

## BUREAU OF LAND MANAGEMENT

### CAVE SAFETY STANDARDS

Visitor and employee safety is the foremost objective of the Bureau of Land Management (BLM)'s cave management program. The purpose of the BLM's Cave Safety Standards is to establish a course of action that can be followed to assure minimal risk to people (both BLM employees and the general public) entering caves on public lands. These standards consist of Cave Safety Guidelines, Search and Rescue (SAR) Pre-Planning, and Risk Assessment (previously the Job Hazard Analysis).

Most cave environments are safe for human use. A safe caving experience depends on sound decisions and staying within abilities. There may be possible risks associated with entering caves, as with any recreation activity.

Ill-prepared or uninformed personnel face the greatest risk in cave entry. Most cave accidents are avoidable with prior planning, training, and the use of the proper equipment. BLM's obligation is to educate cave entrants to the extent possible so they can make informed decisions about their own welfare. Public information and education efforts will continue within funding and manpower limits.

Frequent cave entrants are usually informed and aware of most of the inherent risks that may exist in caving activities. The BLM entered into a Memorandum of Understanding (BLM-MOU-WO 250-2007-01) with the National Speleological Society (NSS) for assistance with managing cave resources. This MOU provides for cooperation between the BLM and the NSS local chapters for the cooperative development of cave safety plans including standards for equipment, experience, and rescue procedures. The NSS's affiliated Grottos or local caving groups associated with the NSS should be contacted when information is needed on the locations and risks associated with caves in your area. The NSS has Grottos in 47 States; a list of the Grottos can be obtained from the NSS. The NSS National Office may be reached by phone at (205) 852-1300 or via email at [nss@caves.org](mailto:nss@caves.org). The web site address is <http://www.caves.org>. The local caving community can assist the BLM with completing cave safety analysis and by making recommendations for personal protective measures for cave entry.

**CAVE SAFETY GUIDELINES:** The following guidelines will serve as a recommended course of action for BLM employees:

1. The local caving community (NSS affiliated grotto) should be contacted to assist the BLM in conducting a uniform safety analysis for each cave under BLM administration. The results of this analysis should be utilized to implement visitor awareness by informing all cave users (BLM and general public) prior to entry into the cave.

The BLM will take the necessary steps to inform and educate cave visitors of the steps necessary for a safe trip. These steps will include a list of known safety risks to inform the visitor of cave use authorizations, cave use registration stations, and cave entry signs. Some caves may require additional monitoring to reevaluate conditions.

2. A Cave Search and Rescue Workshop should be attended (or hosted by offering facilities or organizational assistance) by BLM cave specialists and other personnel responsible for cave use administration. These Cave Search and Rescue Workshops are sponsored primarily by the National Cave Rescue Commission, the National Outdoor Leadership School, National Park Service, and County or State Search and Rescue Groups. These workshops, lasting from one to eight days in length, are intended to increase rescue awareness and improve coordination between rescue personnel, organizations, and agencies.
3. Training should be provided to BLM cave specialists in climbing techniques required for the safe use of caves. BLM should take an active role by co-sponsoring and assisting in such training. Training will consist of above-ground orientation and underground experience with a qualified cave leader. Employee technical skill training and experience are essential to aid in the prevention of injuries and enable employees to better judge the skills of visitors.
4. Employees will conduct underground work in groups of three or more, never alone. This also applies to volunteers.
5. Employees will lead underground operations only after receiving adequate training and having sufficient experience in the cave to be visited.
6. Training should be provided in relevant winter, desert, or other local climatic survival techniques for employees with cave management duties. Basic survival equipment will be made available to cave specialists.
7. Due to the twilight zone of caves being utilized by wide variety of mammals, reptiles, and insects, caution should be used when entering or exiting the cave to avoid potential risk. BLM employees will be trained to avoid this risk and the proper actions to take should an employee be stung or bitten. Proper medications and first aid supplies will be made available to employees. Visitors will be cautioned when entering these areas as a part of the permitting process.
8. BLM cave specialists will receive Red Cross Basic First Aid Training or a Wilderness first aid training course as soon as possible. This can be part of the annual CPR/First Aid Training offered to all BLM employees.
9. Caving and cave rescues take place in a very fragile environment. All possible care should be taken to assure that both cavers and cave rescuers impact this environment

as little as possible. The Leave-No-Trace philosophy should be adhered to. Whenever possible, cave specialists are to use established trails, are not to touch formations or disturb Cultural or paleontological resources, and should carry out all wastes and trash. This includes all human waste. The disturbance or discovery of cultural or paleontological resources should be reported immediately to the BLM Field Office Manager

10. Light sources should be helmet mounted in order to leave the hands free for negotiating the cave. It is recommended that the primary and first back-up light source be helmet mounted. The third light source is usually a flashlight on a lanyard. The lanyard should go over the shoulder and under the arm rather than around the neck.

