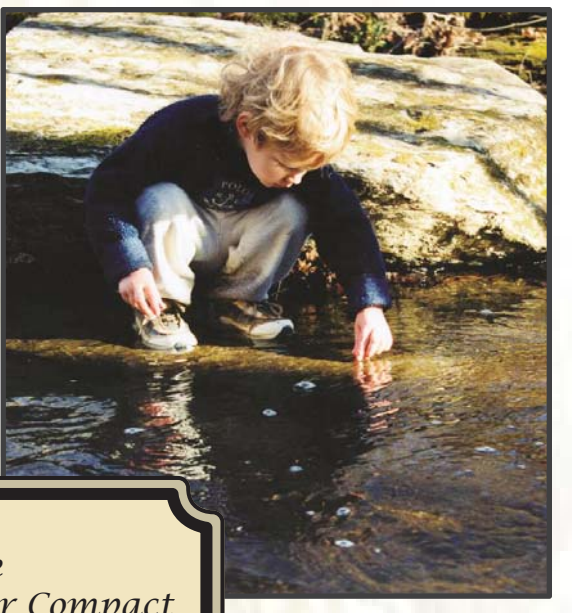
Our Cumberland River Basin

Part Two: from Celina to Carthage

Executive Summary

This is the second in a series of four introductory profiles of the Cumberland River basin. In partnership, the Cumberland River Compact and The Nature Conservancy of Tennessee have developed these profiles to celebrate the Cumberland basin and to encourage stakeholders across the basin to join together and develop a more comprehensive and action-oriented State of the Basin resource. Such a resource would explain in greater detail critical issues in the Cumberland basin, identify opportunities for resource stewardship, and prioritize shared watershed strategies. The State of the Basin would also provide a platform for annually updated "report cards," which would establish health indices, benchmarks and goals, and track progress or decline over time.

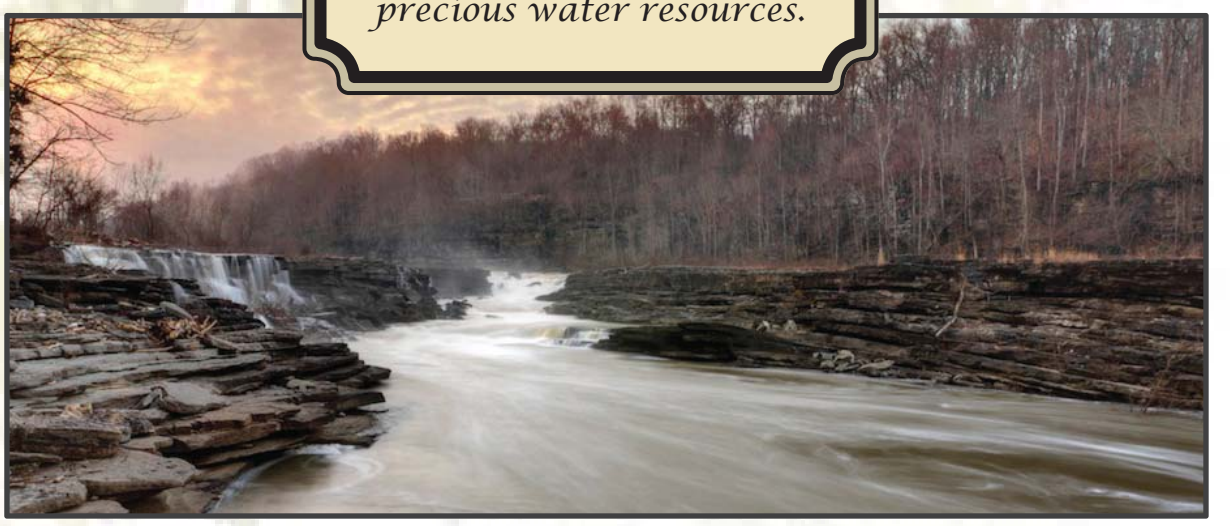
In this second of four profiles, we provide an introduction to the upper middle region of the Cumberland basin. This region includes four geographically diverse watersheds in Tennessee and Kentucky. It is home to the Cumberland River's longest tributary, the Caney Fork, as well as other major rivers such as the Obey and Collins. A number of major reservoirs exist in the region, including Dale Hollow, Cordell Hull, and Center Hill lakes. Throughout the region's history, water has been essential to the region's communities, economies, and ecologies, and will continue to be essential in the years to come. The condition of many of the rivers and streams in this region is pristine, and a number of waterways enjoy special state protections as State Scenic Rivers or are listed federally on the National Resource Inventory. Yet, over 700 miles of rivers and streams in the region currently have impaired water quality and represent a potential threat to human health, ecosystems, or both. Sediment and bacteria are the primary types of impairment in the region, and pasture grazing, abandoned mining, and urban stormwater runoff are the primary sources of these impairments, according to data collected by the State of Tennessee. Many individuals, government agencies, and non-profit organizations work to promote and protect water quality in the region. By working together, we can better understand our region's water resources and collaboratively focus our efforts in a way that will have the greatest impact for the greatest good.

