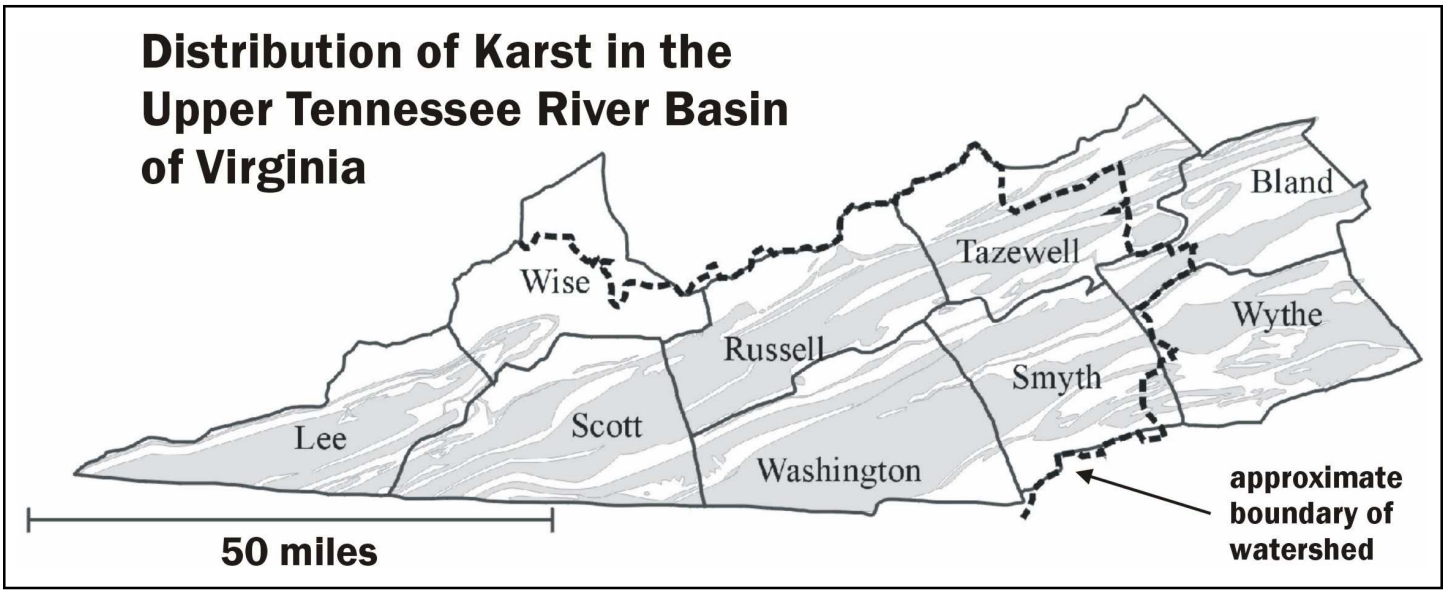
Natural Heritage Resources Fact Sheet

Karst Resources of the Upper Tennessee River Basin



Land draining into the Clinch, Powell and Holston rivers defines the Upper Tennessee River watershed in Virginia. These rivers drain more than 2 million acres, about 8 percent of Virginia's land, in 11 extreme southwestern counties. Most of this land is within the Appalachian Ridge and Valley physiographic region, where resistant sandstone strata support ridges, and carbonate rocks, such as limestone and dolomite, and softer shale formations make up the valley floors. Over geologic time, slightly acidic naturally occurring water has dissolved much of the carbonate rock. The result is a complex and frequently spectacular style of topography called *karst*, which is characterized by sinkholes, disappearing streams, caves and large springs.

Surface and ground water are closely related in such karst regions. Soil, chemicals or bacteria entering through a sinkhole or even spilled onto the ground in a karst area can rapidly flow into groundwater. Water and any pollution it carries quickly flow in underground streams along hard to predict paths. For this reason, sinkholes should never be used to dispose of farm and domestic waste products. Good management practices will protect fragile karst ecosystems and ensure the availability of good drinking water for people in the Upper Tennessee River watershed.