11. In all cases of entry into caves that are heavily utilized by bats, rodents, or other animals, personnel will wear protective clothing to avoid possible health risks introduced by the animal droppings. Personnel will avoid these areas when possible.

12. When negotiating uneven or slippery cave passages, a belay should be used. Training in the proper procedure for belaying should be practiced before the trip with the device which will be used on the trip.

13. A minimal number of caves may have atmospheric conditions that are not favorable for entry. Cave atmospheres and other associated hazards will be evaluated as part of the Risk Assessment process and handled on a case-by-case basis. These caves will be posted at the entrance, and a log kept at the area office of the inherent risks present at the time of the evaluation of the cave. A periodic reevaluation will be conducted as applicable or prior to entering by a BLM employee.

14. The Boy Scouts of America have a specific program and procedures for caving. Scouts are actually required to go through a certification process with signed documents in place prior to allowing the youth to go caving. You should verify with the Troop Leader that this certification process has taken place prior to authorizing Boy Scout's use of caves.

**RISK ASSESSMENT:** This section identifies state-of-the-art procedures including cave pre-trip preparation, cave use, and post cave trip follow-up procedures developed to assist in assuring safety of the cave entrants. Recommended protective measures for safe caving is the main component of Risk Assessment (RA). A Risk Assessment Check List and Risk Management Worksheet (BLM form 1112-5) are found in Attachment 1.

Risk Assessment is a Bureauwide mechanism to identify risks and recommend protective measures to ensure employee safety. All of the recommended protective measures in the RA can be applicable to all cave users.

This RA is not an all inclusive analysis of the potential risks located within a cave and

does not take the place of common sense that must be used by all persons who enter caves. The contents of the RA should be customized for local conditions/situations -- but approval authority remains the same everywhere.

Standardizing cave entry procedures and techniques reduces both the likelihood of error and the possibility of new and unforeseen technical problems. It is expected that cave specialists will learn a set of standard procedures before adapting, tailoring, and customizing their equipment and techniques to specific locations.

**SEARCH AND RESCUE (SAR) PROCEDURES / PRE-PLANNING:** This section offers simple strategies for cave search and rescue planning. A cave SAR Pre-Plan consists of a recommended course of action in the event of a caving emergency and does not need to be lengthy. Having a concise and brief cave search and rescue pre-plan can save critical time during an emergency.

While the BLM will normally be in a supportive role in cave SAR operations, it should take the lead for expediency in life or death situations or when non-Bureau SAR programs are not capable of providing cave rescue service. The Bureau should determine the sufficiency and availability of existing cave SAR programs and assist and support local authorities and cooperate with qualified cave organizations. To expedite SAR response, partnership agreements between the BLM and responsible authorities should be developed. Separately, the Bureau should take whatever action is necessary if a SAR action involves a BLM employee.

Counties with infrequent cave SAR missions often send untrained cave rescuers to conduct cave rescues. Local training is often the most important part of a cave rescue pre-plan, because it associates the SAR team with the people who are lifelong cavers.

Each BLM field office with cave resources should have a Cave Search and Rescue Pre-plan as a part of, or addendum to, a Cave Management Plan or the District's Search and Rescue Plan. The purpose of having a Cave SAR Pre-Plan in place is to save time in the event of an emergency. Personnel changes reinforce the need for a written, readily available Cave Search and Rescue Pre-Plan.

Detailed guidance on the recommended formats for cave search and rescue pre-Plans, documentation sheets for overdue, lost or injured cavers, and a cave search team debriefing report is provided on the following 10 pages. This guidance should be used as a reference source when preparing cave search and rescue preplans for your cave areas.