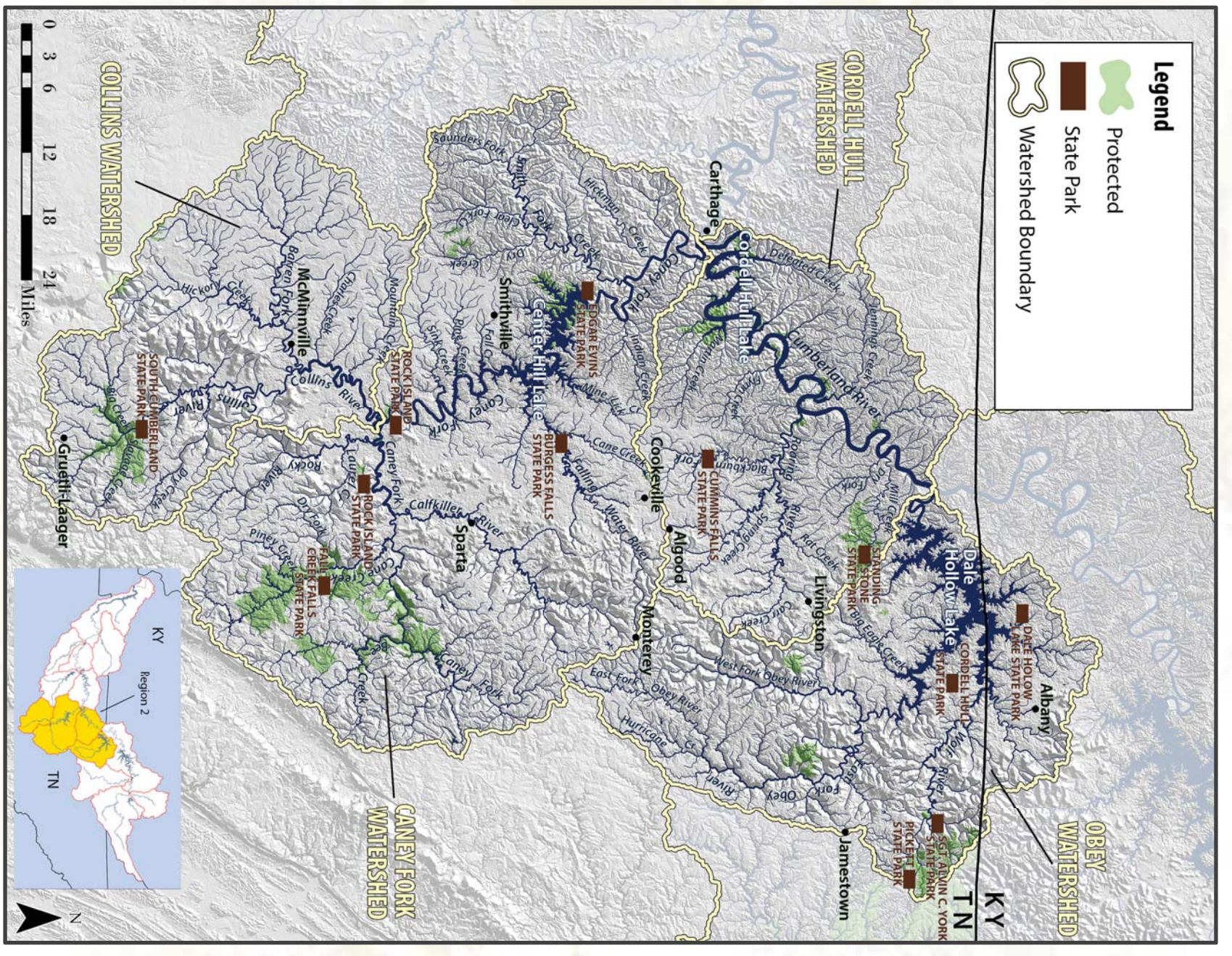


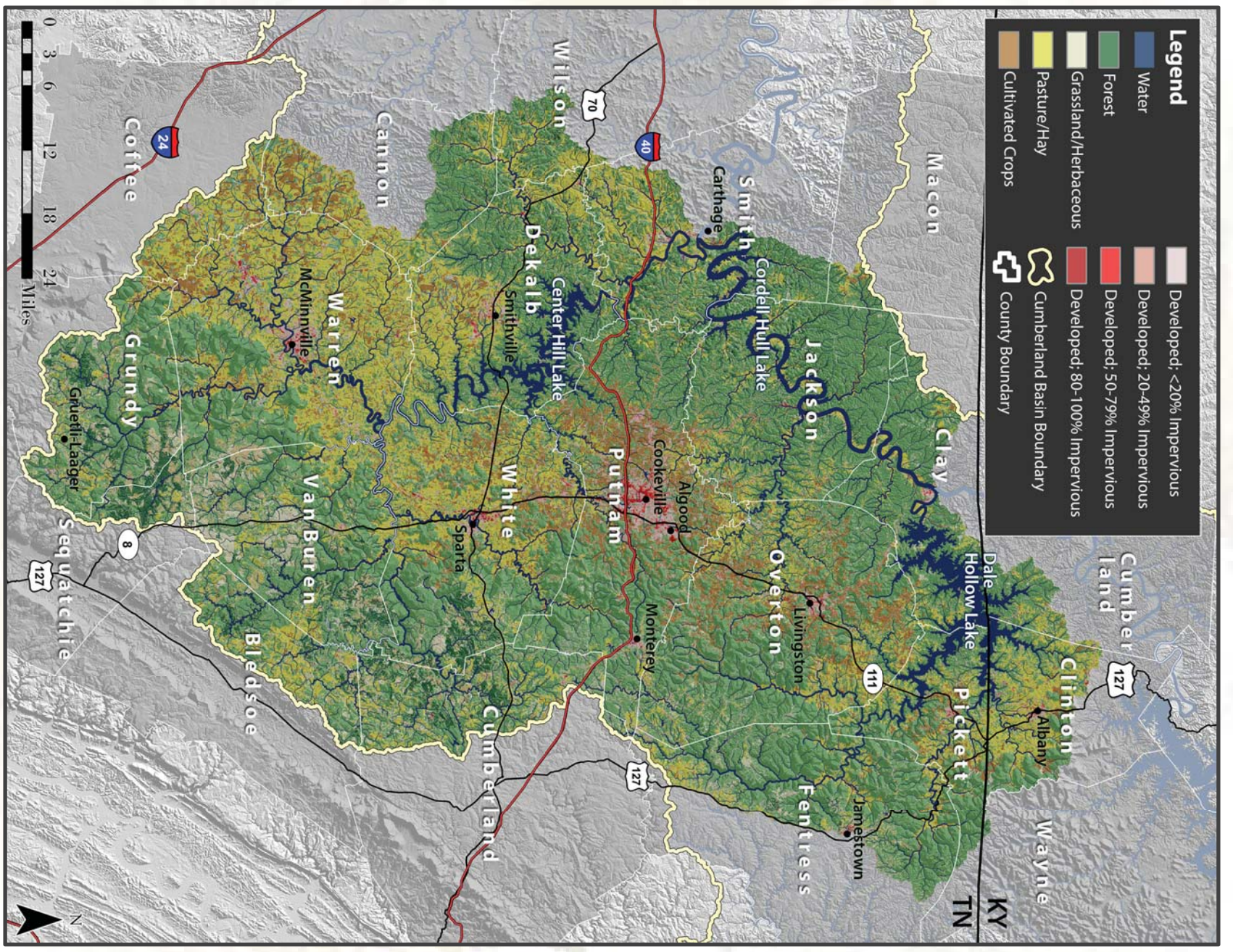
(Photo by Paul Sloan)

Join the Cumberland River Compact and The Nature Conservancy's efforts to become better stewards of our basin's precious water resources.

The Caney Fork (Photo by Chuck Sutherland)





