistoric artifacts have been found on the surface surrounding the Entrance Sinkhole. These include various potsherd types, lithic scatters and ground stone fragments, indicating some type of Native American relationship to the cave. Historical signatures are found in at least ten locations throughout Fort Stanton Cave. Historic artifacts and architectural features have been found in various locations throughout the cave. These include Shepherd's Hut wall and floor, the remains of an 1872 rowboat in Conrad's Branch, 1930s message and bottle, mid-19<sup>th</sup> Century military items eroded from the Entrance Sink talus slope such as .45-70 and .50-70 cartridges, beer bottle fragments, smashed bugle, and at least two badly corroded M1851 pistols.

#### *Native American Religious Concerns*

Feather Cave Archaeological Complex and various pithouse and pueblo ruins occur within two miles of Fort Stanton Cave. Feather Cave contains prehistoric ceremonial artifacts and rock art, indicating Native American religious function in a cave/dark zone environment. Somewhere in the Guadalupe-Sacramento-Capitan mountain chain lies a cave the Mescalero Apaches hold sacred. It is where the Mountain Spirits protected some Mescaleros from certain death by their enemies. This event is commemorated often by the dance of the Mountain Spirits. Caves feature prominently in Mescalero Apache traditional belief systems. It is possible that Feather Cave or such a prominent cave as Fort Stanton was the cave where this took place. If so, they would be considered sacred sites.

### *Recreation Resources*

Euro-Americans have visited the cave since 1855. It is difficult to determine how much visitation was research and how much was for recreation. As noted above the Wheeler Expedition in 1877 and the Great Divide Expedition of 1891 documented Fort Stanton Cave resources. The Wheeler Expedition accurately mapped the known 1877 extent of the cave. Since the 1950s, cavers have conducted continual survey and mapping activities. Since 1972, when permit records began, the cave averaged 200 recreational permits a year. 2002 was the first year in 150 years that the cave was closed to recreational entry for one year in order to construct and install the Priority 7 Gate to protect the Snowy River discovery and recreational public safety from extreme hazardous conditions in that area.

### *Paleontological Resources*

Possible Pleistocene calcified bones have been found near the roof areas of Skyscraper Domes and in Don Sawyer Memorial Hall, all of which features are in the same area and most likely directly related to the Snowy River Passage. These bones have been too fragmented to identify the type animal.

### *Wildlife and Vegetation Habitat*

The cave is habitat for numerous transient and resident bat species, especially:

Pale Townsend's Big-eared Bat (*Plecotus townsendii pallescens* [*Coryhinorinus townsendii*])

Small-footed Myotis (*Myotis ciliolabrum*)

Cave Myotis (*Myotis velifer incautus*)

These bats that have been censused in Fort Stanton Cave and are year-round resident species, including hibernation. There are cave-adapted insects and possibly mollusks throughout the cave such as millipedes and diplurans that feed on various materials, especially the wood of Conrad's boat and crumbs from careless cavers' food. Tiny snail shells, somewhat like hydrobiid snails, of an unknown mollusk species have been seen recently on the ceilings of *Hell of a Thousand Pinches* (Washtub Room stream passage) and *Hell Hole #2*. Unknown/unstudied mold (vegetation) species occur on food fragments very soon after spillage. The Snowy River Passage may have corrosion residue, which results from microbial action on minerals, such as gypsum. As of this analysis the insect, mollusk, mold and microbial species do not seem to be indicated as threatened or endangered.

### *Threatened or Endangered Species*

BLM Sensitive Species Occurring or Potentially Occurring in the Roswell Field Office area of jurisdiction are:

Occult Little Brown Bat (*Myotis lucifugus occultus*)  
 Spotted Bat (*Euderm maculatum*)  
 Pale Townsend's Big-eared Bat (*Plecotus townsendii pallescens*)  
 Fringed Myotis (*Myotis thysanodes*)  
 Long-legged Myotis (*Myotis volans*)  
 Long-eared Myotis (*Myotis evotis*)  
 Small-footed Myotis (*Myotis ciliolabrum*)  
 Cave Myotis (*Myotis velifer incautus*)  
 Yuma Myotis (*Myotis yumanensis*)  
 Big Free-tailed Bat (*Nyctinomops macrotis*)

In November of 2002 Marikay A. Ramsey, Gila National Forest, Ecologist/Region 3 Bat Program Coordinator provided an interagency matrix of proposed Sensitive Species Bats. Region 3 includes the Lincoln National Forest that surrounds the Fort Stanton ACEC:

**USFS Region 3  
 Proposed Sensitive Species Bats  
 2002**

Scientific Name	USFS R3	AGFD	NMDGF	BLM	WBWG
<b>Family Mormoopidae</b>					
<i>Mormoops megalophylla</i>					M
<b>Family Phyllostomidae*</b>					
<i>Choeronycteris mexicana</i>	X	T	S	S	H
<i>Macrotus californicus</i>	X	C			H
<b>Family Vespertilionidae</b>					
<i>Myotis ciliolabrum</i>			S	S	M
<i>Myotis yumanensis</i>			S	S	L
<i>Myotis lucifugus</i>			S		M
<i>Myotis (lucifugus) occultus</i>			S	S	M
<i>Myotis velifer</i>			S	S	M
<i>Myotis volans</i>			S	S	M
<i>Myotis thysanodes</i>			S	S	M
<i>Myotis evotis</i>			S	S	M
<i>Myotis auriculus</i>					M
<i>Lasiurus blossevillii</i>	X	C	S		H
<i>Lasiurus borealis</i>			S		L
<i>Lasiurus xanthinus</i>	X	C	T		H
<i>Euderma maculatum</i>	X	C	T	S	M
<i>Idionycteris phyllotis</i>	X		S	S	H
<i>Corynorhinus townsendii</i>	X		S	S	H
<b>Family Molossidae</b>					
<i>Nyctinomops macrotis</i>			S	S	M
<i>Nyctinomops femorosaccus</i>					M
<i>Eumops perotis</i>			S	S	M
<i>Eumops underwoodi</i>					M

\* - *Leptonycteris nivalis* and *Leptonycteris curasoae* are both listed as Endangered under the Endangered Species Act of 1973, and therefore are not included on this "sensitive" species list.

**USFS R3** – (Arizona & New Mexico). Taxa on this list are species proposed for the list currently undergoing revision. AZ & NM researchers and agency biologists directly involved in bat research and/or management provided input.

**AGFD** – from draft list of *Wildlife of Special Concern in Arizona* (WSCA), Effective March 16, 1996 and to be used until the final WSCA list is approved by the AZ Game and Fish Commission.

Threatened: those species or subspecies whose continued presence in AZ could be in jeopardy in the near future. Serious threats have been identified and populations are (a) lower than they were historically or (b) extremely local and small.

Candidate: those species or subspecies for which threats are known or suspected but for which substantial population declines from historical levels have not been documented (though they appear likely to have occurred).

**NMDGF** – from New Mexican Wildlife of Concern, (Biota Information System of NM [BISON-M], February 21, 2001), New Mexico Department of Game & Fish, informal category which carries no legal requirements.

Sensitive: Taxa which, in the opinion of a qualified NMDGF biologist, deserve special consideration in management and planning, and are NOT listed Threatened or Endangered by the state of New Mexico. These may include taxa that are listed Threatened, Endangered or Sensitive by other agencies; taxa with limited protection; and taxa without any legal protection. The intent of this category is to alert land managers to the need for caution in management where these taxa may be affected.

Threatened: (under New Mexico Wildlife Conservation Act) “any species (or subspecies) which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range in New Mexico;...” 17-2-38-M, NMSA, 1978.

**BLM NM**- U.S. Bureau of Land Management, Dept. of the Interior, New Mexico State Office, Santa Fe. State Offices were directed by the Washington, D.C. Office to develop sensitive species lists. The directive indicated lists would include former USFWS Candidate C2 species until a state office developed their own list. Currently, most of the taxa on the NM list are former C2 species.

Sensitive: “... are those designated by a State Director, usually in cooperation with the State agency responsible for managing the species, as sensitive. They are those species that are: 1) under status review by the FWS/NMFS; or 2) whose numbers are declining so rapidly that Federal listing may become necessary; or 3) with typically small and widely dispersed populations; or 4) those inhabiting ecological refugia or other specialized or unique habitats.” (BLM Manual, Rel. 6-116, 9/16/88, 6840-SPECIAL STATUS SPECIES MANAGEMENT, Glossary page 6).

**WBWG** – The Western Bat Species Regional Priority Matrix is a product of the Western Bat Working Group Workshop held in Reno, NV, February 1998. The matrix is intended to provide states, provinces, federal land management agencies, and interested organizations and individuals a better understanding of the overall status of a given bat species throughout its western North American range.

High: Based on available information on distribution, status, ecology, and known threats, this designation should result in these species being considered the highest priority for funding, planning, and conservation actions. Information about status and threats to most species could result in effective conservation actions being implemented should a commitment to management exist. These species are imperiled or are at high risk of imperilment.

Medium: This designation indicates a level of concern that should warrant closer evaluation, more research, and conservation actions of both the species and possible threats. A lack of meaningful information is a major obstacle in adequately assessing these species’ status and should be considered a threat.

Low: This designation indicates that most of the existing data support stable populations of the species, and that the potential for major changes in status in the near future is considered unlikely. While there may be localized concerns, the overall status of the species is believed to be secure. Conservation actions would still apply for these bats, but limited resources are best used on high and medium species.

### *Visual Resources*

Although not previously addressed, the Fort Stanton Cave NNL visual resource management classification would be Class II and not Class I as there are visible but subdued gates in various locations, but also line-of-sight reflective markers to focus visitor travel on the "impact trail" throughout the main recreational parts of the cave.

VRM Class I areas: preserve the existing character of landscapes.

VRM Class II areas: retain the existing character of landscapes.

The proposed action is located in a highly scenic cave setting, although different from the massive, highly decorated caves in the Guadalupe Escarpment 78 miles south. The general color pattern within the cave is reddish-brown from extensive clay silt deposits.