**CONCLUSION:** Risk management is the primary factor of consideration in the administration of wild cave resources for public use. While the BLM cannot make all caves completely safe for all users, a proactive cave safety policy will compliment the Bureau's cave management program and minimize cave accidents. Standardizing caving equipment, techniques, procedures, and training will increase cave safety.

Implementing the cave safety standards discussed above can prevent most accidents; however, the ultimate responsibility for the prevention of cave accidents rests with the cave user.

The BLM is thankful to the National Cave Rescue Commission, the National Outdoor Leadership School, and the National Speleological Society for contributing towards the development of these cave safety standards.

## **Search & Rescue (SAR) Pre-Plans for Caves**

**Importance:** Pre-plans are especially important in areas with infrequent search and rescue incidents. It is important that any pre-plan is simple or it won't be used in a time of crisis. It is also important that key people (cave specialists, managers, and dispatchers) know how to quickly access the written pre-plan.

Pre-plans organize personnel and equipment for urgent incidents. They provide guidance through the initial response. For extended incidents, they are replaced by a plan drawn up during the first operational shift.

Searches and rescues are different types of urgent events. Both are emergencies since human life is at risk. The pre-plan is not supposed to provide step by step instructions for all personnel. The pre-plan is a document from the BLM resource area or district manager to his/her staff that uses the Incident Command System (ICS) to provide clear leadership and organizational guidelines in urgent situations. The document should not restate what ICS is; it is a simple document that helps organize cave rescues. Fremont County, Wyoming, uses a one page pre-plan with four pages of appendices. The Worland Wyoming BLM District uses a 20 page pre-plan that lists all local resources, item by item, and provides much more specific guidance. The pre-plan should help the BLM field office move fluidly in a time of urgency. There are two very different types of pre-plans, general and specific.

### **Contents of Cave Rescue Pre-plans**

**Cave specific** SAR pre-plans which are specific to one cave.

- **Cave description:** Describes the cave including temperature, humidity, flood potential, and hazards. Identify specific locations in the cave where obstacles exist that require special rope work (lift or lowering systems), what kind of system is needed, and how much rope and equipment is needed for that location. Identify other special needs or obstacles such as tight restrictions, narrow or sharply twisting passage, water passages, or special communications needs.
- **Access:** GPS coordinates need to be available. Descriptions how to get to the cave in simple terms so a deputy or cave specialist can go see if anyone's there. The closest

possible landing zone should be located in the event a helicopter needs to be brought in to air lift the patient to a medical facility. GPS coordinates should be given.

- **Caver parking area:** Describes how to get to the most likely spot to find an overdue caver's vehicle. It also helps rescuers find the cave in the middle of the night.
- **Special equipment:** Includes specialized gear needed for certain passages.

**General** - Cave SAR pre-plans describe the BLM field office's response to any cave incident. They don't contain specific cave information, but should have a simple referencing system so the general pre-plan steers the responders to documents or people with specific information. The components to consider in a general pre-plan include:

- **Search initial response plan:** Informs the Bureau manager or cave specialist who initially takes charge (Incident Commander) how to respond and who to initially involve. This should only be about a page long. It should be the first part of the pre-plan since it describes the strategy BLM will employ.
- **Rescue initial response plan:** Similar to the above, but specific to rescues.
- **Dispatcher's cave SAR "cheat sheet:"** Questions to ask the reporting party.
- **Cave rescue personnel lists:** Home phone numbers.
  - 1) Internal
  - 2) Local
  - 3) State and Regional (have a copy of the National Speleological (NSS) Member's Manual available)
- **Cave rescue logistics**
  - 1) Internal
  - 2) Local (including County and State Emergency Management Coordinator)
  - 3) Regional (identify the Regional Cave Rescue Coordinator by calling the NSS)
- **Medical pre-plan**

Prepare a list of local emergency medical technicians and other medical specialists who have cave training/expertise.
- **Forms**
  - 1) Overdue caver questionnaire
  - 2) Lost caver questionnaire
  - 3) Injured caver questionnaire
  - 4) Search Team debriefing sheet (maze caves need this more than others)
  - 5) Master copies of cave-specific forms

- **References** (these could be kept in your Emergency Operations Center)
  - 1) Manual of U.S. Cave Rescue Techniques, by Steve Hudson
  - 2) Latest copy of the NSS Members' Manual
  - 3) Next latest copy of the NSS Members' Manual (format alternates annually)
  - 4) Any search text (e.g., NASAR Field Commander's Notebook for SAR)
  - 5) ICS Plans Book (contains master ICS forms to be photocopied)
  - 6) Appropriate phone books for local area and agencies

**Distribution of the written pre-plan:** The pre-plan should be kept in the dispatcher's notebook. It should also be posted on the wall in your Emergency Operations Center. The Emergency Operations Center is often either a room in the Sheriff's Office with a phone and a radio or the BLM field office.