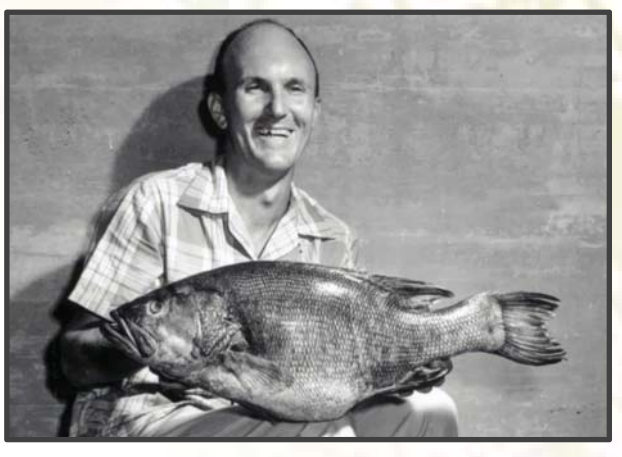


Our Cumberland River Basin: from Celina to Carthage

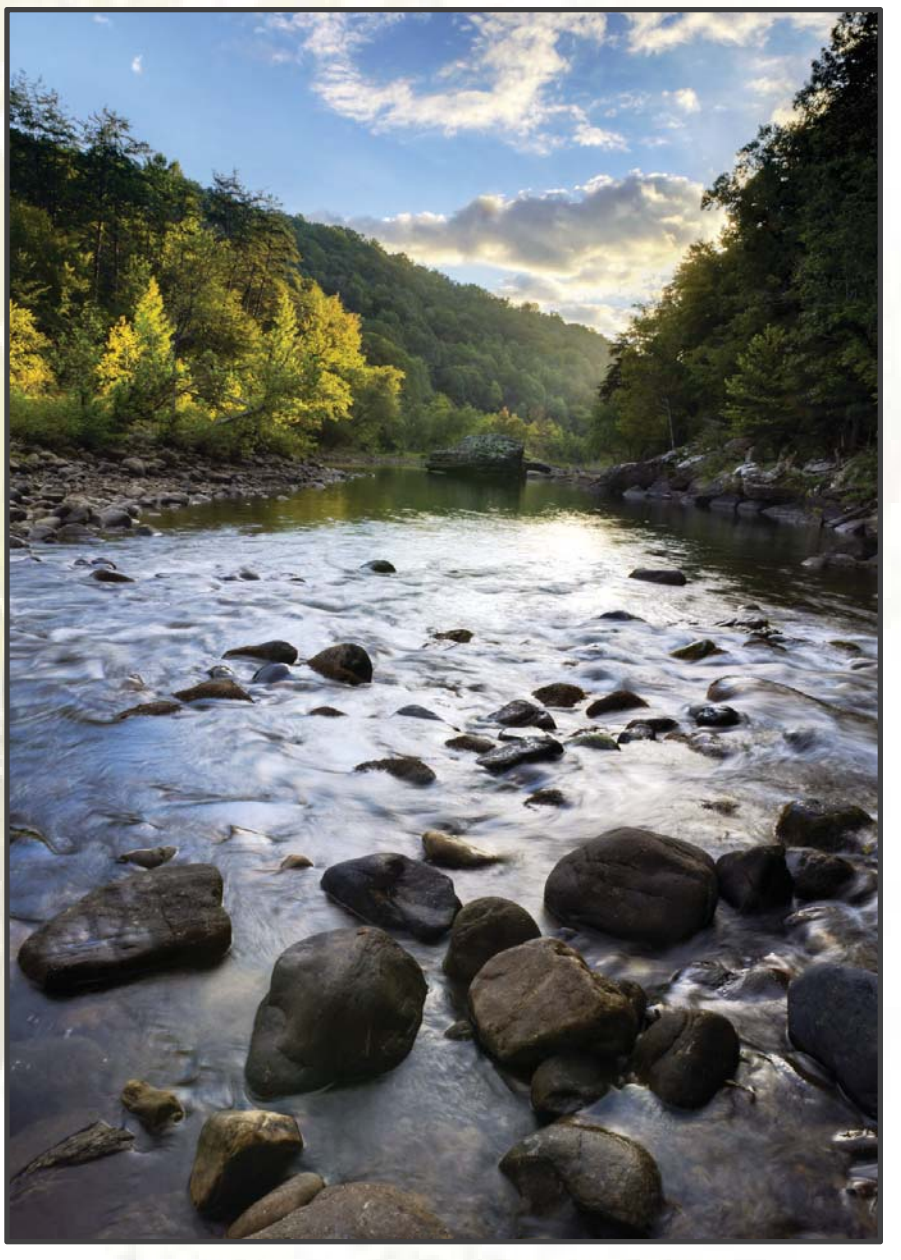
Before the Cumberland River bids farewell to eastern Kentucky, it cuts a twisted path through Cumberland and Monroe counties. Nearing the state line, the river straightens and breaks for Celina, Tennessee. Between this small town and Carthage, Tennessee, the Cumberland River flows for 72 miles, fed by waters off 4,300 square miles of land and from 5,200 miles of tributary streams and rivers.

This is a region of the Cumberland basin defined by four major watersheds and marked by a diversity of stunning landscapes. Over the millennia, water has sculpted deep gulfs and untold miles of cave systems. Tennessee's longest known cave, Blue Spring Cave, includes 