

CAVE OWNERS' NEWSLETTER



A publication of the Virginia Cave Board, Department of Conservation and Recreation No. 19, February 2008

Letter from the Chairman

By Thomas Lera

The Virginia Cave Board (VCB) was formed in 1979 when the Virginia Cave Protection Act was enacted and its members are appointed by the Governor of Virginia to four-year terms. The VCB is associated with the Virginia Department of Conservation and Recreation (DCR). Some of the responsibilities of the Board are to protect the rare, unique and irreplaceable minerals and archaeological resources found in caves, to protect and maintain cave life, and to protect the integrity of caves having unique characteristics or containing exemplary natural community types. The Act makes the vandalism, pollution, disturbance, and removal of artifacts and speleothems from caves a Class 1 Misdemeanor.

Since 1979, several enforcement actions have taken place. In 1998, Batie Creek was included on Virginia's 303(d) list of impaired waters because of low dissolved oxygen levels caused by inflows of anoxic leachate due to a lumber company's improper disposal of sawdust. Low dissolved oxygen levels negatively affected the endangered Lee County Cave Isopod (a type of crustacean) in Thompson Cedar Cave. The lumber company has removed and reused most of the decomposing sawdust. Due to the efforts of the Virginia Cave Board, the Virginia Department of Conservation and Heritage Program and many other partners, the dissolved oxygen levels have rebounded, as has the population of the endangered Lee County Cave Isopod, prompting the removal in 2006 of Batie Creek from the impaired waters list.

Bone Cave, a gated cave in Lee County, was identified in 2002 as a burial cave during a VDOT road construction project. Vandals breached the cave gate and Native American remains were removed without a permit. Enforcement action resulted in the reacquisition of the artifacts and the interment of the remains by the Monacan Indian Nation on lands owned in Amherst County.

Most recently, on U.S. Forest Service Land in Wise County, several vandals tunneled under the gate into


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Rocky Hollow Cave and spray painted graffiti on the boulders and walls. Rocky Hollow is listed on the Virginia Significant Cave List for its federally endangered Indiana Bat Hibernaculum.

The person committing the vandalism in Rocky Hollow Cave was apprehended and required by the court to remove the graffiti under the direction of the Department of Conservation and Recreation staff. If the cave is repaired to the satisfaction of DCR, the charges will be dropped. This is a win-win scenario because the VCB and DCR will benefit from the positive publicity for cave conservation and the enforcement of the Cave Protection Act. The vandal will have learned a valuable lesson while helping to restore the cave to its original condition and avoiding a criminal record.

Cave vandals are frequently unaware that their actions violate the law and do not understand the importance of conserving cave resources. Education is the only way to overcome this barrier of ignorance. Whenever possible, signs describing prohibited acts and the potential penalties for cave vandalism should be installed at cave entrances. If you would like a sign for your cave, request one from DCR, whose address is listed in the newsletter.

As a cave owner, if you observe vandalism, unlawful dumping or pollution in a cave or sinkhole, removal of any organisms or artifacts from within a cave, or the sale of speleothems, please call or write the Virginia Cave Board to report your findings as soon as possible. Together we can conserve our valuable and unique cave resources. 

Sometimes it's the Little Things that Matter

by Shane D. Hanlon & Wil Orndorff

Originally printed in Endangered Species Bulletin September 2007, p14-15.

What is good for a rare, rice-sized crustacean in a Virginia cave system is proving to be good for one of the southern Appalachian region's most biologically diverse and imperiled ecosystems.

The Lee County cave isopod (*Lirceus usdagalun*) is a stygobitic (cave-adapted aquatic) crustacean found on the surface of rocks under swift flowing, shallow water in subterranean streams. Additional specimens are sometimes flushed from springs during floods. This creature is known from only two cave systems and two springs in an area known as the Cedars, located in central Lee County, Virginia. Caves, sinkholes, disappearing streams, and large springs are common topographical features of the Cedars, a terrain called karst that was formed in limestone and dolostone bedrock. The limestone and poor soils of this area support an uncommonly high number of rare plants and animals and a dominant forest community of oak and cedar. The watershed of the Cedars contributes high-quality water to the Powell River, one of the last free-flowing stretches of the Tennessee River system and a river renowned for its rich freshwater mussel and fish diversity.