Secondary colors from iron oxides and manganese deposits in limestone strata above passages are manifested in calcium carbonate formations as caramel to reddish colors.

#### *Hydrogeology and Water Quality (Ground)*

The rocks that outcrop in the area of Fort Stanton Cave are Permian in age. Several geologic formations are present on the surface of the area above Fort Stanton Cave. Dolomite and limestone outcrop from the Bonney Canyon Member of the San Andres Formation. Dolomite and limestone outcrop from the Rio Bonito Member of the San Andres Formation. Sandstone, siltstone, dolomite, and gypsum outcrop from the Yeso Formation. Fort Stanton Cave is formed in the San Andres Formation which consists of dolomite, limestone, sandstone, siltstone, and gypsum. Anticlines and synclines occur in the area that trend in the NNW direction. The Bonito Fault trends to the NNE through the area in the San Andres Formation with numerous associated cracks, fissures and linaments. Tertiary dikes intrude the San Andres Formation in the area. The mineralogy of Fort Stanton Cave consists of selenite needles, starburst gypsum, epsomite cotton and hair, velvet, calcite rafts, manganese coatings and opal-filled needles as well as the more usual speleothem types such as stalactites stalagmites, draperies, flowstone, helictites, anthodites, moonmilk, coralloids, flowers and crust. Clay and silt deposits occur in the cave from from the Pleistocene. The groundwater moves generally in the northeast, east and southeast direction. The depth to groundwater in the area within the San Andres Formation ranges from 60 to 400 feet. The depth to groundwater in perched aquifers in the area range from 20 to 80 feet. Recharge to the groundwater in the San Andres Limestone and perched aquifers in the area is primarily from rainfall and storm flood events.

#### *Hydrogeology References*

Hill, C.A., 1984, Mineralogy at Fort Stanton Cave, New Mexico: Cave Research Foundation annual Report, 52 pp.

Kelley, V.C., 1971, Geology of the Pecos country, Southeastern New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 24, 78 pp.

Mourant, W. A., 1963, Water Resources and Geology of the Rio Hondo Drainage Basin Chaves, Lincoln, and Otero Counties, New Mexico.

## **IV. ENVIRONMENTAL IMPACTS**

### **Impacts Of The Proposed Action**

Some impacts could occur as a result of this project. Stabilization work in a passage containing depositional material would cause alluvial or colluvial materials to be moved from their original position. Natural or cultural resources may be impacted if dug into or broken, such as in the case of a speleothem curtain, extensive flowstone or dense

speleothem areas. Mitigation procedures and protective stipulations in this document, however, would result in operational shutdown and consultation with BLM should such resources be encountered. Unknown biota may be affected.

Positive impacts would be proper scientific documentation and protection of cave resources as recommended or required under federal regulation and in BLM plans and policy. The unconsolidated nature of soil and breakdown deposits would not be anticipated to be severely affected.

### **Identification, Mitigation, And Correction Of Potential Environmental Impacts From Proposed Action.**

Potential impacts that may occur during discovery and documentation phases fall under four areas: mechanical, biological, visual, and other.

- Identification is the narrative description of a potential impact.
- Mitigation is the action taken to prevent or minimize impact.
- Correction is the repair or restoration of an impact that has already occurs. When correction is necessary the cave management specialist would review the situation with BLM management and cavers involved with the project of concern. See Appendix 1 for general mitigation techniques and action, and corrective action and techniques.

#### **Mechanical Damage**

1. *Identification:* Incautious travel can break speleothems or speleogens, crush crusts, or entrench trail areas.

*Mitigation:* Limit travel to established trails as described in appendix.

*Correction:* In consultation with a restoration specialist, damage may be repaired using approved materials and techniques.

2. *Identification:* Palentological and cultural/historical resources can be damaged if they are stepped on or dug through.

*Mitigation:* See appendix for avoidance and management techniques/decisions as well as mitigation actions referred to in 1.a above.

*Correction:* Using accepted restoration techniques for these resource types.

3. *Identification:* If flowstone or pool deposits are too thin to support a person's weight, they can crack or break through. This is a potential problem with the Snowy River deposit.

*Mitigation:* Possible solutions include (1) load distribution appliances such as closed-cell foam pads, protective shoes, matting, etc if science teams determines the

formation can support the weight; (2) Rerouting trails away from sensitive areas; (3) Disallowing persons from walking on the formation.

*Correction:* Acceptance and monitoring of impacted site. Repair of damaged flowstone using restoration techniques and materials referenced in Appendix 1.

4. *Identification:* Digging through natural breakdown or sediments can cause unexpected collapse.

*Mitigation:* Placement of culvert sections, stabilization of loose materials, and careful planning of digging activities.

*Correction:* Acceptance of modified environment is one course of action. Stabilization and re-excavation of the site is another management choice. Abandonment and rehabilitation of the disturbed site may be another action.

## **Biological Damage**

1. *Identification:* Cavers can contaminate the microbiology of the cave by introducing foreign species of bacteria and fungi.

*Mitigation:* See appendix 1 for techniques, clothing, and equipment used to minimize this impact.

*Correction:* Three distinct actions or a combination of actions would be considered after a cave biologist or other appropriate specialist has performed an assessment. First would be decontamination of the foreign material. Second is resting the cave from visitation for a period of time to allow natural recovery. Third is acceptance of the adverse impact and allow continued visitation based upon the advice of the specialist.

2. *Identification:* Cave adapted insects and arthropods, such as thysanurans, diplurans and millipedes, can be killed directly or by disturbing their local environments.

*Mitigation:* Alternatives include: Redirect travel from the sensitive area. Move the subject population to another location. Attempt to bait the population to move to another area. Education of visitors using verbal and written interpretation materials.

*Correction:* Alternatives: Acceptance of impact. Re-directing traffic from subject area to prevent future damage. Closure of the affected area for a period of time necessary for natural recovery.

3. *Identification:* Excess organic material such as human food and waste can disrupt the ecology by introducing abnormal food sources.

*Mitigation:* See appendix 1 for recommended techniques and guidelines for precautions taken when eating and procedures regarding removal of waste materials.

*Correction:* Restoration of the impacted site is performed according to techniques described in section 1.

## **Visual Impacts**

1. *Identification:* Users moving through the cave may change the appearance of formations in the cave by covering them with mud or causing discoloration by handling.

*Mitigation:* Restrict movement to defined trails, require clean boots and clothing in sensitive areas.

*Correction:* Formations can be restored to their original appearance by cleaning using known restoration techniques.

2. *Identification:* Survey station tags, trail flagging and photodocumentation sites add to the visual clutter.

*Mitigation:* Reflective markers can be used to minimize the visual impact of trail flagging.

*Correction:* Flagging can be removed and replaced with reflective markers.

3. *Identification:* Footprints on mud or sand banks, and the proliferation of trails in inadequately marked areas are unsightly.

*Mitigation:* Trails shall be marked in sufficient detail to keep users to a single path. The path shall be no wider than 24 inches in walking areas, and 36 inches in crawlways.

4. *Identification:* Gates and other physical access controls may be unsightly.

*Mitigation:* Reduce the number, physical size, positioning only in critical resource areas, etc. See appendix 3 for further details on gate specifications and use.

*Correction:* Gates violating BLM standards would be replaced with a conforming design as shown in appendix 3.

## **Other**

1. *Identification:* Changes in natural air circulation caused by digging can cause drying of formations and possibly change the biota by changing the moisture balance.

*Mitigation:* An approved environmental closure would be implemented to restore natural airflow that increased due to human causes. The purpose of an environmental closure is to control airflow without introducing any contaminating agents or materials.

*Correction:* Analysis of the presumed impact to determine probable natural conditions followed by an appropriate solution that addresses the cumulative impacts.

A project Authorization Permit and any attached stipulations derived from this EA would authorize the project. For each session, however, a regular cave entry permit with standard stipulations would be issued. All combined stipulations would provide for protection of cave resources by mitigating or alleviating any potential impacts. Mitigation of any residual or cumulative effects would be accomplished through long-term monitoring, maintenance and planning by the Roswell Field Office Resource Staff, and research partners, assisted by law enforcement if and when needed. During the Proposed Action BLM staff would monitor for any possible adverse effects occurring during or resulting from the Proposed Action.

For safety, compliance and monitoring, the BLM Project Coordinator would periodically inspect projects. Discoveries would continue to receive protection from the existing main cave gate and other internal gates, law enforcement efforts, and from monitoring work and cave environmental education to schools and organizations by caving community partnerships with the BLM. To protect the Snowy River Discovery for instance, a vandal resistant gate would be installed. Unknown and unforeseen conditions may affect parts of or all Proposed Action activities, in which case adjustment of use patterns and modifying amendments to this EA, the Fort Stanton Cave Management Plan and The Roswell District Caves Program Plan may be necessary.

The presence of humans in a cave would have both direct and indirect effects on cave resources. Given the nature of previous digs through alluvial fill and drying brecciated condition of this material, residual impacts may include accumulations of alluvial detritus and spoils piles. Rare or exotic cave formations and/or minerals may be present. Unknown microbiota and geochemistry may also be impacted. Although cavers strive to use minimum impact techniques to reduce or eliminate resource impact, unintentional touching, bumping, and stepping on cave formations can occur on any given caving trip.

### **Residual Impacts**

Residual impacts are expected to be minimal, providing all mitigation and stipulation procedures are followed. The mitigation prescribed in this EA, and stipulations derived from mitigations, would serve to abate any residual impacts resulting from movement and activity of project workers, and should provide for minimum impact, if any, on cave ecology, bat habitat and other resources.