35 miles of subterranean passages beneath White County. A waterfall's roar is seldom far from earshot. Fall Creek Falls plummets 256 feet in Van Buren County. It's the nation's highest free-falling waterfall east of the Rockies.

The region's beautifully varied landscape offers world-class water recreation opportunities. Rock Island State Park hosted the 2012 Kayaking World Cup, the world record smallmouth bass was caught on Dale Hollow Lake, and Cummins Falls was recently named one of the country's 10 best swimming holes by *Travel and Leisure* magazine.



David Hayes holds his world record smallmouth bass caught on Dale Hollow Lake in 1955. (Photo courtesy of International Game Fish Association)



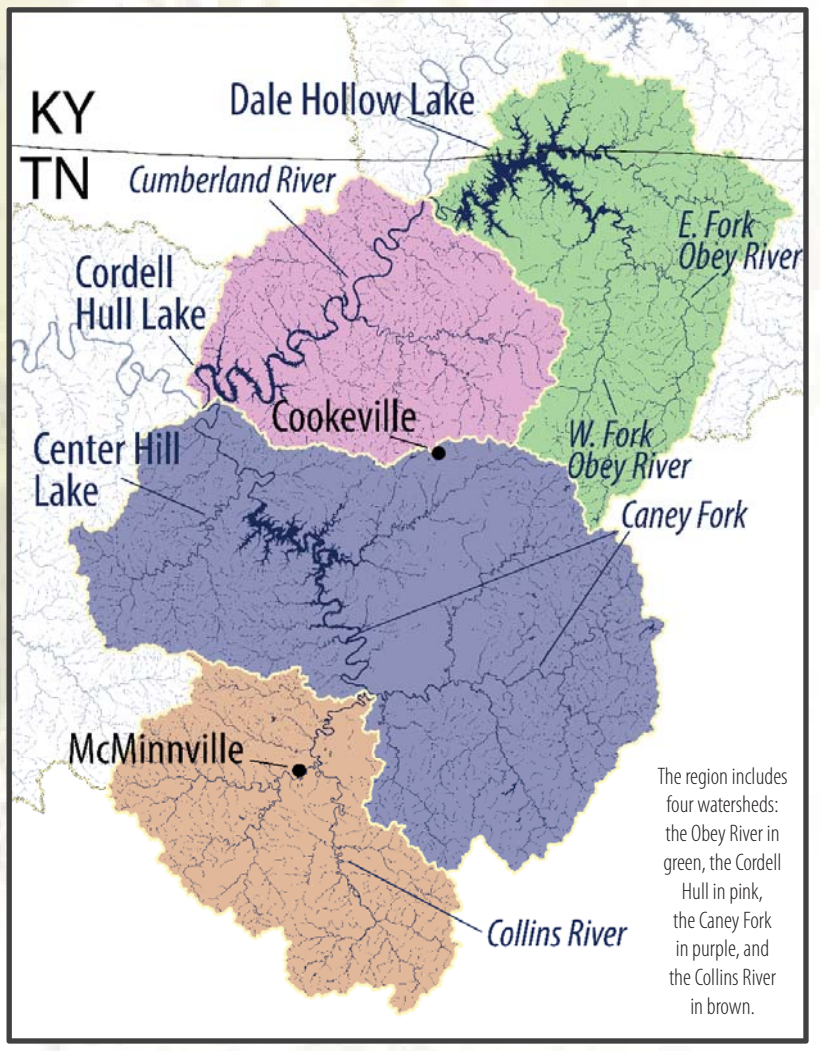
The Caney Fork (Photo by Chuck Sutherland)