The cave systems of the Cedars are hydrologically complex. Because of the porous nature of the limestone karst topography, water flows through the system quickly, having little time for pollutants and contaminants to be captured and metabolized through natural filtration. As a consequence, seemingly benign activities can pose a serious threat to the quality of both ground and surface waters.

At a glance, threats to water quality and karst resources in the Cedars would seem negligible; the landscape is sparsely developed, covered by a predominant mix of pasture and forest. However, in 1987, a local sawmill producing a massive amount of sawdust waste caused one of Virginia's most severe cases of water pollution. An estimated 5.8 million cubic feet (165,000 cubic meters) of sawdust resulted in a massive discharge of leachate (the liquid produced when water percolates through any permeable material) rich in lignins and tannins. These contaminants seeped into a cave

system known as Thompson Cedar Cave, haven to one of the two populations of the Lee County cave isopod known at the time. Water from the underground stream resurfaces from a spring and joins Batie Creek, a tributary of the Powell Lee County cave isopod Shane Hanlon/USFWS Fall 2007 Endangered Species Bulletin 15 River. Decomposition of the leachate produced an intense biochemical demand for the water's oxygen, exceeding that typically produced by raw sewage, and it plagued the cave stream and Batie Creek for more than 15 years, eliminating nearly all of the aquatic life. Batie Creek was marked by a strong sewage odor and the presence of *Sphaerotilus*, a filamentous fungus associated with sewage. Dissolved oxygen levels at the spring approached zero from the late 1980s through the early 1990s. The Service listed the Lee County cave isopod in 1992 as endangered. In 1998, Virginia added Batie Creek to the state's list of impaired water bodies.

The sobering effect of this disaster prompted cooperative action to remedy the problem and protect the fragile karst ecosystem, and with it the Lee County cave isopod. The Service, The Nature Conservancy, Virginia Department of Conservation and Recreation-Division of Natural Heritage, Virginia Department of Environmental Quality, Cave Conservancy of the Virginias, Virginia Tech University, Upper Tennessee River Roundtable, Tennessee Valley Authority, Virginia Cave Board, and the owner of the sawmill were among the major partners involved. Between 1998 and 2007, the partnership coordinated the removal of approximately 60 percent of the sawdust waste from the site, focusing on the actively decomposing portion generating most of the toxic leachate. Newly generated sawdust was taken to an industrial incinerator in Kingsport, Tennessee, to produce electric power. Older sawdust deemed unsuitable for incineration was used as a soil amendment to accelerate revegetation of reclaimed surface mines.

The cooperative effort was clearly successful. By November 2001, the fauna of Thompson Cedar Cave once again began to thrive. On February 19, 2002,



Lee County cave isopod


Photo by Shane Hanlon

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staff from the Virginia Division of Natural Heritage and the Service discovered that the Lee County cave isopod had returned to Thompson Cedar Cave. Since then, the population once thought to be extirpated has progressed towards recovery. We believe that uncontaminated upstream tributaries served as refugia from which Thompson Cedar Cave was recolonized. Concurrently, dissolved oxygen levels in the Batie Creek spring increased dramatically and have stabilized since 2005. As a result, in 2006, the Virginia Department of Environmental Quality removed Batie Creek from its list of impaired waters.

The Lee County cave isopod serves as a poster child for of the Cedar's unique and diverse ecosystem and became a catalyst for conservation. Because most of the cave fauna depends on constant water quality and quantity, protection efforts have focused on surface elements as well as the biological diversity contained within the caves and springs. Acquiring lands has been seen as the most feasible approach for long-term conservation in this region. Accordingly, The Nature Conservancy and Virginia's Division of Natural Heritage, with help from the Service, secured over 1,000 acres (400 hectares) of prime conservation lands in the Cedars. These partners plan to acquire additional lands to expand the Cedars State Natural Area Preserve. The preserve aims

to protect nine significant caves and calcareous glades and woodlands that benefit not only the Lee County cave isopod but 31 other rare species.