### **Cumulative Impacts**

Population increases, concurrent and potential future recreation demand, and continued attraction of Fort Stanton Area of Critical Environmental Concern and Fort Stanton Cave as recreation destinations are considered the primary multipliers of other cumulative resource impacts. Outdoor Recreation Planners expect recreational cave use to continue. There is evidence that this use is beginning to plateau due to the hibernation closure,

which limits the cave season to 6½ effective months for research or recreation activities. Given potential residual and cumulative impacts the prudent methodology would be to automatically close new discoveries to recreation until such time that a determination is made on the viability of recreation use, visitor safety or continued protection of sensitive resources. Thus BLM Roswell Field Office management has closed Lincoln Cavern, Bat Cave, Priority 7, Starry Nights Passage and Snowy River Passage to recreational use.

## **V. CONSULTATION AND COORDINATION**

### **Consultants**

The following members from the caving community were consulted and/or offered suggestions during the drafting of this EA and the Proposed Action:

#### *General*

Calvin Currier  
Dave Belski  
Dick Venters  
Frank Everitt  
Gavin Corcoran  
Jim Cox  
John J. Corcoran, III, Permit Applicant  
Kathleen Rix  
Kathy Peerman, NSS Dig Section Secretary  
Lloyd Schwartz  
Stephen Carter

#### *Biology*

Bob Pape  
Debbie Beucher  
Dr. Diana Northup, Microbiologist  
Penny Boston  
Sharon Chong

#### *Geochemistry*

Mike Spilde

#### *Geology/Hydrology/Minerology*

John McLean  
Paula Provencio  
Victor Polyak

*Preservation/Restoration*

Barbe Barker  
Lois Lyles

*Photodocumentation*

Bob Buecher  
John Cochran

**Specialist Review**

The following Department of Interior resource specialists have assisted in preparation of this EA and reviewed the Proposed Action and its anticipated impacts on resources:

Marcia Menz, Law Enforcement Ranger, Roswell District  
Dan Baggao, Wildlife Biologist, Roswell Field Office  
Mike Bilbo, Outdoor Recreation Planner, Roswell Field Office  
Jerry Dutchover, Geologist, Roswell Field Office  
Pat Flanary, Archaeologist, Roswell Field Office  
Stephen Fleming, Special Agent, Carlsbad Field Office  
Rand French, Wildlife Biologist, Roswell Field Office  
Paul Happel, Natural Resources Specialist, Roswell Field Office  
Ed Roberson, Field Manager, Roswell Field Office  
Mike Williams, Civil Engineer, Roswell Field Office  
Howard Parman, Planning and Environmental Coordinator, Roswell Field Office  
Jim Goodbar, Senior Cave and Karst Resources Specialist, Washington Office  
Dale Pate, Lead Cave Specialist, Carlsbad Caverns National Park  
Ransom Turner, Cave Specialist, U.S. Forest Service, Lincoln National Forest

**Special Acknowledgement**

Stephen Carter and Frank Everitt, Recreation and Cave Program technicians, and John Corcoran III and John Mclean, Cave Program Volunteers, contributed considerable hours assisting Mike Bilbo in the research, organization and preparation of this environmental assessment.

**Appendix 1: Discovery, Entry And Documentation Of New Passages and Features In BLM Roswell Field Office Permitted Caves**

**Introduction And Exploration Policy**

"Modern day" cave exploration and surveying began in the 1960's with the advent of the Guadalupe Cave Survey in the Carlsbad region. Recent management has increasingly relied on accurate and complete survey and inventory notes. In addition, no one may

enter unexplored or unsurveyed passages without surveying as they go. There are many passages that have been "scooped," but not surveyed. In order to avoid further abuse by relatively few individuals, everyone must adhere to this policy.

The Roswell Field Office BLM Cave Program supports the discovery and careful documentation of additional new, pristine sections of Fort Stanton Cave and other Roswell Field Office caves. Although repeatedly visited, documentation of pristine resources has not been complete. Discovery of new, pristine passage(s) may be highly significant and provide important scientific and resource data regarding cave speleogenesis.

Research and dig projects, however, would be authorized only after completion or review of environmental assessments (EA's). After the EA process, the BLM would issue permits in support of projects, with provisions that guidelines and stipulations be closely followed.

### **Dig Project Members Are Not Volunteers**

The Roswell Field Office Cave Program recognizes and credits persons who discover new passage(s), providing them the opportunity to document their discovery, utilizing cave evaluation and classification techniques. Therefore dig project members would not be covered under volunteer agreements during exploratory digs. BLM policy prohibits placing volunteers in hazardous situations such as digging.

### **Discovery**

Upon passage discovery, volunteer agreements would be effected between BLM and discoverers/ explorers after all dug passage is stabilized and an environmental closure emplaced. BLM cave managers are involved in close coordination with the discovery party, and actively participate in planning, documentation, mapping and research.

### **Rules**

1. Permitted caves are withdrawn from public entry except by permit to protect very fragile, very sensitive areas and resources. Digging, breaking or altering formations, or enlarging any passage(s) requires permission from the BLM authorizing official or designated representative.
2. BLM permitted caves are managed with orientation to a strong conservation mandate. It is essential that everyone do whatever possible to minimize their impacts to BLM caves.
3. No One Is Permitted to explore new or unsurveyed passages in any of the BLM permitted caves until consultation with BLM representatives has occurred and methods and techniques of discovery agreed upon by all parties.

4. Survey is a required activity that must be done in conjunction with exploration. Looking at (scooping) passages without surveying them is totally unacceptable and would not be tolerated.
5. Breaking a trail through ultra-sensitive areas, such as aragonite bushes is strictly prohibited. You are required to notify the Cave Program so the BLM can be involved in making a decision of such magnitude. This also includes wading in, swimming through, or disturbing any newly found pools.

### **Cave Entry Guidelines**

The reason for these guidelines in a discovery situation is to allow limited access for scientific research, survey when in association with exploration, and BLM management related trips while impacting the cave as little as possible. Of primary importance are the impacts to the cave and the safety of all who enter.

### **Before Entering the Cave**

1. Everyone must sign a permit.
2. Project/trip leaders are ultimately responsible for the personnel on their trip. Leaders shall do their best to recruit cavers that are willing to follow these guidelines that have been established.
3. Every team entering a permitted cave would have one designated team leader. Team leaders have tremendous responsibilities. They are responsible for the safety of their team and for the actions of their team members. If a team member is acting in an unsafe manner or not being careful and actually causing more damage to the cave, then it is the team leaders responsibility to correct that persons actions. If problems persist, then the team leader must abort the trip and have the team leave the cave. A team leader shall gear team activities to the least experienced member of the team. This pertains to speed of travel as well as climbing abilities. A team shall also stay together unless an emergency requires different actions.
4. Everyone entering the cave is responsible for their actions while in the cave. They are also responsible for reporting to the team leader, acts that are unsafe or damaging to the cave by other team members. The overall goal is to allow access to the cave while minimizing all impacts. It is everyone's responsibility to assure that the cave remains as pristine as possible and that each team member is very safety aware while in the cave.
5. Clothing, boots and caving gear shall be clean before entering the discovery section to minimize the introduction of foreign bacteria, molds and fungi.
6. Boots must Have Non-marking Soles. If you are in doubt, scrape boot over white floor or limestone rocks. Marking boots will definitely leave marks.

7. Carbide lights are acceptable, however, we strongly recommend the use of electric lights. Ceiling burner type carbide lamps can leave carbon marks on the ceiling of the cave and the heat that they generate can damage formations, therefore they would not be allowed.

### **Accidents**

For any accident of a serious nature, such as death or injury requiring rescue or body recovery, a strict protocol would follow:

1. Call 911 or notify the New Mexico State Police District, Alamogordo (505)-437-1313 or,
2. Call the BLM Roswell Field Office 24-hour Emergency Number 1-800-650-7498 and request the BLM Ranger (federal law enforcement) be dispatched. If there is no answer, attempt to Call BLM Ranger 762 at Cell 420-1877.
3. Notify Jim Goodbar, regional State Police field coordinator for cave rescue (505) 234-5929, Fax (505) 885-9264 e-mail James\_Goodbar@blm.gov
4. If none of the above can be contacted, attempt to notify: the Lincoln County Sheriff Department, Carrizozo 1-800-687-2419.
5. Because of access lock combinations and the critical resource Fort Stanton Cave represents, BLM representatives must also be notified. BLM Roswell Field Office Cave Program manager and project coordinator: Mike Bilbo, W 505-627-0278/0272 or H 625-1443 and/or Bill Murry, Valley of Fires Recreation, Carrizozo, 505-648-2241. Bill Murry has an EMT kit and SKED litter
6. All traumatic injuries of less serious nature where a rescue did not occur or self-rescue occurred, shall nevertheless be reported to the Cave Program manager.

### **Trip/Progress Reports**

Team leaders are required to fill out trip report forms and return it to our Cave Program office within two weeks following each work session. The reports would include the date, personnel, places visited and work accomplished including specifics such as types of information or samples collected. If survey was the objective, list the station numbers that were set. The team leader shall submit a preliminary report on the permit post-use report, followed by a formal report no later than two weeks after the session.

### **Traveling Through the Cave**

1. All teams must have a minimum of three people. Survey and exploration teams can have no more than four members on a team unless given specific permission by the

Cave Specialist. Science and management related teams are limited to no more than 6 members on a team.

2. All solid and liquid wastes must be carried with you and out of the cave without exception. Burrito bags or pee bottles may not be left along the trail to be picked up on the way out because they may be forgotten about and someone else may have to retrieve them.
3. No smoking of tobacco or other products and no consumption of alcohol in the cave.
4. If a vertical situation is encountered, everyone entering the cave is responsible for the care and protection of all ropes and the subsequent rigging that is utilized. Wear spots or other problems shall be brought to the attention of the trip leader, who if necessary, shall fix the problem immediately or notify the Cave Program of their concerns. Ropes shall not be re-rigged without permission from the Cave Manager unless an immediate threat is perceived. Please notify our Cave Manager Office of any changes or if a potential problem is noticed. If possible, leave a note for other expedition members explaining the change in rigging and why it was necessary.