Natural Features of the Region

Roughly one-third of this portion of the Cumberland basin is nested within the western edge of the Appalachian Mountains. Here, one finds a mix of the rolling highlands and tranquil, slow-flowing streams of the Cumberland Plateau, along with the steep hills, hollows, and the exuberant, quick flowing streams and waterfalls of the Plateau's western escarpment. Mixed oak forests dominate higher elevations, while maples, buckeyes, tulip poplars, oaks, and other species populate ravines. A westward descent from the Appalachians encounters a mosaic of lower elevation plains and tablelands – the Inner Plateau's Eastern Highland Rim and Outer Nashville Basin. Here in the remaining two-thirds of the region, low to moderate grade streams are the norm, and an abundance of springs emerge from exposed limestone layers. Oak-hickory forests characterize these gentler western forest ecosystems.

Four watersheds define the hydrology of this region: the Obey River, Cordell Hull, Caney Fork, and Collins Fork watersheds. The northern-most of the four is the Obey, and like the mountainous areas of other watersheds in the region, the Appalachians here are cooler and receive slightly more rainfall than lower elevations to the west. The Obey River watershed is home to Cordell Hull and Sgt. Alvin C. York state historic parks, as well as portions of Pickett State Park and Pogue Creek Canyon State Natural Area. As the Obey flows west, beyond the Cumberland Plateau, it reaches Dale Hollow Lake, a reservoir created to control flooding and provide hydropower by the U.S. Army Corps of Engineers' Dale Hollow Dam in 1943. The Obey watershed is one of the basin's least populous, and water quality in the region benefits from the fact that nearly two-thirds of it remains forested. Like the other watersheds of the region, the Obey is home to a great array of plant and animal species. Here, one can spot elusive least bitterns, wading through shallow waters and swaying like reeds when predators appear. Threatened Obey crayfish are found in the watershed's upper reaches and nowhere else on earth.

The Cordell Hull watershed is almost entirely west of the Appalachians. The rivers and streams of this area drain to an impounded section of the Cumberland River known as Cordell Hull Lake, a reservoir created by another U.S. Army Corps of Engineer's project in 1973. Lands to the region's north and west are mostly forested, while the regions' southeastern third is primarily agricultural. The watershed is home to three State Scenic Rivers that all flow into Cordell Hull Lake – Roaring River, Blackburn Fork, and Spring Creek – as well as Cummins Falls and Standing Stone state parks and the 25,000 acre Cordell Hull Wildlife Management Area. The watershed sustains an abundant and distinct array of aquatic life. Streamside salamanders lay eggs in ephemeral streams – a strategy that keeps predatory fish from swimming upstream and plundering them. Critically endangered orangefoot pimpleback mussels still find habitat in free flowing streams. Reintroduced in 2000, lake sturgeon are making a comeback in the watershed and can grow to be nearly 200 pounds.



The region includes four watersheds: the Obey River in green, the Cordell Hull in pink, the Caney Fork in purple, and the Collins River in brown.

Top Left: Wetland edges are popular hunting grounds for barn owls across the region. (Photo by Ron Dudley) Right: Least Bittern (Photo by R. Bennets) Bottom Left: Barking tree frogs spend most of their time high in trees, but descend to the region's wetlands during the breeding season. (Photo by Brad Moon)

The Caney Fork watershed is drained by the Cumberland's longest tributary, the Caney Fork River. This 143-mile river was named for the cane breaks Europeans discovered along its banks when first exploring the area. Center Hill Lake, another large Army Corps reservoir, was created following the construction of Center Hill Dam on the Caney Fork in 1948. At nearly 1,800 square miles, the river's watershed is the largest and most geographically diverse in the region. It is bigger than the Cordell Hull and Collins watersheds combined. Edgar Evins, Burgess Falls, Rock Island, and Fall Creek Falls state parks are all within the watershed, and Short Mountain, Bone Cave, and Virgin Falls state natural areas are here as well. Awe-inspiring Scott's Gulf, a deep canyon carved by the force of the Caney Fork, is home to both the Virgin Falls Pocket Wilderness and the 10,000 acres Bridgestone/Firestone Centennial Wilderness Area. Among the many plant and animal species found in the watershed, channel catfish lay eggs in muskrat burrows and snaketail dragonflies zigzag above the riffles of gravelly streambeds. In the spring, yellow trout lilies can be found blossoming along riverbanks in the company of beech trees.