### **Generic Cave Search Pre-Plan**

Search is an emergency. Search management involves a sequence of steps that are started in order, with each step progressing until the situation is resolved.

The search management sequence is:

- 1. Pre-plan** - Be prepared. Know the hazards and resources.
- 2. Interview** - Information must be gathered from first notice. The more information, the more focused the effort can be. The investigation scales up as the search progresses and more search areas are ruled out.
- 3. Call Out** - Trained help should be enlisted. At this stage, it is time to evaluate the urgency of the situation. This will determine the size and type of response. It is critical that in-cave tasks are dealt with by experienced cavers who can make the judgment calls needed underground.
- 4. Establish the Search Area** - In a cave incident, we may consider the entire cave at the early stages, but should then establish segments within the cave and assign them priority or rank. We must not ignore the fact that the subjects may no longer be in the cave or that they may be in a portion of the cave not on the map.
- 5. Confinement and Attraction** - Once you have established the search area, it is vital that you know if the subject leaves the search area. In a cave situation it is also vital that you know if the subject moves from one segment to another. Guard the entrance(s) and maintain an accurate log of who entered and who left. Place lights with notes and other attraction devices at key cave intersections so wandering searchees will stay there.

**6. Hasty Search** - To begin active search, the best action is to quickly check out the most likely places first. Speed is the primary objective here. Check the obvious, look for clues, report conditions.

**7. Wide Search** - The objective here is efficiency, not pure speed nor absolute thoroughness. Search the passages in order of priority segments. This allows for search of the maximum amount of cave with the cavers on the scene in the fastest time possible. The process can be repeated for increased coverage if needed.

**8. Grid Search** - As a last resort before suspending the mission, a grid search can be conducted. Grid searching is slow and highly labor intensive, and it is important that teams mark the territory covered in some way. You may have to mount a clean up trip later to remove all of the notes and flagging. In a complex cave system this process could take a huge number of people an incredible amount of time.

**9. Rescue/Suspension** - Whatever the method used, the goal is to find the person or determine that they are not within the search area. If found, the exercise becomes a rescue or recovery operation. The options if they are not located are to expand the search area (e.g., to some other cave or some part of the cave we do not know) or to simply scale down the operation. The object is not to quit, but to scale back. The decision to scale back is a tough management decision and should be carefully documented.

**10. Critique** – Identify the problem areas and the efficiencies; what worked and what did not work. How can the cave search be improved the next time?

## Training

**Internal training** begins with familiarization with the written pre-plan by dispatchers and BLM staff. A next step is having the BLM staff read appropriate parts of Cave Rescue Techniques. The staff should be comfortable with the first four chapters and aware of the rest of the book as reference material. Finally, **a simple mock cave rescue by the local SAR team may be the most valuable preparation.**

External training can be done at your site or at national seminars. National Cave Rescue Commission (NCRC) runs annual week-long cave rescue seminars and currently offers four levels of training (4 weeks total). NCRC also runs many weekend workshops. The best use of staff time may be to have an NCRC instructor offer a short workshop on your site. Inviting other local agencies to participate will help organizations coordinate and cross-train better. Other external training includes ICS training and especially, Managing the Search Function (MSF), a 40 hour NASAR course, or Managing the Search Operation (MSO), with a similar curriculum.



## Dispatcher's Sheet for Cave Search & Rescue

**Overdue parties:** (Cavers haven't returned home as expected.)

Date: \_\_\_\_\_ Time of call: \_\_\_\_\_

1. Who is calling? \_\_\_\_\_ Their phone number: \_\_\_\_\_

2. Are they the contact person that the cavers were supposed to notify when they were out of the cave? \_\_\_\_\_

3. What time was the group supposed to return? \_\_\_\_\_

4. Where, other than the cave, could the group be? \_\_\_\_\_

6. Has this happened before? \_\_\_\_\_

7. Please describe the vehicle they are in: \_\_\_\_\_

8. What cave were they going to? \_\_\_\_\_

9. What type of equipment did they take besides lights and helmets? (ropes, wet suits, scuba gear?) \_\_\_\_\_

10. Have you contacted anyone else to go see if their car is still at the cave? \_\_\_\_\_

\_\_\_\_\_

11. Does anyone in the group have any known medical concerns? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Lost caver:** (One or more cavers are missing inside a cave.)