### **Trails and Trail Markers**

We are very concerned about the preservation of all the resources in the cave. Everyone is cautioned to be very careful. In the past, "conservation", and "resource" were not words associated with caves, consequently, our permitted caves have "Impact Trails" throughout. The Cave Program is trying to establish only one trail through all areas of these caves. Please stay on these established trails. During exploration stages, pick the trail of least damage and mark it immediately and carefully.

When traveling through the cave, stay on established trails. Reflectors were installed to focus the bulk of visitor traffic on the "Impact Trail." All team members shall be aware of these and re-site them when they get knocked over. Red is in, White is out.

If trails are hard to see, either re-flag them immediately or notify the Cave Program so that we will know of the problem. Flagging use in the permitted caves are as follows:

Orange for marking most trails.

White for Snowy River Pool Deposit Center Trail

Diagonal White & Blue Stripes, denotes sensitive areas such as gypsum crust, aragonite etc.

Diagonal White & Red Stripes, denote off-limits areas.

Blue, is utilized for survey stations

When flagging a trail, use plenty of flagging tape and flag both sides. This helps keep the trail as narrow as possible.

Crystal Crawl is rock-lined 36 inches wide which is just over adult body width, again to focus movement on the center impact trail and preserve areas where gypsum needles are regrowing. As you travel the passage, pull rocks that have gotten moved out.

## **Attitude, Behavior And Conduct**

Carelessness and disregard for resources has taken place in permitted caves over many decades. With today's knowledge about resource protection, there is no excuse for needless damage to cave resources. Intentional damage to make it easier to move through certain areas would be treated as serious violations and would be prosecuted. Such actions may result in denial of access to BLM-managed caves, commensurate with the nature of the violation(s). Continued occurrences in BLM permitted caves would cause the area in question to be put off limits to everyone.

1. No cave material (minerals, speleothems, bones, etc.) may be removed from the cave without a valid existing scientific collecting permit. Collecting for someone else who has a valid collecting permit requires written authorization from the permit holder and from the Cave Specialist.
2. No digging, hammering, or breaking of formations, rocks, etc. may be performed without permission.
3. Aqua Socks or other clean, non-marking shoes must be worn when crossing flowstone areas. Wearing boots or walking barefoot across these areas is not allowed.
4. There would be no wading or swimming in pools to reach cave passages or leads without the consent of the BLM authorizing officer or his representatives. Any pools in newly discovered areas must remain pristine and untouched.

## **Climbing in Cave**

1. There is climb potential in the permitted caves. At this writing there is no record in Roswell Field Office Cave Files of exploratory climbs, although we know most elevated leads have been looked at. Those wishing to do climbs shall clear suggested climbs with the Cave Program manager before attempting any climb.
2. The use of bolts, while not strictly prohibited, must be approved by the Cave Manager before hand and shall be used sparingly. Any bolt that would not be used after an initial climb must be removed and the hole covered. Any bolt or hanger that is to be left in place must be made from austenitic stainless steel. If you have any doubts as to the metallic composition of the bolts, do not use them.

## **Resource Protection Zones**

The following areas, due to their sensitive, fragile nature or on-going scientific research, are off limits to all persons without permission of the BLM authorizing officer or his representatives. The areas of ongoing scientific research would be well flagged and you are cautioned not to go beyond a certain point. Please do not visit or disturb these areas. Those entering these areas without permission would be denied future access to all off trail areas:

1. Lincoln Cavern.
2. Bat Cave.
3. Priority 7
4. Starry Nights Passage
5. Snowy River Passage

### **Unexplored Areas and Survey, Inventory & Mapping**

1. Exploration in BLM permitted caves may not occur without surveying what you see. Survey as you go. Exploration (scooping) Without Surveying Is Strictly Prohibited. Violators would be denied future access to the cave. Standards listed in Appendix 2 above must be adhered to when inventorying and mapping.
2. Discovery teams may name new areas, but names deemed inappropriate or distasteful would not be accepted.
3. When moving into unexplored areas, trails shall be established that do not damage cave resources. Persons running lead tape position, shall carefully evaluate the passage and choose the path that would do the least damage to the cave. Trails shall be flagged immediately, so that those persons who follow would not have a choice as to where to walk. They would have to stay on the established trail.
4. Entering Extremely Sensitive Areas, such as aragonite bushes blocking the path, or other noteworthy speleothems deterring progress, stop and do not proceed. Notify the Cave Program manager. The authorizing officer or his representatives would make a decision of this magnitude.

### **New Discovery Classification**

Upon new passage discovery, the subject area would automatically be designated Classification 5-E-IV (Appendix 5):

1. Management Class 5 caves or cave sections are closed to general use because they contain paleontological, geological, biological, archeological or other resources of special scientific value that would be easily altered, even by careful use of the cave. This does not exclude administrative entry for management purposes such as monitoring research activities, impacts upon the cave, or the rerigging of ropes for the safety of those who work in the cave. The extent of the cave makes it important that limited, careful exploration when accompanied by survey and inventory be allowed to continue as part of this classification.
2. Resource Class E caves or cave sections contain resources of scientific value that can and/or would be seriously disturbed by frequent visits, or by visits of cavers unfamiliar with the cave's unique resources. Scientific resources may be either archeological, biological, geological, mineralogical, or paleontological in nature.

3. Hazard Class IV caves or cave sections extremely hazardous from a structural standpoint. Experience indicates that exploration should be conducted by no less than three cavers, all of whom must have considerable caving experience that includes vertical descent and climbing. All members must observe caving safety and vertical safety rules and must use the following basic equipment:

- Aqua-type shoes or boots with non-marking soles
- UIAA-approved caving/climbing helmet
- Electric headlamp mounted on helmet
- At least two backup light sources
- Water and food for a 24-hour period
- First aid kit
- Appropriate descending and ascending gear
- Cave pack or other bullet-shaped soft pack
- Specialized clothing as determined (e.g. Tyvek suits).

Failure to comply with these conditions may threaten your future access to permitted BLM Roswell Field Office Caves.

## **Administration, Monitoring And Resource Protection**

### **Permits**

1. Except for maintenance or administrative purposes, no permitted cave pristine or off-limits passage or room may be entered without an approved cave permit. Everyone on a trip must sign the permit which also serves as a liability release form. Prior to a proposed trip, a written application must be submitted for review by the cave manager or his/her assistant.
2. The Cave Program manager, Resource Staff, has the authority to approve permits for Class 2, 3 or 4 caves. Permits for Class 5 and 6 caves must be approved by the BLM authorizing officer or his/her designate. A signature of approval on the application form constitutes a valid permit under the conditions of the form. Solo expeditions would not be permitted.
3. Permits must be returned to BLM issuing office within 5 days following trip completion. This would help insure that trips are completed safely and that accurate records of cave use are kept. These records would be maintained by the Cave Program manager. On Class 3 trips, groups inexperienced in caving techniques shall be accompanied by at least two experienced leaders to assist the group, to help with emergencies and, to assure that no one remains under-ground unescorted in the event that one leader has to accompany someone back to the entrance.
4. Anyone that demonstrates incompetence, failure to cooperate, negligence or other actions detrimental to their own or the group's safety, or to the cave resources, would be

disciplined accordingly. All incidents would be documented and the BLM notified as soon as possible. Evidence of incompetence, past negligence, or willful vandalism would be cause to deny a permit request. Failure of all trip members to read, understand and sign the permit before entry into the cave invalidates the permit.

5. The BLM reserves the right to include a staff member on any trip and empowers that staff member with the right to abort any trip that endangers cave resources or personnel safety.

## **Visitor Use Monitoring And Resource Protection Programs**

### **Visitor Use Monitoring**

1. Due to the nonrenewable nature of most cave resources, it is important that the impact of various types and intensities of use be carefully and systematically documented so that acceptable levels of use can be estimated and a reasonable carrying capacity established for each cave before irreparable damage is done. Due to individual variation, each cave must be monitored and its management evaluated separately.

2. Carrying capacity is established from the correlation of two important types of information: cave use and the measured condition of the resource associated with various levels of use. The resource used to evaluate impact must be accurately measurable with a consistent technique, and its condition must be correlated with the presence of people in the cave.

### **Techniques**

#### *Photo and Video Monitoring.*

Photo monitor points would be established during initial survey.

1. Quantitative and qualitative measurement of cave resources is generally more difficult than measuring visitation. Within the permitted caves, the monitoring of cave vistas and, when possible, water quality are principal indices of cave use impacts. Cave micro-climate may also be monitored.

2. Vistas are measured using a system of fixed photo points and video points established at selected sites within the cave. Each site is marked with an unobtrusive identification tag. These photos and videos provide comparative qualitative and quantitative data for any resources visible within the photograph.

#### *Pool Monitoring*

Although very shallow and limited in amount, future discoveries may result in larger pools. Aquatic systems are vulnerable to alteration by people and include indices of change that are relatively easy to measure. Ions, turbidity, and other parameters that are

likely to be altered by human activity would be monitored periodically, where feasible, to quantitatively measure any change within the cave.

#### *Formation Breakage Monitoring*

Speleothems found throughout the permitted caves are very vulnerable to damage; damage still occurs. Periodic counting of broken formations would be done. This is to establish breakage rates and to pinpoint areas of more significant impact.

#### *Biological Monitoring*

Cave ecosystems are fragile and subject to detrimental effects by human disturbances. A base line for each cave shall be developed and periodically monitored. This includes bat species and populations.

#### *Radon Monitoring*

Levels of alpha radiation within Southeastern New Mexico caves are sufficiently high to warrant setting limits of exposure based on the highest monthly readings recorded. The radiation is caused primarily by radon 222 (Thorium). Past research at Carlsbad Caverns has shown that employee long-term exposure to radon is well below the maximum permissible as by OSHA. Alpha radiation is no threat to visitors and the threat to staff appears minimal.