The region's southernmost watershed is the Collins River watershed. It is drained by the Collins River, which flows to the northeast to join the Caney Fork River at Center Hill Lake. Both the South Cumberland and Rock Island state parks are found within the watershed, and the Collins River itself is a Tennessee State Scenic River. Savage Gulf is another majestic canyon in the region, where the waters of the Collins River, Big Creek, and Savage Creek dance between narrow canyon walls and sheer sandstone cliffs. One of the most agriculturally active watersheds of the entire Cumberland basin, the Collins River watershed sees substantial cattle and grain production, and is home to highly productive tree and landscape plant nurseries. The watershed's aquatic biodiversity is fascinating. Amongst the many species that inhabit the watershed, Barbara's Buttons can be found on the rocky, wet, banks of area streams, and slender glass lizards inhabit sandy soils near streams and ponds. The subterranean waters of this watershed's remarkable cave systems provide a home in the dark to translucent southern cave crayfish.

Barbara's Buttons bloom on the rocky, wet, banks of Collins River watershed streams. (Photo by Patrick Coin)

Savage Gulf within the Collins River watershed (Photo by Stephen Alvarez)

The Value of Our Water Resources

From the Native Americans who hunted buffalo beneath Cummins Falls to early settlers who formed communities around the region's many springs and scenic rivers, water has played and will continue to play an essential role in our lives and livelihoods.

The city of Jamestown, within the Obey watershed, was first known as "Sand Springs." Numerous springs here once provided freshwater for Cherokee inhabitants, and later for early settlers, including Mark Twain's parents. By the early 19th century mineral spring resorts on Bon Air Mountain and in Beersheeba Springs attracted patrons from across the nation. During this time, the Cumberland and its tributaries became major transportation corridors for exporting tobacco, cotton, and timber. Steamboats carried the region's goods all the way to New Orleans. Thousands of log rafts also made their way down the Caney and the Obey to the Cumberland River, eventually making their way to mills and markets in Nashville. By the late 19th century, waterfalls across the region were being used to run a number of historic mills. Burgess Falls powered a gristmill and sawmill, while Great Falls at Rock Island Park turned a cotton textile mill. Even outlaw distillers, such as U.S. Secretary of State Cordell Hull's father, found ways to put the region's waters to work, using headwater streams to condense alcohol steam into moonshine.

Late 19th century patrons of Beersheba Springs (Photo courtesy TN State Library and Archives–Nashville)

Today, roughly 270,000 people call the region home and rely on the area's freshwater resources everyday. In terms of public water supply, both Dale Hollow and Center Hill lakes serve area communities. Cookeville, for example, withdraws over 10 million gallons a day from Center Hill. The Cumberland's tributaries also provide freshwater supply to communities. McMinnville takes water from the Barren Fork, while Sparta obtains water from the Calfkiller River. Beyond the public supply needs of communities, water supports several economic engines in the region such as agriculture, energy production, and tourism.

The Collins River watershed has more agricultural land than any other Cumberland basin watershed with the exception of the Red River watershed. Many farmers in the Collins River watershed grow soybeans, corn, and wheat. Pasture and grazing lands are also abundant. Warren County, within the watershed, is famous for its many plant nurseries, which bring over $350 million in annual revenue to the local economy.

Bridgestone's Centennial Wilderness affords spectacular views across Scott's Gulf. (Photo by Chuck Sutherland).

For over a century, the area's waters have contributed significantly to the energy needs of the region's people. Water powered important 19th century mills at Burgess Falls and Great Falls. Between 1928 and 1944, the Falling Water River made hydroelectric power for the city of Cookeville possible. Since the mid-20th century, the Army Corps of Engineers has generated hydropower at Center Hill, Dale Hollow, and Cordell Hull dams, while TVA has produced energy at Great Falls Dam. Together, these dams produce enough energy to meet the needs of over 250,000 people.

The region is brimming with exceptional tourist and recreational opportunities. Eleven state parks are found here, including Tennessee's Fall Creek Falls State Park, which welcomes over 1.5 million visitors every year. Many less visited, but highly enticing wildlife management areas and state natural areas are also open to the public, as well as the 10,000-acre Bridgestone/Firestone Centennial Wilderness in Scott's Gulf.

In 2010, *Travel and Leisure* magazine listed Cummins Falls as one of our nation's 10 best swimming holes. (Photo by Alec Norman)

The region has become a mecca for paddlers of all skill levels. The Caney Fork played host to the 2012 Freestyle Kayaking World Cup at Rock Island State Park. Elsewhere on the Caney, Class IV and V whitewater races through Scott's Gulf, and beautifully scenic, placid sections flow downriver of Center Hill Dam. Sections of the Obey, Roaring, and Collins rivers are also becoming popular paddling destinations.

The reservoirs at Dale Hollow, Cordell Hull, and Center Hill together attract millions of people annually and offer visitors a wide range of recreational opportunities from fishing, boating, swimming, and diving, to hiking, bird watching, camping, hunting, and picnicking. Dale Hollow Lake alone attracts 3.5 million visitors annually. For those seeking the thrill of the catch, the fishing opportunities afforded by these areas are truly world class. This is a region where legendary angler Billy Westmoreland made a name for himself catching smallmouth bass, where the state record spotted bass was caught on Center Hill Lake in 1989, and where the world record smallmouth bass was caught on Dale Hollow Lake in 1955.