Time of call: \_\_\_\_\_ Reporting party:  
\_\_\_\_\_

Phone number: \_\_\_\_\_

1. Who is missing?

Name: \_\_\_\_\_ Age: \_\_\_\_\_

Address:  
\_\_\_\_\_

Physical condition: \_\_\_\_\_  
\_\_\_\_\_

Medical concerns? (Asthma, Diabetic, Allergies, Medications) \_\_\_\_\_  
\_\_\_\_\_

Experienced in caving? \_\_\_\_\_

Been in this cave before? \_\_\_\_\_

2. Where was the point last seen? \_\_\_\_\_

What time were they last seen? \_\_\_\_\_

What time did they enter the cave? \_\_\_\_\_

When were they supposed to come out of the cave? \_\_\_\_\_

3. Do you have any guesses where they are or what happened to them? \_\_\_\_\_  
\_\_\_\_\_

What equipment were they carrying \_\_\_\_\_

How long do you think their lights will last? \_\_\_\_\_

4. Where are the other group members now? \_\_\_\_\_

Can they do a hasty search of the most probable areas? \_\_\_\_\_

Do any of them know basic first aid? \_\_\_\_\_

Is someone watching the cave entrance to see if they come out? \_\_\_\_\_

Have you contacted anyone else to help with the search? \_\_\_\_\_



**Injured caver:** (A caver reports that another caver is injured and still in a cave.)

Date: \_\_\_\_\_ Time of call: \_\_\_\_\_

Reporting party: \_\_\_\_\_ Phone number: \_\_\_\_\_

**1. Who is injured?**

Name: \_\_\_\_\_ Age: \_\_\_\_\_ Ht: \_\_\_\_\_ Wt: \_\_\_\_\_ Sex: \_\_\_\_\_

Home address: \_\_\_\_\_

Physical Condition: \_\_\_\_\_

Medical concerns: (Asthma, diabetes, allergies, medications) \_\_\_\_\_

**2. What's wrong with the patient?**

How did the accident happen? \_\_\_\_\_

What time did it happen? \_\_\_\_\_

Did anyone do anything to keep them warm? \_\_\_\_\_ What? \_\_\_\_\_

Who is with them? \_\_\_\_\_

Will they be able to help drag themselves out? \_\_\_\_\_

Can other members of your party help? \_\_\_\_\_ How many? \_\_\_\_\_

We especially need a guide to take our Initial Response Team into the site. Who should do that? \_\_\_\_\_

Can you call some other cavers to come help? \_\_\_\_\_

Please call us to let us know who's coming to help.

**3. Where is the injured caver?**

Cave name: \_\_\_\_\_

Where are they inside the cave? \_\_\_\_\_

How hard is it to get to that part of the cave? \_\_\_\_\_

Are they in a safe spot? \_\_\_\_\_

# Cave Search Team Debriefing Report

Filled out by the Search Team Leader and turned in to the Operations Director

Team Leader: \_\_\_\_\_

Team Members: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Headed into cave: date/time \_\_\_\_\_ Returned: \_\_\_\_\_

Area of search assigned by Operations Director (general description)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Type of search: Hasty \_\_\_\_\_ Detailed \_\_\_\_\_ POD \_\_\_\_\_ (%)

**Probability of Detection (POD):** If the person was actually in the part of the cave that you searched, what is the chance you would have found them using your search techniques? 100% means that there is no way that they could still be in there. 5% means you could search that area forever and still not be sure that they were not there.

Area actually searched (detailed description, please put a map on the back): \_\_\_\_\_

\_\_\_\_\_

Have all passages in this area been thoroughly checked?

\_\_\_\_\_

Is additional searching required for this area?

\_\_\_\_\_

Describe what you recommend we do next?

\_\_\_\_\_

Any comments, hunches or opinions?