#### *Gates*

1. Gates are an obstruction on the aesthetic integrity of the cave entrance and other sections. They often alter the ecology of a natural cave, hindering or entirely impeding airflow, nutrients, detritus, and the movement of bats and other organisms in and out of the cave. The entrances to many caves are so large that gates would not be feasible. Interior gates may be used to restrict access to areas of significant hazards (e.g. Class V) or which merit special resource protection. Gating is used to protect cave resources only where the need is considered essential by the Cave Program manager or authorizing officer and a biologically neutral (bat and other animal friendly) gate can be constructed. National Environmental Protection Act (NEPA) documentation would be required for all gate construction. Any EA requirements can be tiered off the Main Gate and Hell Hole Gate EA's.

2. Jim Cox shall be retained to construct any additional gates. If Cox is not available, his state-of-the-art design shall be followed (see EA's on file in Roswell Cave Program):

- Bat-friendly vandal-resistant horizontal spacing/riser design
- Substantial depth and width concrete footing
- Schedule 80 round pipe with suspended interior free-rolling stainless steel bars

- Exterior hardening rods
- Exterior military or aircraft-grade black epoxy paint
- Heavy piano-style hinge
- ½-inch steel plate lock boxes
- Anodes attached (to prevent corrosion up to 30 years)

Volunteers are willing to help build and install gates - coordinate with the caving community representatives.

### **Cave Alteration Situations And Conditions**

1. During cave exploration an area may require enlarging to permit entry into new passageways or chambers.
2. Permission to enlarge a constriction, or to dig through breakdown or cave fill, must be obtained in writing from the Cave Program manager.
3. Environmental alterations and potential damage to cave resources would be given the highest priority considerations before permission to alter a cave is given.
4. NEPA documentation would be required before any changes may be made to the natural conditions.
5. Explosive charges or mechanical devices, such as "rock splitters" or "jack-hammers," would not be authorized for use in permitted caves except for pre-approved, coordinated construction uses.

### **Maintenance Standards**

1. The BLM Roswell Field Office Support Staff is ultimately is responsible for the upkeep of all BLM facilities, including those underground. All cave gates have been approved by the BLM Roswell Operations Chief for engineering integrity prior to construction and installation. This requirement would continue.
2. The Operations Chief and the Cave Program manager would be responsible for assuring that maintenance techniques do not degrade the permitted caves beyond trails or other cave developments. During maintenance projects in the cave, tools and materials shall not be left in the cave for extended periods and when not in actual use shall be concealed from public view. Exotic substances that would wash or roll off developed areas and enter natural cave areas shall not be used. Cave trails may be periodically washed to remove silt and foreign material buildups which create a slick and hazardous trail surface. All materials, including the waste water, shall be removed from the cave.
3. The use of internal combustion engines in the cavern environment would not be permitted except during daytime local low-pressure airflow out of the cave at the Main Gate. Interior use would be detrimental to cave atmospheres and biota. Additionally,

exhaust fumes may have an adverse effect on speleothems and be a hazard to employee health.

### **Cave Restoration Programs**

1. Any visitation in caves causes some direct degradation of cave resources: Foreign matter resulting from human use, such as lint, algae, fungi and bacteria would be problems. To help maintain a natural cave environment, most these materials would be periodically removed, although the natural flooding process in the Main Passage causes that area to remain highly resilient. Trips into off-trail areas often result in mud buildup on flowstone and formation areas. These areas would be monitored and cleaned periodically. Care must be taken in establishing trails through any cave. Speleothem breakage is very difficult to restore.
2. Cave restoration work would be scheduled and supervised by the Cave Program manager. This type of activity shall not be undertaken by untrained persons; knowledge of caves is of the utmost importance. Restoration projects requiring specialized knowledge or skills not available in BLM staff would be performed by experienced persons on a volunteer or contract basis.
3. Chemicals detrimental to the caves ecosystem and/or to cave users would not be used in restoration work on a normal, regular, or routine basis. Exceptions must be approved by the Cave Program manager. Direct and indirect effects of all restoration techniques must be carefully monitored to help insure protection of the cave environment. A cave restoration log would be maintained to document both the details of restoration activities and the results of restoration impact monitoring. Individuals or groups involved in cave restoration work would be responsible for the removal of all evidence of their activities (e.g. footprints, tools, etc.) from work areas.
4. No historic or prehistoric items may be removed from its original setting in the cave without supervision of the BLM archaeologist.

### **Research Guidelines**

1. Ongoing cave research is conducted within the permitted. The majority of this research is contributed by individuals interested in studying caves. Any competent researcher with a proposed project that is consistent with BLM cave management policies and likely to contribute to the management and understanding of cave resources would be encouraged to work. Research proposals must be submitted to the Cave Program manager for review and approval or disapproval.
2. Based on the proposal and completion of a volunteer agreement, a project plan would be prepared by the Cave Program manager. Project leaders would work under a separate permit for each daily session.

3. Researchers would provide the Cave Program manager with data from their studies in an appropriate format, such as field notes, photographs, special reports, scientific articles, and /or other materials.
4. Researchers would meet with and present their findings to the Cave Program manager and other appropriate staff or researchers.

### **Interagency Collaboration**

Bureau of Land Management, Roswell Field Office, would collaborate with its adjacent Carlsbad Field Office; the Carlsbad Caverns and Guadalupe Mountains national parks; and the U.S. Forest Service, Guadalupe and Smokey Bear ranger districts, Lincoln National Forest) on cave management activities. To achieve this end, a Memorandum of Understanding has been implemented between all three agencies specifically for cave management concerns. Much of the content of this plan was developed jointly with these agencies. Cave Program staff occasionally engages in joint cave surveys with other agencies to reduce costs and enhance efficiency.

### **Procedures For All Caves Under The Federal Cave Resources Protection Act (FCRPA) Of 1988 (PI 100-691)**

#### *Need*

1. Significant caves on Federal lands are an invaluable and irreplaceable part of the Nation's natural heritage; and
2. In some instances, these significant caves are threatened due to improper use, increased recreational demand, urban spread, and lack of specific statutory protection.

#### *Stated Purpose*

1. To secure, protect and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people; and
2. To foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.

#### *Definitions*

1. The Federal Cave Resources Protection Act (FCRPA) of 1988 defines a cave as: Any natural occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge (including any cave resource therein, but not including any vug, mine, tunnel, aqueduct, or other manmade excavation) and which is large enough to permit an individual to enter, whether or not the

entrance is naturally formed or manmade. Such term shall include any natural pit, sinkhole, or other feature which is an extension of the entrance.

2. The Interior Department regulations (43 CFR Part 37) implementing the FCRPA state the following:

#### *Cave*

A cave must be traversable by a human, must be a minimum of 50 feet long and its entrance cannot be as wide as the cave is long. A vertical cave must be at least 20 feet deep. Features that do not meet this criteria would not be considered to be karst features.

#### *Karst Feature*

Cavities, sinkholes, or other solution features that seem to be a cave, but do not quite fit the definition given above.

#### *Cave Name*

When a cave has an established name, this would be retained unless deemed inappropriate. The changing of a cave name is a serious matter and must be well documented, tentatively approved by the BLM authorizing official, and final approval must come from the Council on Geographic Place Names. In the case of a cave without an established name, a number would be assigned. Discoverers can name a new cave section, but it cannot be named after a living person nor be inappropriate or distasteful. Also, it may not be named after a geographic feature which may give away its location. All new names are subject to cave Specialist approval.

#### *Cave Records And Files*

A file for each cave or sensitive section, such as Lincoln Cavern, is to be maintained separately and kept in a locked, secure location with limited access. Each cave file must contain the following at a minimum:

1. Discovery Date
  2. Finders
  3. Assigned number
  4. How located
  5. How and why named
  6. Topographical map of area showing the location of the cave
  7. Directions for reaching the cave entrance
- 
1. Road log by tenths of a mile
  2. Walking distance, both vertical and horizontal
  3. Approximate walking time at an average pace
  4. Pedometer log or step log

5. GPS coordinates in UTM
8. Detailed descriptions of hazards present within the cave, and/or enroute to the cave entrance, including recommended equipment and procedures for reaching, entering, and exploring the cave. Rope lengths for each situation shall be specified.
9. Detailed descriptions of major features of the cave, including speleothems, fauna, flora, biological, hydrological, geological, archeological, paleontological, etc.
10. Recommendations on type and amount of use restrictions.
11. Cave Map, including plan view, vertical section, and all original survey computation notes, unless an agreement beforehand lets an organization other than the BLM keep the original notes. If this is the case, then a good copy of the notes would suffice.
12. Photographs showing the cave's entrance and at least the cave's major areas and features. Notation would include the photographer and the date the photograph was taken.
13. Significant trip reports.
14. Permanent record, listing date of each cave entry and number of cavers on each trip.

## **Appendix 2: Cave Survey Standards For Roswell Field Office Permitted Caves**

In order to impact caves as little as possible while gathering a maximum of information from each survey trip, a set of survey standards have been developed that must be adhered to by all parties involved in cave survey. The Cave Program would work with each group to help bring everyone up to these standards. The main objective of surveying teams shall be the gathering of quality data.

All original notes would be turned over to BLM at project completion. The notes shall be turned into the Cave Program manager according to project plan stipulations. Copies of notes would be provided on request to those doing the work.

Survey teams are limited to 4 individuals per team. Following are authorized survey party position descriptions:

### **Sketcher Position**

The sketcher is the most important person on the survey team and has the most responsibilities regarding survey trips. He or she is responsible for the team. The sketcher must ensure that any unsurveyed passage seen by any member of the team is surveyed on that trip. He or she must also ensure that backsights are read and recorded.

Once the team begins to survey, the sketcher becomes the team leader and controls the speed and ultimate direction the team takes. All other team positions shall work with the sketcher to help accurately survey the cave passage.

BLM-provided cover sheets and data sheets shall be used unless specifically stated in a written formal agreement that the originating party can use their own sheets. This is to help bring consistency to the various surveys being performed in the permitted caver. All surveys shall have a cover sheet and shall be filled out completely. When filling out the cover sheet, be sure to record the name of the cave, the general area of the cave, and survey station. Also record the full name of those individuals participating in the survey.