One of Earth's final frontiers exists just beneath your feet in the region. Millennia in the making, water has carved natural masterpieces from the area's limestone, resulting in primordial cave systems whose passages, caverns, and inhabitants are still being discovered today! Within these systems, critically endangered gray bats hibernate. Cavefish spawn in underground waters. The four-acre, 350-foot high Rumble Room was only discovered in 1998 and is currently the second largest known cave chamber in the United States. The Cumberland basin is home to a vast array of plant and animal species, and its water sustains and is sustained by this great biodiversity. The variety of life includes everything from the Cumberland's arching, riverbank sycamores to the endangered mussels within its waters. When our freshwater ecosystems are diverse and healthy, they provide a tremendous array of benefits to our communities. They protect us from floods, control erosion, and filter impurities from our water. They provide us with sources of food and medicine, as well as inspiration and wonder. Yet, we live in a world today where over 20% of all freshwater species are either threatened or extinct and where we continue to lose species everyday. Within the region, a startling 185 different species are at risk. Considering this, our freshwater's incredible value as a sustainer of life and biodiversity is difficult to overstate.

When water combines with CO_2 in the atmosphere and soil it becomes acidic. When acidic water comes into contact with limestone or dolomite, cave systems are formed. Lost Creek Cave was acquired by the State of Tennessee and made part of Fall Creek Falls State Park in 2012. (Photo by Tim Curtis)

Our Impacts

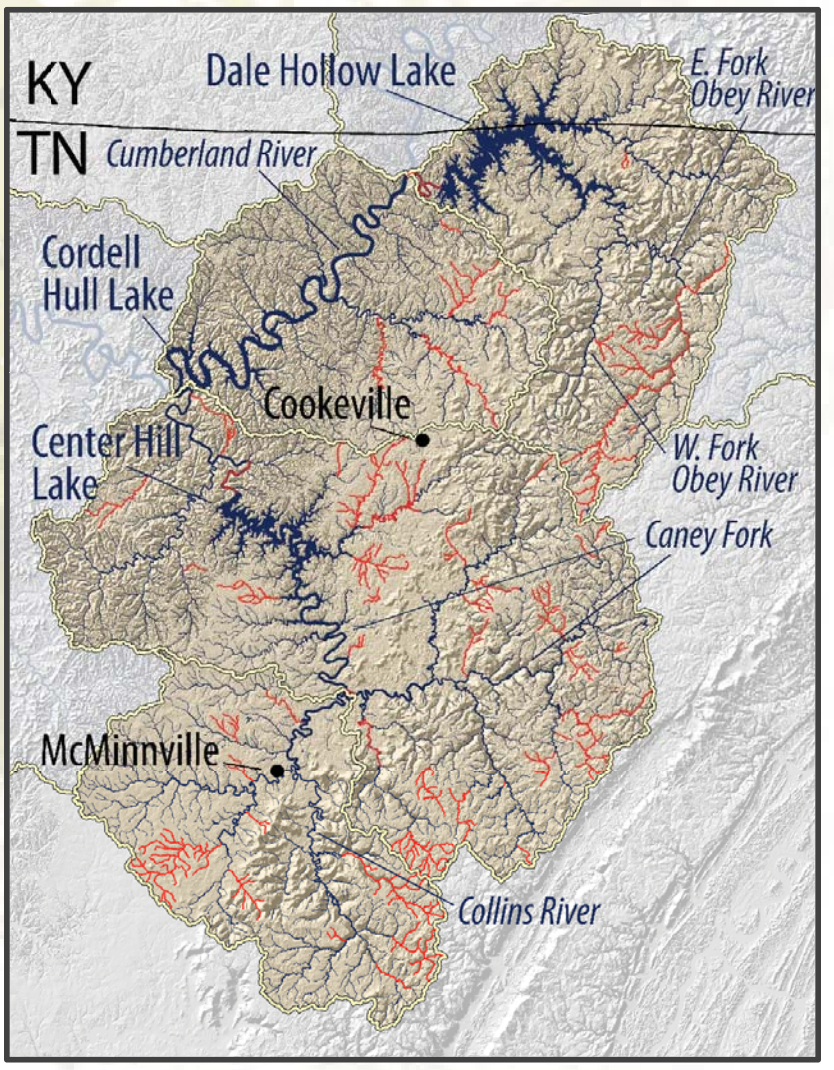
White-fringeless orchids are one of the 185 threatened species in the region. (Photo by Dr. Thomas Barnes)

Our lives are enriched by the valuable uses we make of the region's water resources. Whether our water is being used for drinking and public supply, irrigation, industry, or for producing hydropower, all people and communities in the region should have enough water to meet their needs. That said, we must ask ourselves: Are the demands we are placing on our resources sustainable? While many waterways in the region remain healthy, past and current human practices have significantly degraded others, compromising the ability of our communities to use this essential resource in the future.

Across the region, Tennessee and Kentucky report that over 700 miles of surveyed streams and rivers are impaired. Impaired waters represent a threat to people, ecologies, or both. Most commonly, impairments are a result of excess sediment and bacteria, though acidity (low pH) and iron impairments are also common.

Notably, the karst nature of the region complicates water-quality concerns. The course of waterborne pollutants in karst terrain is difficult to track, and flow paths can take unexpected routes that contradict the topography of the land.

Watershed	Most Common Impairments	Most Common Sources of Impairment
Obey River	pH, sedimentation, iron	Abandoned Mining
Cordell Hull	Bacteria, low dissolved oxygen	Pasture grazing
Caney Fork	Sedimentation, bacteria, pH	Pasture grazing, abandoned mining, and urban stormwater runoff
Collins River	Bacteria, sedimentation, pH, iron and manganese	Pasture grazing, abandoned mining



Shown in red, over 700 miles of streams and rivers are impaired in the region.