\_\_\_\_\_

### **Tips for Searchers**

1. Look for clues more than the person.
2. Stop and listen for banging rocks once in a while. Banging rocks against the cave floor travels much farther than other cave noises. Call out the person's name and listen carefully for a response.
3. Tape off searched areas with labeled flagging (e.g., Team B, 95 percent POD, 9/28/04 10 pm).
4. Work in pairs, but keep the team together.
5. Be sure to return to the surface with enough time and energy to brief the next shift of searchers. You will then be expected to get some rest before relieving that shift.

### Risk Assessment Check List

Employee Name: \_\_\_\_\_ Reviewed: (Employee Initial) \_\_\_\_\_

Position Title: \_\_\_\_\_ Date: \_\_\_\_\_

Area or Division: \_\_\_\_\_

Job Element	Risk	Recommended Protective Measures
Specific Job Element, Pre-Trip Preparation/ Equipment Check	Unprepared/ Equipment Failure	<p>Before Your Cave Trip</p> <ul style="list-style-type: none"> <li>* Obtain a cave map</li> <li>* Know the location of physical and legal access</li> <li>* Locate information on risk</li> <li>* Tell someone where you are going and when you should return</li> <li>* Inspect and test equipment before using. Be sure all equipment is adequate for the cave trip</li> </ul>
		<p>Recommended Protective Equipment:</p> <ul style="list-style-type: none"> <li>* cave map</li> <li>* gate keys or combination</li> <li>* pencil</li> <li>* small tablet</li> <li>* three reliable independent light sources</li> <li>* if carbide light is a source, extra carbide and a lamp repair kit</li> <li>* extra batteries and bulb</li> <li>* hard hat with chin strap or preferably a caving or climbing helmet equipped with a light</li> <li>* boots</li> <li>* knee/elbow pads</li> <li>* face dust mask</li> <li>* gloves</li> <li>* fluorescent flagging</li> <li>* compass</li> <li>* small first aid kit</li> <li>* 20 feet of 1 inch nylon webbing</li> <li>* personal medication</li> <li>* 1 quart drinking water</li> <li>* adequate quick energy food supply</li> <li>* large garbage bag or space blanket</li> <li>* small candle</li> </ul>

Job Element	Risk	Recommended Protective Measures
		For vertical caves, vertical climbing gear and knowledge and <u>experience</u> of its proper use, cave pack. Vertical work can have extreme inherent risks!
Caving Trip	No communications with office resulting in premature launch of search/rescue effort	Leave an itinerary with your supervisor or dispatch. Information should include: <ul style="list-style-type: none"> <li>* Cave location (and interior destination in the case of large caves)</li> <li>* Directions to get to the cave</li> <li>* Accompanying personnel</li> <li>* Location of extra keys or lock combinations</li> <li>* Expected time of exiting the cave and arrival at the office</li> <li>* Time when a search team should be activated</li> <li>* Other locations you may be found including other caves, restaurants, etc.</li> </ul>
	Encounters with snakes, rodents, insects, bats	<ul style="list-style-type: none"> <li>* Use standard snake avoidance procedures</li> <li>* Avoid rodent concentration areas; do not disturb bat roosts</li> <li>* Utilize a NIOSH/MSHA approved respirator in caves having potential Hanta Virus, Histoplasmosis or other airborne hazards</li> <li>* Wear gloves and when necessary seal clothing to prevent entry of insects</li> </ul>
	Lost vehicle keys.	<ul style="list-style-type: none"> <li>* Place your car's ignition keys in a safe location <u>before</u> entering the cave</li> <li>* Each party member should be told the location of vehicle keys</li> </ul>
	Bodily injury from gate operation	<ul style="list-style-type: none"> <li>* Use proper lifting techniques, use caution, request help when necessary (gates should be designed to minimize these dangers)</li> </ul>
	Lost cave gate key and/or trapping other party in cave	<ul style="list-style-type: none"> <li>* After entering cave, lock gate behind you and place gate key in a safe location</li> </ul>
	Uneven, slippery terrain when crawling, climbing and walking; loose rock/breakdown material; danger of injury from falling	<ul style="list-style-type: none"> <li>* sturdy hiking boots with adequate ankle support and non-marking soles</li> <li>* knee pads</li> <li>* elbow pads</li> <li>* gloves</li> <li>* hard hat with a chin strap or a climbing helmet</li> <li>* Move carefully with caution, so as not to dislodge loose rocks.</li> </ul>
	Intense darkness with a danger of	<ul style="list-style-type: none"> <li>* Have an adequate, reliable light source, move slowly</li> <li>* Do not exceed physical capabilities</li> </ul>