Data sheets are straight-forward and should make note-taking easier. Enter one station per box with the distance, azimuth, vertical angle, and passage dimensions in the corresponding boxes. Do not write two station numbers per box. This is confusing when it comes to data entry. Also, record all numbers using decimal points, not fractions. This makes it much easier for data entry.

Sketchers shall have designated letters to use for new stations before entering the cave. These would be provided by the expedition cartographer or the Cave Resources Office. The sketchers goal is to produce a quality sketch that accurately depicts the passage that has been surveyed and to record all necessary notes, numbers, etc. that accompany the sketch. The sketcher is responsible for making sure that all needed items are done correctly.

There are three types of drawings that must be produced for all surveys. These are the plan, profile, and cross-sectional views. All drawings must be drawn to scale, on graph paper, and shall have a north arrow and a distance scale on each page. The sketcher shall use an appropriate scale for the passage being sketched. The sketch shall not be so small that it is impossible to show any detail, but it shall also not be so large as to not fit well on the page. If the passage is small to medium in size, then 20 or 30 feet to the inch would work well. If the passage is large to extremely large, then 50 feet to the inch is appropriate.

Heavy dots or small triangles can be used to denote survey stations. Make sure the stations are marked accurately and labeled clearly on the sketch. If during the course of the survey, you change scales on your notes, be sure to clearly indicate that a scale change has taken place. The sketcher would take legible notes that are clean and neat.

### **1. Plan View**

This drawing shall be done with a protractor and ruler, to scale on graph paper. The plan view shall concentrate mostly on floor detail. Cave walls, boulders, columns, flowstone, drops in the passage, etc. shall be drawn in their proper positions and orientations. Smaller features shall be added with general symbols such as gravels, sand, mud, dirt, etc. The use of floor-sloping symbols are OK and necessary in places, but the composition of the floor should also be apparent from your sketches. Writing a general statement such as "All floor detail is gypsum" is not an acceptable practice for most situations. Sketchers shall take the time to fill all floor detail in on the plan view with the proper symbols.

If you have plotted stations accurately, any major survey errors should show up in your sketch.

### **2. Profile View**

A running profile, taken from survey point to survey point, should accurately depict ceiling height changes, floor changes, height of station above the floor, formations such as stalagmites, stalactites, soda straw areas, rocks, boulders, bedrock, and other important features that help relay more information about that particular passage. Be sure to include ceiling leads on the profile as well. The profile shall also be plotted accurately. It can be located next to the plan sketch or done on a separate sheet of graph paper. Label the survey points with heavy dots or small triangles and the station name.

### **3. Cross-Sections**

Cross-sections are an important part of the sketch and shall be done whenever there is a significant change in the character of the passage or every 100 feet or so. You can never have too many cross-sections. Make sure the cross-section and the view direction is clearly marked on your sketches. Like the profile view, they shall depict all important features that are found when looking in cross-section at that particular point in the

passage. Obviously, this would include the general shape of the passage. When surveying a large room, cross-sections as well as a running-profile down the middle of the room are very helpful.

#### **4. Passage Dimensions**

Passage dimensions are most accurately being recorded on the plan, profile, and cross-sectional sketches. However, it is very time consuming for someone to go back over all sketches to retrieve needed data. It is much easier to record passage dimensions as the stations are being established. The goal is to record numbers for left-wall, right-wall, ceiling, and floor that best represent the actual passage dimensions at that point. Sometimes a station will be located in a position that is not indicative of the passage itself and it would be necessary to assume that the station is in the middle of the passage. In most cases, the distance from the floor and ceiling as well as left and right wall would be an estimate. For left and right wall try to estimate the distance across the passage from the station. Measure across if this is feasible and more helpful. If the ceiling height is very high, try to triangulate to a point on the ceiling and a point of the floor. Left and right wall measurement would be taken at right angles to the survey line.

#### **5. Mapping Rooms and Large Passages**

When mapping a large room, you can either pick a spot in the middle of the room and do a series of spray shots to determine wall locations or do a perimeter survey around the room. Spray shots or perimeter surveys do not contribute to the caves total length. These extra survey shots are used to firmly establish shapes and sizes of the larger rooms and passages. The goal of each survey is to produce a quality set of notes with minimal impact on the cave features.

If needed, the Cave Program manager would work with each group to help bring and keep sketchers up to approved standards, but would have the final say on each individual. Any group to survey in permitted caves shall submit names of individuals they would like to be sketchers to the BLM Cave Program manager. This shall be done well before any work begins. Copies of notes taken on other cave trips by individuals unknown to our Cave Resources personnel shall be included if they wish to be sketchers. The Cave Program manager would then work with the Chief Cartographer or Expedition Leader of each group to establish the designated sketchers for that project. Constructive criticism would be provided to each sketcher after each work session.

#### **Instrument Position**

Brunton Compasses would not be used during survey work. Pentax precision survey equipment or Suunto equipment would be used.

The instrument person is a very important position and requires diligence and care. This person is responsible for making sure the instruments are in good working order and have been run through the test course. Several different types of instruments may be used;

however, they must all be in degrees and must be oriented to magnetic north. Instruments utilizing quadrants may not be used. Readings shall be to at least .5 degrees, i.e. 105.5 degrees. If the instrument reader can comfortably read to the nearest .25 degrees, then that is acceptable also.

In order to prevent resurveys because of loop closure errors, Backsights and Foresights must be read whenever possible. When compared, the resultant readings shall be no more than 2 degrees different. If a discrepancy of larger than 2 degrees occurs, then the readings shall be redone. Remember, the goal is to produce a Quality Survey. This is not a race. Sometimes, because of the difficulty of reading instruments between two particular stations, no amount of rechecking would provide agreement between the foresight and backsight. Usually, the instrument reader will have more confidence in either the foresight or backsight. He or she shall communicate to the notekeeper which one is thought to be more accurate. The notekeeper would then circle the better reading. Certainly, this would not be the case at all stations, but should help when looking at loop closure errors. Loop closure errors of greater than 2% are considered unacceptable and may show the need for resurveying a portion of that loop. In order to avoid resurvey, it is very important that the instrument person be experienced and careful.

Every effort to read backsights shall be made; however, sometimes this is impossible. Tight crawlways and other hard-to-get-to positions are examples of impossible conditions. This does not relieve the team of the responsibility to get backsight readings whenever possible. Once again, the real push is to produce a quality survey and as such it takes time.

For those using a Suuntos compass and inclinometer, be sure to use just ONE eye and move the instrument back and forth or move your eye up and down to accurately line up the station point and the line in the instrument. Using the two-eyed method often introduces errors in your readings because the eye looking through the instrument and the eye looking at the station point are in two different locations.

### **Instrument Readers**

Persons who consistently show unacceptable loop closure errors would not be allowed to read instruments in the BLM permitted caves.

Using graph paper, pick a point on the ceiling to be measured. Establish station 2 directly under this point. Measure the distance between station 1 and station 2 (Vertical angle MUST be 0). Take the inclination between station 1 and the point on the ceiling directly above station 2 (3 on the illustration). Plot this data in the survey book. Drop a perpendicular line from the point on the ceiling to station 2. This is the ceiling height which can be measured directly from the graph paper. Cartography and map production maintain control.

## **Lead Tape Position**

This position on the survey team is as important as the sketch and the instrument reader. The lead tape determines the route to take unless the sketcher overrides his decision. (Remember the sketcher controls the survey team at all times.) It is the responsibility of the lead tape to locate survey stations an optimum distance from the previous station while planning ahead to the next station. A station shall also be set at any leads that would be surveyed at a later date.

While setting stations, the lead tape must set them with the idea that the instrument person has to be able to read the instruments from that point. The lead tape position is responsible for flagging the trail as it is being surveyed so as to minimize the impact of future visitors to these areas. Other members of the team shall help in this endeavor also.

## **Survey Markers**

At this time, we have not established any one method for marking stations. Presently in use are hard plastic pieces with the station number written on them in permanent ink or blue flagging tape that have the station numbers written on them. Neither are ideal for every site, but work adequately. Station sites must be recoverable and well-marked. In addition, stations shall not be located on extremely fragile formations. The tape to be used must be in feet and tenths/hundredths of feet or meters and tenths/hundredths of meters. Tapes in feet and inches would not be acceptable.

## **Inventory Position**

The fourth person on a team inventories the features found near every station. If there are less than 4 people on the survey team, then one of the others can produce the general inventory of the areas being mapped. Recognizing cave features are essential for whoever does the inventory process. Novices should not be doing the inventory. The mineral inventory process being accomplished in Lincoln Cavern is complex and requires training. The mineral survey leader has the final say over who may participate in that inventory.

### **Appendix 3: Classification System**

The classification system described in this plan consists of a three element code rating made up of (1) a numeral indicating type of management, (2) a letter indicating resources contained in the cave and (3) a Roman numeral indicating its hazard rating. As such, a cave coded "2-D-II" describes: (1) an undeveloped cave that may be visited with a BLM Cave Program trip leader (Management Class "2"); (2) speleothems of unusual quality (Resource Class "D") and (3) moderate hazards with primarily horizontal passage (Hazard Class "II").

It is not expected that any cave would fit exactly into one individual category within this or any other classification system, but past experience in using this system at the Guadalupe Ranger District of the Lincoln National Forest, the Roswell Field Office of the BLM, and at Carlsbad Caverns National Park has proven its worth. For example, a Class III cave need not necessarily have a vertical drop up to 15 meters, as long as the other general characteristics would be descriptive of the cave. It would be necessary, particularly with large or extensive caves, to assign different classification ratings that may vary seasonally in order to minimize interference with, or safety hazards resulting from natural processes and populations.

A cave's rating may be changed as a result of findings from additional explorations or by the alteration or removal of a hazard or resource responsible for the initial rating. A cave's rating shall not only reflect what is encountered within the cave, but also what is encountered in reaching the cave. Details of the individual code elements are explained below.