The Cedars region does not exist in a vacuum, and land acquisition alone will not be enough to protect its unique biological resources. The cave streams where *Lirceus usdagalun* lives, for example, are supported to a large extent by surface streams that sink into cave systems along the edge of the Cedars. These streams meander through mostly inaccessible cave passage as they flow under the Cedars and emerge at springs feeding the Powell River. Protecting these streams helps not only the subterranean resources of the Cedars but also the aquatic fauna of the Powell River. 

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Use of Southern Caves during the Civil War

by Babs Melton, Director of Crystal Caverns at Hupp's Hill Historical Park

From the late 1700's on, Americans frequently visited caves to marvel at the curious formations found in the underground world. By the 1850's, caves frequently provided Americans with community social centers that hosted dancing and sightseeing trips. While the Civil War caused massive disruptions in most other patterns of life, the social role of caves continued, but with additional functions as well.

Judging from the amount of graffiti inscribed on dozens of cave walls, many Civil War soldiers recreated themselves in the underground world. A soldier typically faced long periods of absolute boredom that were only briefly punctuated by bursts of terrible excitement. Understandably, visiting a cave could break the mind-numbing monotony of endless drill, sentry duty, and work details. As most soldiers were only 18 to 30 years old and had never been a dozen miles from home prior to their military service, joining the army provided a great way to see the larger world around them. Caves also offer shelter from the elements, a haven from pursuing enemies, and surcease for the war-weary soul.

After a large battle, every church and government building, and many private homes, barns, and caves, within a 50-mile radius of the battlefield were pressed into service as field hospitals. Lacking knowledge of, and supplies for, sanitary surgical procedures, the conditions found in these makeshift hospitals contributed to the high mortality rates. The cries of wounded and sick soldiers echoed through many honeycomb passages.

Caves also served as holding cells for prisoners. A fairly large number of prisoners could be forced underground at bayonet point, and then the cave's few natural entrances could be easily guarded with relatively few guards. Again, however, unsanitary and overcrowded conditions promoted disease.

The foregoing discussion of some of the uses of caves during the Civil War provides an important, but often overlooked, glimpse at military life. But the crucial importance of caves was more often their role in providing saltpeter for use in black gunpowder production.

Black powder is a mixture of potassium nitrate (which is also called saltpeter/saltpeper or niter/nitre), sulfur/sulphur, and charcoal. When ignited, the mixture generates a group of gases and liberates energy in the form of heat. Heated gases expand rapidly, producing an explosive force, especially if confined. The faster that the chemical reaction is generated, the more powerful is the resulting explosive force. If the ignition process is fully enclosed within a container of some sort, the explosion of a bomb results. If the container has a vent, such as the open end of a gun barrel, the expanding gases can propel a missile through the vent.

Gunpowder first appeared in the Arabic writings of Abd Allah (c. 1200), and Roger Bacon provided "recipes" for its production in 1268. A simple, if time consuming, process could produce its key component, saltpeter. Workers filled the bottom of an extraction vat with sand, then layered saltpeter soil over the sand filter, and leached the vat with water, which became turbid lye. Adding some egg white flocculated the turbidity and, after the precipitation had settled, the cleared saltpeter solution was scooped into a flat copper basin (reduction pan) on the hearth. There, the solution boiled down to concentrated saltpeter brine. Finally, the hot brine was poured into crystallization vats that contained copper sticks that served as crystallization nuclei. After crystallization, the saltpeter was scratched off the sticks and the rest of the brine went back to the reduction pan, repeating the process again and again. The first known American powder mill, where the caked mixture was crumbled into granules, was built in 1675 in Milton (Milltown), Massachusetts. Thereafter, more mills were built, usually in northern states.

Since gunpowder was the sole explosive used during the Civil War, the need for black powder was enormous and constituted a more painstaking task than did manufacturing solid shot and other forms of ammunition. Possessing only a few small mills of their own, Southern states obtained most of their gunpowder supply from northern factories; after the war began, however, the newly formed Confederate

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states were forced to find other supplies of the valuable commodity. With only 60,000 pounds of gunpowder in the entire South in April 1861, but 175,000 pounds needed by the artillery alone, the CS Ordnance Department had to swiftly begin its own manufacturing efforts despite the scarcity of key components.