Job Element	Risk	Recommended Protective Measures
	tripping	
	Getting lost and/or disoriented	<ul style="list-style-type: none"> <li>* Sign the cave registers when entering and leaving cave areas</li> <li>* Use group tactics to avoid disorientation</li> <li>* Continually look back and establish landmarks</li> <li>* Flag route when uncertain of location</li> <li>* Carry map and compass, look for survey markers and refer to cave map</li> <li>* Have a minimum of one experienced caver per group of four</li> <li>* Stay within your <u>group's</u> ability and experience</li> <li>* Never attempt to go further into a cave than a point from which you can safely find your way out</li> <li>* Mark your trail at frequent intervals with removable markers such as reflective tape or engineer's tape</li> <li>* Check your back trail frequently</li> <li>* <u>Always</u> remove your trail markers on the way out</li> </ul>
	Psychological problems, claustrophobia, intense silence	<ul style="list-style-type: none"> <li>* Discuss "natural fears" with novices before entering</li> <li>* Work as a team, take your time, talk to group members</li> <li>* Provide reassurance to those in need</li> <li>* Escort afflicted person from cave if necessary</li> </ul>
	Water: danger of falling in resulting in exposure accelerated hypothermia, giardia from drinking	<ul style="list-style-type: none"> <li>* Use caution when traversing wet areas</li> <li>* Don't enter caves that are known to be flooded or affected by seasonal water flow conditions or caves located in washes or canyon bottoms when weather conditions may threaten flooding</li> <li>* Keep up to date on local weather conditions</li> <li>* Don't drink from cave water sources</li> </ul>
	Exertion/exhaustion, hypothermia, wind exposure	<ul style="list-style-type: none"> <li>* Recommend proper physical conditioning. The group leader should inquire about people with known potentially dangerous physical conditions and treatment needs before entering the cave</li> <li>* Adequate clothing should be worn in layers</li> <li>* Quick energy foods should be consumed to keep up with calorie utilization</li> <li>* Avoid overexertion</li> <li>* The group should pace itself for the slowest member</li> </ul>
	Breathing difficulty from dust, histoplasmosis, hydrogen sulfide (H <sub>2</sub> S), Carbon dioxide (CO <sub>2</sub> ), or other gases in some caves	<ul style="list-style-type: none"> <li>* Avoid dusty areas when practical</li> <li>* Use a dust mask</li> <li>* Move slowly to lower respiration rate and reduce dust</li> <li>* Avoid known H<sub>2</sub>S and CO<sub>2</sub> risk areas</li> <li>* Test oxygen level and other suspected gas levels with appropriate monitoring equipment</li> <li>* Stay alert to breathing rates in lower parts of caves</li> </ul>

Job Element	Risk	Recommended Protective Measures
	Exposure to unsafe levels of radon gas (potential cause of lung cancer)	<ul style="list-style-type: none"> <li>* Measure radon levels to determine acceptable exposure limits</li> <li>* Exposure to radon should not exceed maximum allowable rates</li> <li>* Document radon exposure time in log book</li> </ul>
	Disease causing agents in rodent/bird droppings, cactus spines in rat nests	<ul style="list-style-type: none"> <li>* Avoid rodent concentration areas and bat roosts</li> <li>* Wear gloves</li> <li>* Use a NIOSH/MSHA approved respirator</li> </ul>
Search and rescue (getting injured out of cave)	Additional lost or injured people	<ul style="list-style-type: none"> <li>* Refer to Cave Search and Rescue Plan</li> <li>* Implement Incident Command System in the event of a rescue</li> <li>* Attend/host cave search and rescue training on a regular basis</li> </ul>
Post Cave Trip Notification and Cleanup	Launch of premature search effort, explosion, corrosion, dead batteries	<ul style="list-style-type: none"> <li>* Check in with dispatcher or office. After office hours, notify supervisor by telephone</li> <li>* Properly store carbide to assure that water will not contaminate resulting in released gas</li> <li>* Charge lamp batteries or change when necessary. When charging batteries it is essential that proper ventilation be maintained and a log kept of their use. Batteries are considered a hazardous waste and should be disposed of properly</li> <li>* Clean all equipment and make it ready for next trip</li> <li>* Store equipment in a dry location</li> <li>* Store batteries and carbide separate from other caving equipment</li> </ul>
Documentation of Effort to Notify Cave Users of Risks and Recommended Protective Measures	Uninformed Cave Users Exposure to Unsafe Conditions	<ul style="list-style-type: none"> <li>* Complete Risk Management Worksheet</li> <li>* Document risks and safety concerns</li> <li>* Develop and utilize (through distribution to cave users) a Check List of the Recommended Protective/Safety Measures for a safe cave trip</li> </ul>