#### **Management Classifications**

##### *Class 1*

Class 1 caves are developed caves. These include two types:

1. Highly developed caves (portions of Carlsbad Cavern) and
2. Minimally developed caves (Fort Stanton Cave).

Highly developed caves are managed to provide a visitor maximum comfort and convenience (e.g. hard surfaced trails, handrails, electronic lights, sanitation facilities, and elevators) and a variety of interpretive media (e.g. electronic self-guided tours, interpretive signs and ranger talks). The highly developed cave provides an opportunity for most visitors to tour the cave without special clothing, equipment, knowledge or skills. It fulfills the desires of most visitors, and permits large numbers of people to tour the cave daily.

Minimally developed caves are managed to provide relatively easy access with minimal modification of cave resources. Development normally consists of a designated trail following an easy-to-walk route. This fulfills the needs of those that wish for a more

natural cave experience without requiring special skills or equipment; only sturdy footwear, drinking water and a flashlight are needed. As a safety precaution, and for the protection of cave features, visitors unaccustomed to this type of cave experience can be accompanied by Cave Program volunteers specially trained in visitor services and interpretation.

### *Class 2*

Class 2 caves are undeveloped caves or areas that may be visited when visitors are accompanied by designated BLM trip leaders. Scheduling of trips into Class 2 caves or cave areas would be subject to the availability of a qualified trip leader. Class 2 caves contain sensitive natural and/or cultural resources, often of unusual quality. Trip leaders would be responsible for interpreting the cave and for insuring that each group takes all feasible precautions to leave the cave unaltered for future visitors.

Although access in some caves may be relatively easy, it may be quite difficult in others, requiring crawling and/or extensive climbing. Participants would be required to furnish their own equipment. These trips are for people that desire a wild caving experience and may require specialized skills.

Cave Program manager would designate qualified employees and/or volunteers to lead trips into Class 2 caves or areas. An employee would be designated to lead trips into a specific cave, caves or cave area, rather than Class 2 caves in general. Trip leaders would be selected on the basis of their knowledge of the access to the cave or cave area, first aid training, caving skills and leadership abilities. Leading scheduled trips into Class 2 caves or cave areas would become an additional duty of these employees and shall not supersede their regular duties. If a designated trip leader is not available without interrupting normal operations, the permit applicant would be asked to select an alternate date for the proposed trip.

### *Class 3*

Class 3 caves are undeveloped caves that may be visited by permit. The resources within these caves are less easily impacted than in Class 2 caves and they can be enjoyed without incurring significant alteration if groups are conscientious and conservation-minded. Class 3 caves vary from those that are easily accessible, to very difficult caves that require crawling and/or extensive climbing. Permittees are responsible for providing their own equipment. Evidence of incompetence, previous cave abuse (whether within permitted caves or not - federal cave managers routinely network through electronic means), or disregard for federal and state regulations would be grounds for denying a permit.

### *Class 4*

Class 4 caves are closed to general use pending further evaluation for designation in another management category. Caves are designated Class 4 because:

1. They are newly discovered and require further exploration, research, and/or inventory to evaluate how they shall be managed;
2. They have been explored and known for years but have not been sufficiently studied or inventoried; or
3. They are potential Class 2 or 3 caves that have been well-explored and inventoried, but are being withheld from reclassification pending the results of resource impact studies on caves currently being managed as Class 2 or 3.

Class 4 caves that have been explored and inventoried and are pending reclassification as Class 2 or 3 caves may be opened to small, guided groups. Such trips would be authorized only for groups with bona fide instructional need, or for BLM personnel, including volunteers, involved in cave interpretation. Otherwise, Class 4 cave entry is approved only for minimum administrative purposes and research.

#### *Class 5*

Class 5 caves are closed to general use because they contain paleontological, archeological, geological, biological or other resources of special scientific value that would be easily altered, even by careful use of the cave. This does not include administrative entry for management purposes, such as monitoring research and survey activity and the impacts these activities have had upon the cave, or the rerigging of ropes for the safety of those who work in the cave. When the extent of the cave is great, then it is important that limited, careful exploration when in conjunction with survey and inventory be allowed to continue as part of this classification.

#### *Class 6*

Class 6 caves are closed to all use except the minimum required for administrative entry. These caves are closed for such reasons as:

1. Extremely hazardous passage, even for the most skilled caver;
2. Extremely fragile resources in unavoidable areas;
3. Endangered specie habitats that may be threatened by visitors use; or
4. Preservation of the caves for future scientific study or comparative data bases.

### **Resource Classes**

#### *Class A*

Class A caves contain few or no features of scenic or scientific value, or are of the type that cannot easily be destroyed or removed. Basically, these are caves in which frequent visitation by cavers would involve an acceptable level of degradation.

### *Class B*

Class B caves contain speleothem or other resources of scientific value that, due to their size or their location within the cave, would not be easily subject to vandalism, disruption or destruction by visitor use.

### *Class C*

Class C caves contain speleothems that are either of such size or so positioned within the cave that they are unusually susceptible to breakage and/or vandalism. They may also contain other resources of scientific value that may be seriously disturbed or destroyed by visitor use may also be found in Class C caves.

### *Class D*

Class D caves contain speleothems that are of unusual quality or are extremely delicate and susceptible to breakage, or resources of scientific value that may be seriously disturbed or destroyed by cavers. Examples of Class D speleothems include selenite needles, gypsum flowers or hair, epsomite or mirabolite formations or crystals, and helictites.

### *Class E*

Class E caves contain resources of unusual scientific values that may and/or would be seriously disturbed by frequent visits, or by any visits of cavers unfamiliar with the cave's unique resources (e.g. biological species that have a sensitive habitat or are otherwise threatened). Scientific resources may be either archeological, biological, geological, mineralogical, or paleontological in nature, or they may be rare speleothems.

## **Hazard Classifications**

### *Class I*

Class I caves are the easiest to traverse. Visitation shall generally be conducted by no less than three cavers, who observe caving safety rules and use the following basic equipment: hard hats, three light sources per person, boots with non-skid soles and protective clothing.

Following are general characteristics of Class I caves:

1. Single, well-defined main passageway with no lateral passage.
2. No passageways less than 60 centimeters (24 inches) in diameter.
3. No step-type drops over one meter (three feet).
4. No known loose ceiling rocks.
5. Few loose rocks on the floor.

### *Class II*

Class II caves are mostly horizontal in structure, but present moderate difficulties to traverse. Visitation shall be conducted by no less than three cavers, one of whom is experienced. All members must observe caving safety rules and use the following basic equipment: hard hats, three light sources per person, boots with non-skid, non-marking soles and protective clothing. Following are general characteristics of Class II caves:

1. Well-defined main passageways with only dead-end lateral passages.
2. Crawlways less than 60 centimeter (24 inches).
3. No step-type drops over three meters (10 feet).
4. No known loose ceiling rocks.
5. Loose floor material.

### *Class III*

Class III caves are more difficult to traverse than Class I and II caves. Visitation shall be conducted by no less than three cavers, two of whom have moderate caving experience (including rope descent and ascent experience). All team members must observe caving safety and vertical safety rules, and use the following basic equipment: hard hats, three light sources per person, boots with non-skid, non-marking soles, and protective clothing with no loose or protruding attachments that may become entangled while doing vertical work. Each caver shall have a complete set of their own ascending and descending devices. (Note: Vertical equipment may not be needed in some Class III caves). Following are general characteristics of Class III caves:

1. Multiple passageways with straight connecting passages.
2. Vertical drops up to 15 meters (50 feet).
3. Loose rocks on ceilings over two meters in height. No known loose rocks in passages less than two meters (6 feet).

### *Class IV*

Class IV caves are the most difficult to traverse. Visitation shall be conducted by no less than three cavers, all of who have considerable caving experience (including rope descent and ascent). All team members must observe caving safety and vertical safety rules, and use the following basic equipment: hard hats, three light sources per person, with no loose or protruding attachments that may become entangled while doing vertical work. Each caver shall have a complete set of climbing equipment for descent and ascent of vertical pitches.

Following are general characteristics of Class IV caves:

1. Maze-type passageways.
2. Vertical drops over 15 meters (50 feet).
3. Loose ceiling rocks in crawlways under two meters.

*Class V*

Class V caves are those that may be prone to flooding or rock falls, or contain dangerous gases or airborne diseases. Class V caves shall only be entered by qualified cavers with special equipment, and only if the need for information is proportionate to the risk involved. Extra safety precautions shall be taken, and special communications and rescue capabilities available.

**Appendix 4: Roswell Field Office Cave Permit Documents**

**United States Department of the Interior, Bureau of Land Management  
Roswell Field Office, 2902 West 2nd, Roswell, NM 88201-2019  
Phone: 505-627-0278/0272**

**<<< APPLICATION FOR CAVE ENTRANCE PERMIT(S) >>>**

***THIS FORM IS NOT A PERMIT***

**Complete this Application and Return to the above Address Allow One Week for Processing. A Separate Permit Will Be Sent to You.**

Cave Name(s) and Interior Destination(s)	Intended Use Date	Alternate Dates	
		2nd Choice	3rd Choice
<b>FORT STANTON CAVE</b>			

**PERSON TO BE CONTACTED IN CASE OF AN EMERGENCY:**

Name, Address, Zip, Area Code, Day & Night Phone Number(s), Email:
--

**TRIP LEADER (Must be 18 years or older):**

1. Name, Address, Zip, Area Code, Day & Night Phone Number(s), Email, Fax Number (if available):
--

Names and Addresses of other people who will enter the caves(s). The consent of a parent or legal guardian is for all individuals under 18 years of age who will not be accompanied on the proposed cave trip by their parent or legal guardian:

2.
3.
4. Continues to #10

***THIS APPLICATION FORM IS NOT A PERMIT***

**PURPOSE OF VISIT:**  Recreation  Photography  Education  Research  
 Survey  Mapping  Administrative  Other: Describe

--

**PARENTAL OR LEGAL GUARDIAN CONSENT**

As part of the application to enter the cave(s) administered by the Bureau of Land Management, **I consent** to allow my child to participate in the proposed cave trip. The trip leader named on this application form is delegated the responsibility for the care and instruction of my child while he or she is in the cave(s). By my signature on this form, I also agree on behalf of my child to be bound by the permit General Conditions and any Special Stipulations that will apply to authorization for the cave visit.

