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Fragile Underground

Caves are the world's most remote and fragile wilderness. They offer irreplaceable habitats for rare plants and animals, some of which spend their entire lives in complete darkness. On its way to our drinking supply, water often travels through caves into wells, springs, and aquifers, the source of most of our drinking water. A cave's intricate passageways and dramatic formations offer exquisite scenery and fascinating opportunities for research and mapping. Many caves also preserve fragile prehistoric and historic records for millennia.

However, caves are threatened by human activities above and below ground. Carelessness and ignorance, as well as intentional vandalism, can quickly – and permanently – damage a cave: its formations, its environment, and the plants and animals that live there.

Karst Matters

Karst landscapes include caves, sinkholes, underground streams, and other features formed when bedrock is dissolved by water. Lava tube caves are *pseudo-karstic* features, created by volcanic activity. One-fifth of the nation's land area is karst, and nearly every state has caves, as do most countries in the world.

"Karst areas are among the world's most diverse, fascinating, resource-rich, yet problematic terrains. They contain the largest springs and most productive groundwater supplies on Earth. Karst is the landscape most vulnerable to environmental impacts, however careful use of karst areas can produce substantial economic and scientific benefits. Sound management of karst requires the conscientious participation of citizens"* and land-use decision makers, often working closely with speleologists who explore, survey, and study caves.

Protecting Our Water

Caves play a vital role in the quality of our drinking water. In karst and pseudo-karst areas, surface water flows into caves quickly, receiving little filtration. This water, and the impurities it carries—human and animal waste, pesticides, fertilizers, petroleum products, and other pollutants—often travel great distances underground, contaminating wells, springs, and aquifers. Only by wisely and carefully managing the relationship between karst and water, and keeping pollutants from entering caves, can we protect the quality of our drinking water.


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Nature's Masterpieces

Deep in the earth, drop by drop, crystal by crystal, a solution of water and minerals seeps through cracks in the rock, depositing formations, or *speleothems*, on the floors, ceilings, and walls of caves. However, a careless touch or malicious gesture can destroy what took centuries to form. **Once damaged or destroyed, cave formations can never be replaced.** To preserve this fragile resource, Congress passed the Federal Cave Resources Protection Act in 1988 to "secure, protect, and preserve significant caves on Federal lands for perpetual use, enjoyment, and benefit of all people." Many states have laws protecting caves and their contents.

Keepers of our Past

Caves offer valuable clues to significant geologic events as well as to our prehistoric and historic past. Deep underground, caves have preserved human fossils, and those of extinct plants and animals. Since prehistoric times, caves also have served as homes, burial grounds, and sites for religious practices. Unlike most other environments, caves, with their nearly constant temperatures, preserve our most sensitive archaeological and cultural sites.

Fragile Habitats

Cave-dwelling animals – *troglobites* – are unique species of organisms including insects, crustaceans, and fish, that spend their entire lives underground. They are specially adapted to living in total darkness, and offer scientists insight into biological processes. Biologists recently have discovered cave-dwelling *extremophiles* whose food web is based on *chemosynthetic, or* "mineral-eating" bacteria. These organisms provide clues about the earliest forms of life on Earth, and are being studied by scientists at NASA to learn about the potential for life on Mars.

Because troglobites cannot live outside a cave, their survival is endangered if the cave environment is damaged or altered. Water pollution, visitor traffic, trash, flooding, and a change in air patterns or temperature can disturb a cave's fragile food web and ecosystem. **Once destroyed, these isolated environments have little chance to regenerate, and unique troglobites would be gone forever.**

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photo by Dave Bunnell

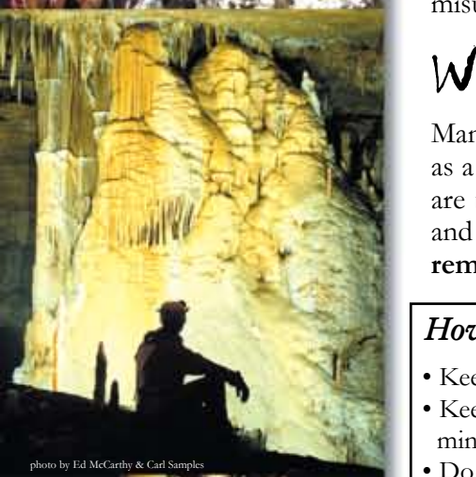

photo by Ed McCarthy & Carl Samples

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Bats Need Friends

Animals that make their homes in caves, but return to the surface to feed—including bats, bears, packrats, snakes, raccoons, swallows, moths, foxes, and people—are trogloxenes. Among these, bats play an important role in the balance of nature. Most North American bats eat insects, and a single small bat can eat 1,200 mosquito-sized insects an hour. Other bats feed on fruit and nectar, and in the wild, they pollinate flowers and disperse seeds for important agricultural plants. In addition, bat droppings are a valuable source of fertilizer, and an important foundation in the food web of some cave habitats. Unfortunately, today more than half of the American bat species are in severe decline or are already endangered, largely because pesticides and land development have severely reduced their food supply. Moreover, cave habitats are being destroyed, their entrances are being closed, and human visitors are disrupting bat nurseries and hibernating colonies. Worst of all, people who fear or misunderstand the value of bats are deliberately killing them.

What Lies Ahead

Many caves and their contents have been destroyed or badly damaged as a result of human activities. Rare species of cave-dwelling creatures are threatened or already endangered. Water quality in aquifers, wells, and springs has diminished. **Fortunately, there is time to protect our remaining caves and karst resources.**

How you can help protect and preserve the fragile underground

- Keep sinkholes free of garbage, sewage, oil, and other contaminants.
- Keep streams in karst areas clean by controlling runoff from farming, mining, and timbering operations.
- Do not damage formations, and do not deface or write on the cave walls. Leave artifacts as you find them.
- Oppose the sale of cave formations.
- Report vandalism and unauthorized entry to proper authorities. The NSS offers a reward for information leading to the successful prosecution of cave vandals.
- Respect cave dwelling animals, and leave their unique habitats undamaged.
- Play an important role in conservation and education by contributing to the NSS Save the Caves Fund or a cave conservancy in your state.

Cave Safely

The best way is by visiting one of the many "show" caves developed privately or by the National Park Service. Undeveloped, or "wild" caves should be entered only with experienced cavers, and with the proper training and equipment.

Suggested Reading

Living with Karst,
by George Veni, Harvey DuChene, Nicholas Crawford, et. al.,
American Geological Institute

A Guide to Responsible Caving,
(available at no cost through the NSS Web site.)

America's Neighborhood Bats, by Merlin Tuttle

For Educators
Project Underground Workbook, edited by Carol Zokaites

Visit www.NSSBookstore.org
for the largest selection of books on caves.

On the Internet

The National Speleological Society (NSS)
www.caves.org

The National Caves Association
www.cavern.com

Bat Conservation International (BCI)
www.batcon.org

National Park Service Cave and Karst Program
www.nature.nps.gov/geology/caves/program.htm

National Cave and Karst Management Symposium
www.nckms.org

The National Speleological Society (NSS) is the largest organization in the world dedicated to protecting, conserving, exploring, and studying caves. The **Save the Caves Fund**, supported solely through donations, provides essential funding for cave conservation and restoration, karst resource management training, and educational programs. For more information visit the NSS Web site or contact the NSS office.

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* George Veni, Harvey DuChene, Nicholas Crawford, et. al., *Living with Karst,* (AGI: 2000) 5. Used with permission.

photo by John Ganter

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Discovering Caves

Fragile Underground

photo by Alan Cressler