Powder mills adequate to the task were required, and mills at Wilmington and Richmond supplied the Army of Northern Virginia while the Army of Tennessee received its supplies from Atlanta and Augusta. But throughout the war the enemy systematically targeted for destruction both new and existing infrastructure. Further, the government had to supply the mills with food for the workers; fuel; gunpowder's ingredients; and wagons for transporting raw materials to, and the finished product from, the production site. As the war dragged on for four horrible years, there were shortages in every category.

Labor was also in short supply; vast numbers of able-bodied workers enlisted in the army, and it was feared that lack of adequate safety protocols for the remaining workers could reduce the labor force still further. Large supplies of sulfur had to be imported from Louisiana. Charcoal was chiefly produced from stands of hardwoods in outlying areas. As the South's distribution system was inexorably destroyed by enemy actions against vital transportation systems, moving all key ingredients to the mills was problematic. But the most exhaustive action was centered on locating sources of saltpeter, an effort that required great creativity.

As the Union blockade slowly strangled southern ports, the Confederacy experienced shortages in 90% of the items used in daily life, including supplies of saltpeter. But once they understood that saltpeter was found in urine (often inescapably mixed with manure) in the soil, the nitrogen-rich byproducts of protein metabolism, Southerners sought niter-earth in old buildings, cellars, plantation quarters, tobacco barns, and caves. Soon even these sources were exhausted, so throughout the war years, "night-soil collectors" emptied human waste from public outhouses into big wagons that hauled off the waste to

processing facilities. The Confederate government even ran newspaper ads for donations of "chamber lye" (urine), which they collected door-to-door in barrels. The Army started stockpiling animal dung for "niter beds," enormous compost piles of rotting manure, urine, flesh and bone from which saltpeter would eventually leach out.

The nitrogen-rich urine-soaked dung of any animal species will do the job. That's where bat caves come into the picture. Bats are the insect-control specialists of the world, typically eating one half their weight in bugs each night, thereby ridding the earth's inhabitants of innumerable pesky varmints and also leaving great deposits of easily mined guano in caves. Many of Virginia's western mountain caves provided tons of saltpeter; unfortunately, this massive mining also destroyed many caves, which are irreplaceable natural resources intricately linked to groundwater supplies.

But you don't even need deposits of bat guano to find saltpeter in caves. Caves form when folded subsurface layers of limestone and dolomite are dissolved by naturally acidic groundwater. When water flows into caves, it deposits sand and clay on the cave floor. When groundwater that is transporting bacteria evaporates in the pore space of these cave sediments, nitrogen fixed by bacteria re-precipitates in the sediments, and saltpeter accumulates. Later, chemists also discovered that our very air contains nitrogen, but extracting nitrogen from such sources had to wait for 20th century technology; today, most saltpeter is made from nitric acid, which is derived from air-extracted nitrogen. As one wag (John Ruch, *Stupid Questions*, 2000) suggested: "if the South had had better chemists, it could have foregone urine collection and simply gone with the wind"!!! 

Cave Conservation Organizations in and around Virginia

By Dave Socky

There are many cave and cave related organizations in and around Virginia. Most are related to conservation of caves and karst areas and can be an excellent resource for information and help. This article lists a few of these organizations and gives a little detail on their purpose – their mission. Web sites are included where more detail on the organization can be found, including links to others cave and karst related organizations.

The organizations covered in this article are listed here:

- **ACCA** American Cave Conservation Association
- **ACC:** Appalachian Cave Conservancy
- **CCV:** Cave Conservancy of the Virginias
- **NSS:** National Speleological Society
- **VAR:** Virginia Region of the National Speleological Society
- **VCB:** Virginia Cave Board
- **VSS:** Virginia Speleological Survey

Please read on for details about these organizations.

Virginia Cave Board (VCB)

Web:

http://www.dcr.virginia.gov/natural_heritage/cavehome.shtml

Virginia is rich in cave and karstland resources with over 4000 known caves. The Virginia Cave Board was established to conserve and protect caves and karstlands of the Commonwealth and advocate the wise use of these resources.

Virginia Cave Board members serve Virginia by advising private individuals, organizations and public agencies on cave and karst related matters, providing cave management expertise, preparing and presenting educational material, identifying significant caves, and recommending conservation and preservation measures for cave resources within the Commonwealth.