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**RISK MANAGEMENT WORKSHEET**

1. Organization and Location			2. Page		
3. Operation / Task	4. Beginning Date:	5. Ending Date:	6. Date Prepared		

7. Prepared by (Name / Duty Position)

8. Identified Hazards	9. Assess the Hazards: Initial Risk				10. Control Measures Developed for Identified Hazards: <i>(Specific measures taken to reduce the probability of a hazard)</i>	11. Assess the Hazard's Residual Risk:				12. How to Implement the Controls: (May Be Filled in By Hand)	13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.)
(Be Specific)	L	M	H	E	(Be Specific)	L	M	H	E	(Be Specific)	(Be Specific)

14. Remaining Risk Level After Control Measures Are Implemented: (CIRCLE HIGHEST REMAINING RISK LEVEL)	<b>LOW</b> (Line Supervisor)	<b>MEDIUM</b> (Branch Chief)	<b>HIGH</b> (District Manager)	<b>EXTREMELY HIGH</b> (Must be State Director/Associate)
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15. RISK DECISION AUTHORITY: **(Approval/Authority Signature Block)** (If Initial Risk Level is Medium, High or Extremely High, Brief Risk Decision Authority at that level on Controls and Control Measures used to reduce risks) **(Note:** if the person preparing the form signs this block, the signature indicates only that the appropriate risk decision authority was notified of the initial risk level, control measures taken and appropriate resources requested; and that the risk was accepted by the decision authority.)

\_\_\_\_\_  
(Signature)



**CONTINUED**

8. Identified Hazards	9. Assess the Hazards: Initial Risk				10. Control Measures Developed for Identified Hazards: <i>(Specific measures taken to reduce the probability of a hazard)</i>	11. Assess the Hazard's Residual Risk:				12. How to Implement the Controls: (May Be Filled in By Hand)	13. Supervisors and Evaluation by: (Continuous Leader Checks, Buddy System, etc.)
(Be Specific)	L	M	H	E	(Be Specific)	L	M	H	E	(Be Specific)	(Be Specific)

## RISK MANAGEMENT WORKSHEET INSTRUCTIONS

1. Organization conducting the Risk Assessment and the location of the operation.
2. If more than one page is used, indicate number of pages. (For example: Page 1 of 3)
3. In general terms, identify the operation/task(s) to be performed.
4. Enter the date that the operation/task(s) is to begin.
5. Enter the date that the operation/task(s) is to end.
6. Enter the date that the Risk Assessment was prepared.
7. Enter the name and duty position of the person completing the form.
8. Identify specific hazards associated with the operation/task(s). It is important to be specific and start at the beginning, the preparation phase (Equipment draw/transportation of equipment) of the operation. (For example: unfamiliar equipment, inexperienced operators, improperly configured equipment, challenging terrain, natural hazards, hazardous chemical use, span of supervision, location of work, types of roads, confined spaces, pinch points.)
9. Assess the initial risk using the risk assessment matrix.
10. Identify control measures for each identified hazard in block 8.
11. Assess the residual risk, the risk remaining after control measures are taken into consideration, using the risk assessment matrix.
12. Identify how the controls will be implemented (For example: SOPs, tailgate safety briefings, written/oral policy statements/directions, familiarization training, Right to Know training, use of PPE, use of spotters.)
13. Enter the specific individual(s) or method(s) used to supervise and evaluate the provisions of the Risk Assessment. (For example: supervisor/leader on site, buddy system, employee crosstalk.)
14. Circle the appropriate remaining level of risk.
15. The authority accepting the risk should sign this block; however, if the authority is notified and accepts the risk, the person completing the form can note same sign block 15. (See "Note" in block 15.)