The Upper Tennessee's watershed is predominantly rural; about 48 percent of the land is forested and 40 percent is agricultural. Less than 12 percent of the watershed is devoted to urban, mining or recreation. Nonetheless, 305 of the 4,400 miles of streams in the Virginia portion of the watershed were considered "impaired" in 2002 because they violated water quality standards. Businesses and citizens can work with local, state and federal agencies to address and reduce these impacts, taking advantage of technical expertise and cost-sharing programs. Important partners include local soil and water conservation districts, U.S. Department of Agriculture service centers, the U.S. Fish and Wildlife Service, the Tennessee Valley Authority, the Cave Conservancy of the Virginias, and the Virginia Department of Conservation and Recreation (DCR). Because the region has until recently remained largely undeveloped, citizens of southwestern Virginia still have the opportunity to combine much-needed economic growth with responsible environmental stewardship.

The Upper Tennessee River system is among the richest on Earth in terms of biodiversity, with karst springs supplying much of its base flow. Biodiversity serves as a gauge of a watershed's environmental health; diverse populations of indigenous aquatic species indicate good water quality. The condition and diversity of living communities in cave and karst systems are likewise a measure of environmental quality. Lime-rich waters flow through caves and out of springs supplying calcium carbonate that supports a variety of freshwater mussel species. Some species have perished, and others have declined drastically. Twenty mussel species and five fish species are now considered endangered under the U.S. Endangered Species Act.

Several of DCR's natural area preserves in the Upper Tennessee River watershed are significant in terms of karst. The Cedars Natural Area Preserve in Lee County includes a unique karst limestone/dolomite barren and montane dry calcareous forest/woodland. Calcium carbonate rich soils and a lack of surface streams provide unique habitat for many rare plants and animals. The Pinnacle and Cleveland Barrens natural area preserves in Russell County contain plant and animal communities that depend on the special conditions of their karst landscape. Unthank Preserve in Lee County protects one of Virginia's most biologically significant cave systems.

The biodiversity of the Upper Tennessee River basin extends well below the land surface. DCR's Natural Heritage Program

DCR
Virginia Department of Conservation & Recreation

For more information, contact:
Department of Conservation and Recreation, Virginia Karst Program

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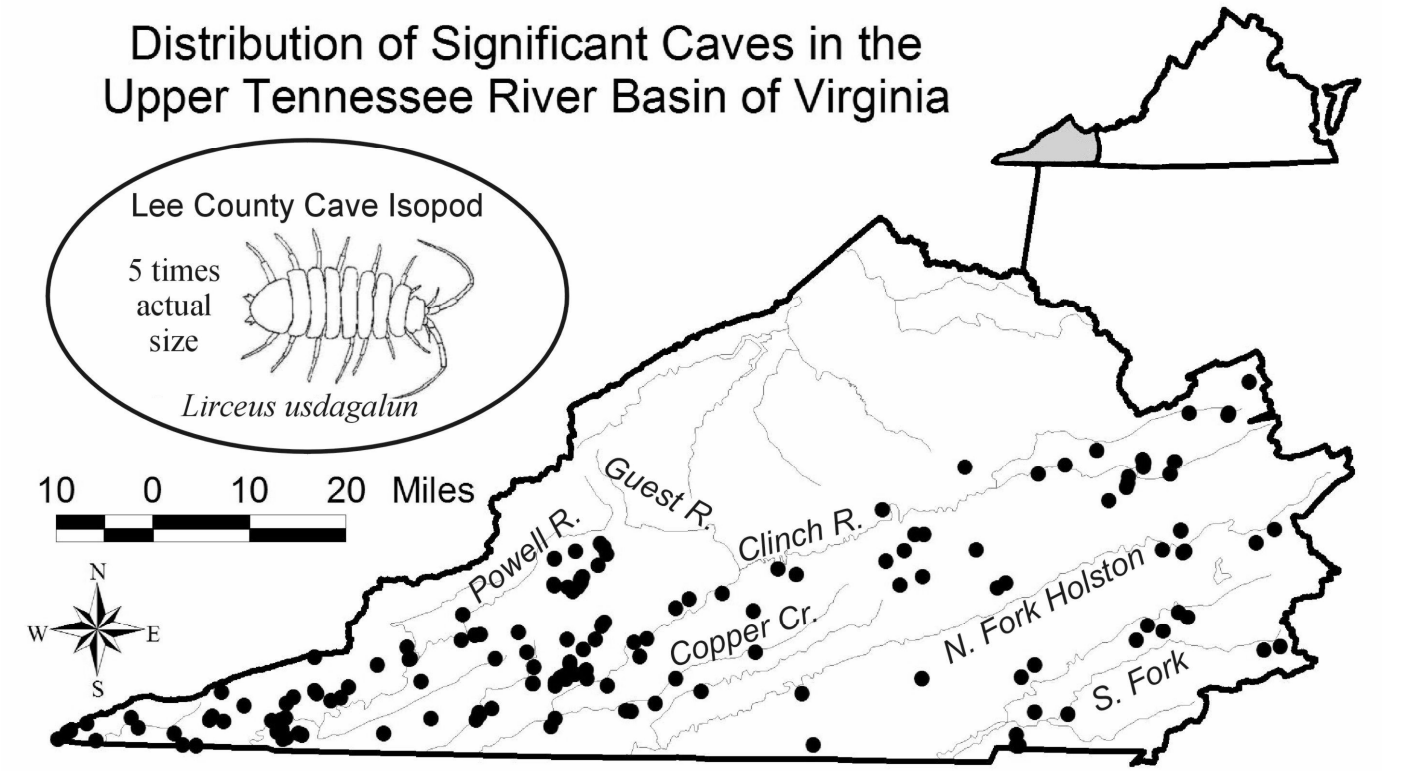
tracks 76 rare cave animal species in this basin, with only 224 total documented occurrences. Many of these animals are known only from a single cave. These figures do not include numerous species that are newly discovered and not yet described. Most rare cave-dwelling species are invertebrates. In caves in this watershed, such rare invertebrate species include 20 cave beetles, 11 springtails, six millipedes, five amphipods and five isopods. One aquatic cave isopod species, the Lee County Cave isopod, is federally listed, and the Virginia Endangered Species Act protects an aquatic cave snail found only in a few caves along the Powell River.

