

Program Guidance-Recommendations for Resource Protection:

The following section addresses cave permits, visitor use monitoring, and cave protection, maintenance, restoration, and research. The inventory and classification process should include all criteria for determining cave significance as noted in the FCRPA: cultural, biological (microbiological), geological/mineralogical/paleontological, hydrological, recreational, scientific, and educational attributes.



Permits:

Many resource areas contain high numbers of caves, sometimes exceeding 300-400. For resource protection and visitor safety, some caves may remain closed to regular or general entry. It is expected that programs will be implemented that will allow entry into and the use of some, if not all, of an area's caves. If entry is to be allowed into undeveloped caves for recreation, research, interpretation, or other reasons, such entry should be regulated by a cave entry permit program.

How ever the have different policies on issuing cave entry permits; however, protection and conservation of the resource(s) and safety for the visitor should be the primary determining factors. In a developed cave, trips off of the established visitor trails should require a written permit, approved by the superintendent or a designee. Anyone failing to comply with park policies regarding conservation of cave resources and/or safety guidelines for cave entry should be denied a cave permit. Any incident should be documented and the chief ranger notified as soon as possible.



Permits:

There are basically four management strategies for cave entry permit programs.

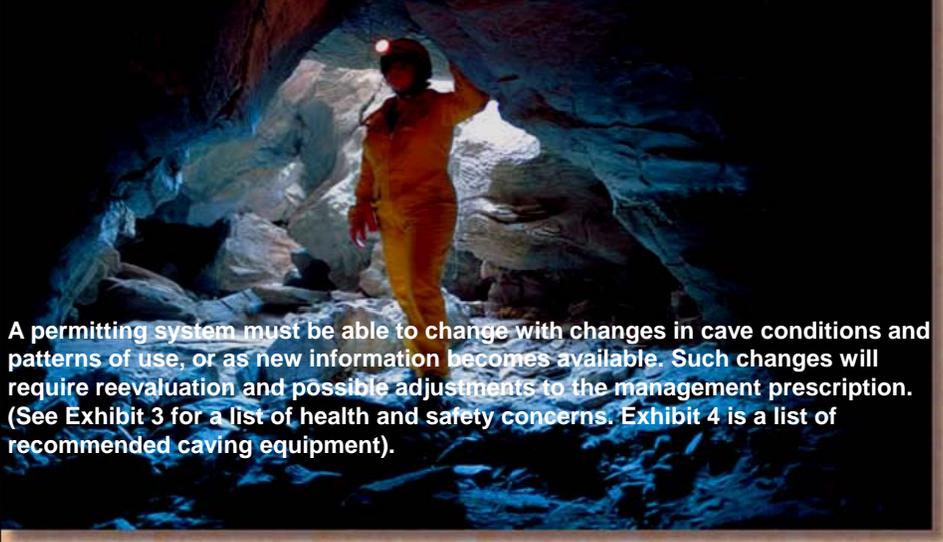
1. Require an entry permit only for those caves with high resource values, fragile or unique features, cultural remains, sensitive ecosystems, or scenic values.
2. Require an entry permit for caves with conditions that increase the possibility of injury or illness, such as airborne diseases or high CO₂ levels, structural instability, technical difficulty, flooding, or contaminated water.
3. Require an entry permit for all caves. The advantage of this approach is that management has very good visitor use records and much more control over cave use. This strategy requires a large commitment of time, money and manpower, if there are many caves, or if there is a significant nearby population center, and the installation of gates or traffic monitoring equipment to maintain tight physical control.
4. Require an entry permit for only a certain number of caves for recreational use, based on recreational appeal and the lowest possible risk to cave resources and visitor safety.