<b>CHILD'S NAME AND AGE (Print)</b>	<b>SIGNATURE OF PARENT OR LEGAL GUARDIAN</b>
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	

<b>Continuation:</b>

***THIS APPLICATION FORM IS NOT A PERMIT***





**HAZARD AND SPECIAL STIPULATION SHEET "FSC"**  
**FORT STANTON CAVE**

COMBINATIONS	FENCE	GATE	HH	BC	LC

**GENERAL HAZARDS**

Make your trip a safe and enjoyable one by being prepared and careful. All caves contain some hazards which are common to the underground environment such as loose rocks, low ceilings, low or tight passages, slippery surfaces and uneven floors. Be prepared by using proper equipment, following safety hints and using common sense.

Specific hazards described below are those which are known by BLM, but additional hazards from various sources may have occurred since the cave was last inspected.

**SPECIFIC HAZARDS**

**MAIN CAVE (excluding Hell Hole)**

1. Slippery surfaces.
2. Low ceilings.
3. Loose breakdown.
4. Several tight squeezes.
5. Intermittent stream flow with deep pools (usually seasonal).
6. Hypothermic conditions due to cold water (39-45 degrees) in northern main passage (including summer).
7. Steep slopes.
8. Muddy conditions.

**BACK SECTION (including Hell Hole)**

1. Extremely long crawls.
2. Low ceilings.
3. Tight squeezes.
4. Loose rocks.
5. Slippery surfaces.
6. Muddy conditions.

**SPECIAL STIPULATIONS**

1. The Bat Cave, Lincoln Caverns and Priority 7 are **off limits, closed** to recreational caving.
2. No renewable or non-renewable resources (either plant, animal, cultural or mineral) shall be collected from this cave for any reason unless specifically authorized in writing.
3. No one shall intentionally deface any natural cave surface.
4. Overnight camping, firearms and open fires (except carbide lamps) are prohibited in the cave.
5. Do not annoy or disturb bats at any time.
6. Maximum group size in the Main Cave (this side of Hell Hole) is limited to ten (10) persons per trip.

7. Maximum group size in the Back Section (beyond the Hell Hole Gate) is limited to six (6) persons per trip.
8. There can be 16 total persons in this cave, as long as 10 are on this side of Hell Hole and 6 are on the other side of Hell Hole.
9. Avoid contact with bats - do not disturb bats at any time.
10. Some areas may be closed for research or to protect bat roosts and will be marked with flagging tape. Do not enter these areas.
11. No fires are to be built within the Surface Fence or Entrance Sink.
12. In areas which have a marked trail system, flagging or rocks, use the established routes - don't step off the trail.
13. **This cave is a major hibernaculum.** To protect hibernating bats, which include three threatened and endangered bat species, this cave is closed to recreational caving from November 1 to April 15 annually.

**Permission to be exempted from any of the above stipulations  
must be obtained in writing from BLM prior to entering the cave.**

## SAFETY AND CONSERVATION CHECKLIST WHILE VISITING & EXPLORING CAVES

**INQUIRED ABOUT THE CAVE BEFORE TRIP?** When taking a surface trip, you would make it a point to learn something about your route and the type of country you would be traveling through. Do the same with caves.

**AT LEAST ONE EXPERIENCED CAVER IN EACH CAVE PARTY?**

**NO ONE ENTERED CAVE ALONE.** Minimum party of three is the rule.

**WORD LEFT WITH SOMEONE, STATING WHICH CAVE VISITED.** Left approximate return time and instructions that if not returned within six hours of planned time, someone should be contacted for help. State police - 911 - have search and rescue responsibility in New Mexico.

**RAIN IN WEATHER FORECAST?** It is *extremely dangerous* to enter a gypsum or other storm-drain type cave if there is the slightest possibility of a rainstorm anywhere near the area.

**COMPLETE FIRST AID KIT WITH GROUP.** In case of injury in the cave: [1] one person goes for help while one person remains with the injured party. [2] keep injured warm and treat for shock. [3] if there is any doubt concerning the extent of injury, don't attempt to move the injured until help arrives.

**MINIMUM OF THREE SEPARATE LIGHTING SYSTEMS FOR EACH PERSON. HAVE SPARE BATTERIES AND BULBS.** Carbide lamps good for emergency backup and heat source. Chemical light sticks good backup light source.

**HELMET REQUIRED FOR EACH PERSON.** Construction-grade hard hats or UIAA-approved caving or rock-climbing helmets, with non-elastic chin strap fastened at all times while in cave. **No other helmet (ie, bike, skateboard, army) type is considered safe in a cave environment.**

**USED STURDY ANKLE-SUPPORTING, NON-MARKING LUG-SOLE HIKING BOOTS.** Leather soles are no good in caves.

**USED STURDY PROTECTIVE CLOTHING.** Coveralls or pants like blue jeans and long-sleeved shirts. Knee pads and leather gloves are standard items. Leather gloves protect formations from body oils and serve to keep your hands warm and clean.

**AT LEAST ONE QUART OF WATER PER PERSON.** Foods high in carbohydrates are good for this activity. A spare emergency food ration is recommended.

**ALCOHOL OR OTHER DRUGS LEFT BEHIND.** They cause disorientation and impaired motor function which can *easily* result in serious cave injury or death.

**PETS LEFT ON SURFACE.** They are not allowed in protected, permitted caves.

**AVOIDED ATTEMPTS TO PENETRATE PILES OF UNSTABLE OR LOOSE EARTH, ROCK BREAKDOWN.** These can be very dangerous!

**STAYED WITHIN OUR ABILITY AND EXPERIENCE.** Never attempt to explore further into cave than a point from which you could safely find your way out. Continually look back while traveling through cave passages. They look much different from opposite direction, and being able to recognize them might avoid trouble. Do not use string or other trash to mark your route.

**ON THE WAY OUT RETRIEVED ANY AND ALL ROUTE MARKERS,** such as flagging tape or reflective markers. If you don't they may confuse others and you have littered the natural cave environment. You are not doing anyone a favor by leaving markers behind - each group has to experience the cave for themselves.

**REMOVED ALL HUMAN WASTE FROM CAVE.** Cigarette smoke is not a natural cave element and can impact cave life. People have a tendency to unconsciously flip cigarette butts, resulting in litter and organic waste. Spitting tobacco and leaving other human waste can attract micro-organisms dangerous to human health. Microbial action on various types of human waste will cause unpleasant odors. Cave visitors are advised to remove all human waste from cave environments and dispose of it properly.

**REMOVED ALL MANMADE LITTER FOUND IN THE CAVE, EXCEPT FOR SURVEY MARKERS AND SPECIAL FLAGGING TAPE, CLOSING AN AREA OR MARKING A SPECIAL FEATURE.** Burying garbage in-cave is unhealthy for the cave environment; on the surface, it is dug up by wild animals and blown around by the wind. Package spent carbide in plastic

bags or plastic containers, remove it from cave and dispose of it properly. *Spent carbide left in-cave kills cave life!*

**AVOIDED CONTACT WITH BATS.** Disturbing hibernating bats causes them to use up stored food reserves, which cannot be replenished due to lack of insects for food, resulting in death. Hibernating bats may also die from shock if they are suddenly awakened. All bats in this region are insect eaters, one bat can eat up to six times its weight in insects per night. A bat colonies are of great benefit to area farmers!

**DID NOT TOUCH FORMATIONS WITH BARE HANDS.** Caves are very fragile and are subject to vandalism and unintentional damage. Many formations will break at the slightest touch and can't be repaired or replaced. Oil and mud from your hands will stain formations and inhibit their natural growth.

**AT SURFACE CAMP PRACTICED *LEAVE NO TRACE* OUTDOOR AND BACK COUNTRY ETIQUETTE.**

**LEAVE NO TRACE** is a national program that emphasizes to all backcountry users: pack out what you pack in, leave backcountry places cleaner than you found them, and leave natural and cultural resources intact for the benefit and enjoyment of future generations. This is how citizens can join with public land agencies in maintaining and protecting beautiful, fragile public lands - both arid and forested, surface and underground.

**KEPT CAMP CLEAN - LEFT CAMP CLEAN. NATURALIZED SITE BEFORE LEAVING.** Earn the appreciation of those who follow you and set a good example for them, too.

**RESPECTED PRIVATE PROPERTY AND OBTAINED PERMISSION FROM THE OWNER(S) BEFORE CROSSING.**

**VEHICLES, ROADS AND GATES.** Leave all fences and gates as found. Park vehicles to avoid blocking roads or gates. Operate vehicles only where they will not cause ruts or start erosion. Avoid driving on two-track dirt roads when wet. Stay on established roads wherever possible.

**AVOIDED DISTURBING WILDLIFE AND LIVESTOCK BY CAMPING AWAY FROM WATER SOURCES.** Watch speed during lambing and calving season, March and April. Lambs separated from mothers usually don't survive. Waited for sheep to clear road before passing.

**USED ONLY DEAD AND DOWNED WOOD FOR CAMPFIRE. BUILT CAMPFIRE ONLY IN SAFE PLACES AND NEVER LEFT THEM UNATTENDED.** Be aware of fire danger in area: you are responsible for checking with local, state and federal agencies to find out if fire restrictions are in effect. A person or persons who cause a wildland fire may be held financially liable for suppression costs.

### **CAVERS' MOTTO:**

**TAKE NOTHING BUT PICTURES & INSPIRATION  
LEAVE NOTHING BUT WELL-PLACED FOOTSTEPS  
KILL NOTHING BUT TIME**