National Speleological Society (NSS)

Web: **<http://www.caves.org/>**

The NSS is a national caving organization with

and preservation measures for cave resources within the Commonwealth.

National Speleological Society (NSS)

Web: **<http://www.caves.org/>**

The NSS is a national caving organization with over 12,000 members and 200 grottos. The National Speleological Society does more than any other organization to study, explore, and conserve cave and karst resources; protect access to caves; encourage responsible management of caves and their unique environments; and promote responsible caving.

Virginia Speleological Survey (VSS)

Web: **<http://www.virginiacaves.org/>**

The Virginia Speleological Survey (VSS) is a non-profit, volunteer organization that collects, maintains, and distributes information regarding the cave and karst resources in Virginia. The VSS is an official internal organization (survey) of the National Speleological Society (NSS) and has been around under the current name since 1974.

Cave Conservancy of the Virginias (CCV)

Web: **<http://www.caveconservancyofvirginia.org/>**

CCV is a nonprofit organization, established in 1980 for the purpose of protecting and managing caves and karst resources in Virginia and West Virginia and are based in Richmond, Virginia, USA. CCV membership is made up of people from all walks of life that recognize the importance of caves and karst resources. The CCV helps to protect the fragile environment of caves so that the many unique species that can survive nowhere else may be preserved for study and enjoyment by future generations.

CCV is proud to have contributed independently and in conjunction with various other nonprofit organizations on educational, environmental protection, and research projects over the years.

American Cave Conservation Association (ACCA)

Web: **<http://www.cavern.org/acca/accahome.html>**

ACCA is a nonprofit membership organization whose activities and proceeds are dedicated to the conservation of caves and related resources across the

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nation and around the world.

ACCA educates people about caves and karstlands so that these features and their resources can be conserved. ACCA supports the studies of caves and karstlands since good education must be based upon good information. Target audiences are those people who live in, work in, or otherwise use or enjoy karstlands. These audiences range from the general public (and especially school children) to those who directly use cave and karst resources or make decisions that affect these resources. Many of the adverse impacts of land use on karst and cave resources are unintentional and result from a lack of basic knowledge about how karstlands and caves function and interact.

Appalachian Cave Conservancy (ACC)

Web: <http://www.acave.us/>

The Appalachian Cave Conservancy, Inc. is a non-profit organization formed in 1978. Its purpose is to apply "best management practices" to caves on privately owned lands in the Appalachian region. To achieve this mission, the Conservancy enters into voluntary agreements with landowners to develop and implement effective management plans based on the site-specific characteristics of the cave and surrounding property.

The intent of ACC is to apply the knowledge and skills obtained over the years of to the conservation and management of caves in the Appalachian region. The relationship of the land owners of the property above caves is crucial to the proper conservation and management of caves and their cooperation and participation is encouraged. Any person who owns land in the Appalachian areas of Virginia and Tennessee with cave entrances is eligible to receive services from ACC. The ACC anticipates that most of their services will be devoted the management of significant caves that require more intense management. However, people who own land with relatively insignificant caves would be able to receive

advice on proper cave management


Virginia Region of the National Speleological Society (VAR)

The VAR is a group of grottos in and around Virginia which has united to form an association of the National Speleological Society, which is called a region or regional association.

The VAR is the oldest region of the NSS, was started in 1950. The VAR publishes a newsletter called the *Region Record* and olds fall and spring meetings with business sessions and other activities. The VAR sponsors conservation and cave protection activities and maintains contact with other environmental groups.

Karst Waters Institute (KWI)

Web: <http://www.karstwaters.org/>

The Karst Waters Institute (KWI) is a non-profit institution whose mission is to improve the fundamental understanding of karst water systems through sound scientific research and educating professionals and the public. Institute activities include the initiation, coordination, and conduct of research, the sponsorship of conferences and workshops, and occasional publication of scientific works. 

For additional information please contact the **Virginia Department of Conservation and Recreation, Division of Natural Heritage**, 217 Governor Street- 3rd Flr, Richmond, VA 23219 or one of the following members of the Virginia Cave Board:

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We're on the Web! Visit us at:

<http://www.dcr.virginia.gov/dnh/cavehome1>

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