Eight species of bats use caves in the Upper Tennessee River basin. Four are considered rare - the Indiana bat, the gray bat, the Virginia big-eared bat and the Eastern small-footed bat. The first three are protected under the U.S. Endangered Species Act. Bats play a valuable role in insect pest control and are generally harmless to humans.

Explorers have documented more than 4,400 caves in Virginia, approximately 1,700 of which lie in the Upper Tennessee River basin. Established by the Virginia Cave Protection Act of 1979, the governor-appointed Virginia Cave board maintains a list of about 400 significant caves, nearly half of which are in this basin. Some of these caves are miles long and several hundred feet deep. Many display great beauty. Hard water leaves deposits in caves forming speleothems, which can occur in a variety of shapes and mineral compositions. For example, stalactites form on the ceilings, and stalagmites form on the cave floor as minerals carried by the water droplets accumulate. Visitors should not touch such formations as they are they are very easily damaged.

There are many opportunities to learn more about the Upper Tennessee River basin's caves and karst resources. Natural Tunnel State Park in Scott County showcases a spectacular karst feature, and programs at the park include wild caving trips. For more information, contact the chief ranger at (276) 940-2674 or visit www.dcr.virginia.gov/state_parks/nat.shtml. Cumberland Gap National Historic Park in Lee County has Gap (Cudjo's) Cave, which has a rich cultural and biological heritage. To tour Gap Cave by lantern, contact the National Park Service staff at (606) 248-2817 or visit www.nps.gov/cuga. DCR's Karst Program staff also frequently teaches educators and public officials about the Commonwealth's cave and karst resources. Project Underground, a key component of DCR's environmental education mission in western Virginia, also provides teacher workshops that include content training, lesson plans, activities, posters and other educational tools.

The protection of karst resources is critical to achieving sustainable development in the Upper Tennessee River basin. The risk of surface and ground water contamination is inherently greater in karst topography, which connects upland environments to streams and rivers via extensive cave systems, relatively few of which are documented. As much or perhaps more so than bats or isopods, the people of the basin need clean karst. As the area becomes more developed, reliance on these shared water resources grows.



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