Permits:

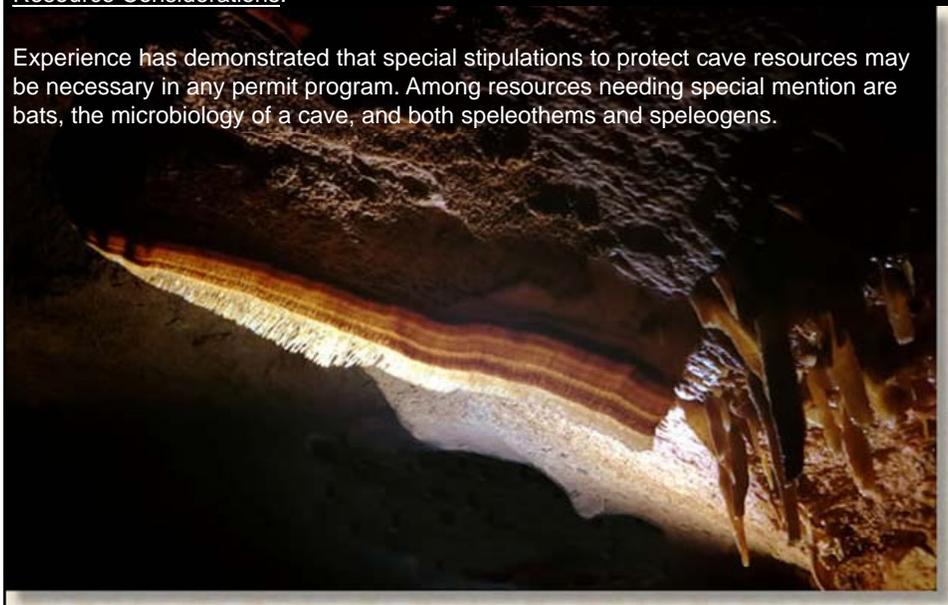
Management strategies should be determined through resource evaluations and inventories to determine the method best suited for a given cave. Key information for this determination includes cave inventory records, consultations with those people who are most familiar with the cave, and firsthand knowledge of the cave.

A permitting system must be able to change with changes in cave conditions and patterns of use, or as new information becomes available. Such changes will require reevaluation and possible adjustments to the management prescription. (See Exhibit 3 for a list of health and safety concerns. Exhibit 4 is a list of recommended caving equipment).



Resource Considerations:

Experience has demonstrated that special stipulations to protect cave resources may be necessary in any permit program. Among resources needing special mention are bats, the microbiology of a cave, and both speleothems and speleogens.



Resource Considerations:

Bats

Bats should not be handled more than is absolutely necessary for needed research. Only qualified researchers who understand NPS policies and mandates regarding protection of natural resources should do such handling. Humans should avoid interaction with maternity colonies and hibernating colonies. Managers should carefully consider research requests to avoid stressing the bats.



INSIDE EARTH

Resource Considerations:

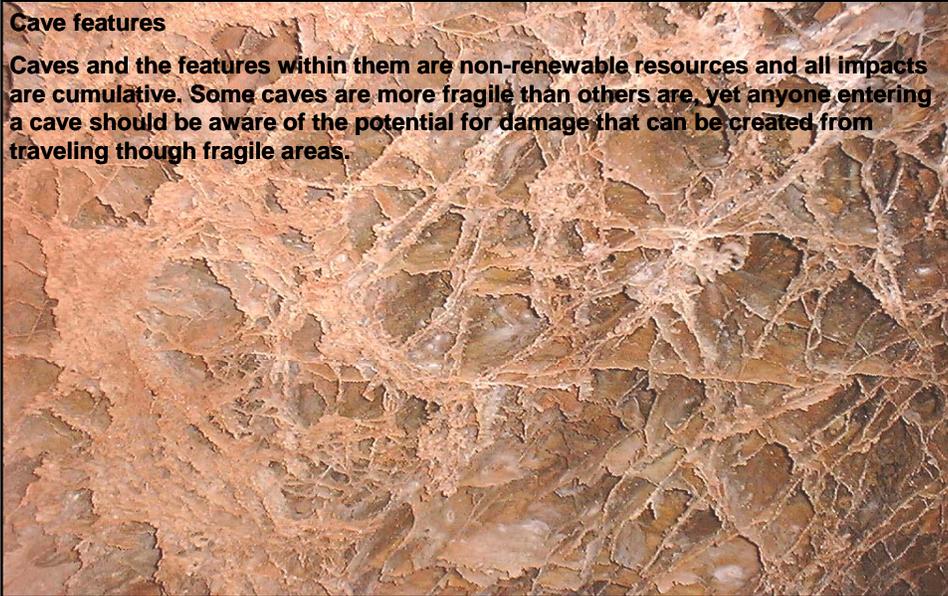
Microbiology

Many recent discoveries have been made concerning microbiological life within caves. Persons traveling in caves should pay special attention to preventing the disturbance of such ecological systems. This can be accomplished by adhering to minimum impact techniques. This should include packing out all trash, catching food crumbs when eating, and carrying feces and urine out of the cave. More common microbes can rapidly displace those adapted to low-nutrient environments if nutrient availability increases. Hair, skin, and surface microbes shed by human visitors have the potential to disrupt these environments for extended periods. Cave passages being studied by microbiologists may require access restrictions. Water should be especially safeguarded. Studies have shown some of the most significant damage in caves occurs in pools where a change in water quality affects microbial communities.

Resource Considerations:

Cave features

Caves and the features within them are non-renewable resources and all impacts are cumulative. Some caves are more fragile than others are, yet anyone entering a cave should be aware of the potential for damage that can be created from traveling through fragile areas.



Resource Considerations:**Visitor Use and Monitoring/Measuring Visitor Use**

The impact of various types and intensities of use should be carefully and systematically documented.

Use at a developed cave may be determined by mechanically or optically counting people on the elevators, as they exit the cave, by ticket sales, or by a ranger. The cave permit provides use data for undeveloped caves. Many of the caves whose use is regulated are not gated; therefore, the accuracy of use data generated from approved permits is dependent largely on voluntary compliance with entry procedures.

Register placement in caves can be a valuable tool for the resource manager, whether or not a permit is needed to enter the cave. Electronic counters should also be considered for some situations. It is important to have a notice on the register, indicating that signing it will not insure a rescue, should the need arise. Valuable information that is needed on a register should include name, address, date, group affiliation, and comments. The register serves as verification of visit by the permitted party, verification of visits by unauthorized parties, verification of visits to certain areas of the cave, baseline information for visitor impact studies, a record of visitor observations concerning vandalism, gate condition, biota etc., and a means of relaying valuable observations, especially in caves that can be entered without a permit.

Resource Considerations:**Measuring impacts to cave resources**

Quantitative and qualitative measurement of cave resources is generally more difficult than measuring visitation. Within a unit, monitoring of cave vistas and water quality provides principal indices of cave use impacts. In developed caves, cave microclimate may also be monitored.

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

Aquatic systems are vulnerable to alteration by people and include indices of change that are relatively easy to measure. Common ions, turbidity, bacterial contents, and other parameters that are likely to be altered by human activity should be monitored periodically where feasible to quantitatively measure any change within the cave.



Resource Considerations:

Establishing appropriate visitation levels

The amount of annual use is established from the correlation of three important types of information: (1) established levels of maximum allowable impact, (2) recorded cave use, and (3) the measured condition of the resource associated with various levels of use. The methods used to evaluate impact must be accurately measurable with a consistent technique, and resource condition must be correlated with the presence of people in the cave.

A maximum level of acceptable cumulative impact should be established, and visitation regulated according to the desired "life" of the route. In many cases, a fixed trail--which by definition is allowed to accept an infinite amount of impact--and well-managed off-trail policies can reduce impact of the surrounding resources to nearly zero. Furthermore, timely mitigation efforts can keep the impacts from ever exceeding the maximum level, allowing visitation to continue indefinitely. However, the impact from visitation should never exceed the park's ability to keep it below the pre-established limits.

Resource Protection:

Need for Inventory and Monitoring

Use of caves by humans can have significant detrimental impacts upon cave resources without proper management. Biological resources that are being threatened include but are not limited to several species of endangered bats, ferns and lichens, and microbial communities. Especially vulnerable are cave-adapted invertebrates. So little is known about many of these species that evaluation of population stability, impacts from current and past human activities, and probabilities for species survival cannot be assessed without further inventory and monitoring efforts.



Resource Protection:

Water Quality and Quantity

Because cave and karst systems are intimately tied to local and regional hydrological systems, threats to these natural systems, if allowed to go unmitigated, can have impacts on water supplies and water quality and consequently cave biota, mineral deposits, and speleothems. Direct threats to cave and karst groundwater aquifers can include interruption or diversion of natural hydrologic flow; land disturbances; runoff from roads, parking lots, lawns, and roofs; inappropriately placed toxic waste repositories; pollution/runoff from sewage and septic systems livestock and poultry operations, and/or landfills; leaks from improperly maintained and monitored underground gasoline storage tanks; oil and gas leaks from hydro-carbon development; toxic and corrosive chemical spills; and improper use of pesticides, herbicides, and fertilizers. Any of these situations can cost millions of dollars to remediate and have devastating impacts on karstic aquifers. The hydrologic nature of karst systems allows for easy infiltration and rapid transport of contaminants over large distances below the surface. Regional, rather than localized, aquifer contamination is one of the prevailing risk factors that distinguishes karstic aquifers from porous and permeable aquifers. In addition, erosion as a result of agricultural activities such as excessive tillage and overgrazing, as well as deforestation and fires, can result in significant deterioration of water quality from sediment loading.

Resource Protection:

Preferred Techniques

Preferred means of cave protection are confidentiality of cave locations, law enforcement patrols, and use of interpretive media to help people appreciate caves and understand the fragility of cave resources. Interpretation is an extremely important management tool since it encourages voluntary compliance and cooperation in protecting these nonrenewable resources.



Resource Protection:**Gates**

Gates are an obtrusion on the aesthetic integrity of the cave entrance and are often deleterious to the ecology of a natural cave, especially if improperly designed. Poor gate designs may impede or obstruct airflow and the movement of bats and other organisms into and out of the cave. Even a "bat-friendly" gate is not as friendly as an ungated entrance, though it may offer protection from external threats.

The use of gates to prohibit unauthorized entry is often unsuccessful against determined vandals. This technique should be used to protect park caves only where the need is considered essential and a biologically neutral gate can be constructed. The entrance to many caves is so large that gates are not feasible. Interior gates may be used to restrict access to areas of significant hazards or areas that merit special resource protection. Before a gate is constructed the appropriate specialists should be consulted to ensure mitigation of all park concerns, including ecological, physical, cultural, aesthetic, and law enforcement issues.

Resource Protection:**Exploration**

Active exploration results in the discovery of the resource, usually in its most pristine condition. Consequently, exploration activities should not be taken lightly or treated as only a recreational activity. Exploration should be management driven and undertaken in close consultation with knowledgeable resource management staff. Participating staff and volunteers must be adequately trained and must demonstrate trustworthiness. Exploration should be allowed only on a "survey as you go" basis. Implementing such a program should substantially reduce the need for unnecessary and potentially damaging trips into a cave or cave passage to gather cartographic data that should have been collected during the initial exploratory trips. Original survey notes should be considered the property of the park, which must provide adequate storage and protection of the data. Survey data can be sensitive, and, if so, may not be made available to a FOIA request pursuant to the FCRPA provisions mentioned above. Survey data should not be distributed without careful consideration of the potential for misuse that could adversely impact the cave, including portions of the cave yet to be discovered.

Resource Protection:

Exploration-Continued

During cave exploration an area may require enlargement to permit entry into virgin passageways or chambers. Permission to enlarge a constriction or to dig through breakdown or cave fill must be obtained in writing from the park superintendent or a designee. Environmental alterations and potential damage to cave resources should be given the highest priority consideration. The alteration must have a strong justification and permission can only be granted upon demonstration that all impacts can and will be mitigated. Explosive charges or mechanical devices, such as "rock splitters" or jackhammers, should not be permitted for use in park caves except for pre-approved construction uses within the developed caves.