What Human Activities Are Having the Greatest Impact?

Tennessee and Kentucky report that the most common sources of river and stream pollution in the region are from pasture grazing, abandoned mining, and urban stormwater runoff.

Certain pasture grazing practices have impaired many stream miles in the region. On farms where overgrazing is practiced, loosened topsoil can easily wash into nearby streams during heavy rainfall. This sediment smothers aquatic life and habitat and the muddied water prevents sunlight from reaching plants. Poor feeding, watering, and waste management locations for livestock can also lead to sediment problems and can enable bacteria to reach water. When bacteria impair surface or groundwater, people who come into contact with that water are at risk of ear or eye infections, vomiting or dysentery. The negative impacts of these grazing practices are especially pronounced where streams and rivers lack sufficiently forested stream banks. Without these natural forest buffers, rainfall can quickly and easily wash pollutants into nearby waters.

Abandoned mines from previous generations of activity also impair many stream miles in the region. These mines present a number of problems for waterways, the most common of which is acid mine drainage. Acid mine drainage occurs when ground or surface water comes into contact with rocks that contain high levels of sulfide minerals. Resulting acidic water can then leach heavy metals from rocks or pipes and have harmful effects on humans, other animals, and plants. When acidic water mixes with drinking water resources, it is a matter of serious concern. It can corrode plumbing systems, leaching toxic metals such as lead, iron, and manganese in the process. Lead exposure can cause hearing loss, seizures, and even miscarriages, while iron supports the growth of harmful organisms such as bacteria in water. Manganese poisoning can lead to bronchitis, lung embolism, or Parkinson's disease.

Acid mine drainage can persist indefinitely. (Photo by Tim Schumann)

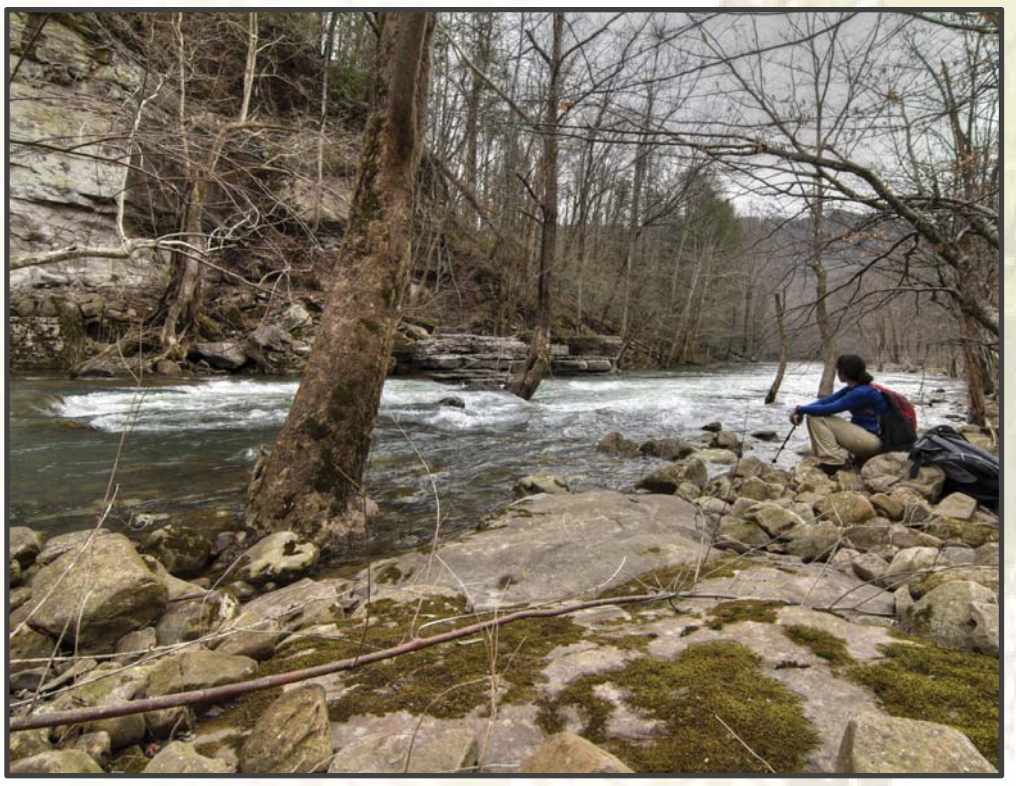
In urbanized areas, impervious surfaces, such as roads, buildings, and parking lots, negatively impact water quality in the region. Water quickly runs off these surfaces, rather than slowly infiltrating the soil as it would in a forest or field. As it runs off, pollutants, such as trash, petrochemicals, pet waste, sediment, nutrients, or other pollutants are quickly conveyed into nearby waterways. This rush and volume of stormwater erodes banks, and the conveyed pollutants kill aquatic life and alter freshwater habitats. In addition, they can make water unsafe to swim in and make treating drinking water more difficult and expensive.

Dams are another significant source of impairment. Dale Hollow, Cordell Hull, Center Hill, and Great Falls all provide the region with many benefits, including hydropower, flood protection, drinking water, and lake recreation. However large dam projects also drastically alter river habitats as they create reservoir pools, or lakes, behind them - tempering flow, altering temperatures and dissolved oxygen levels. Many freshwater plants and animals accustomed to river environments have been eliminated or adversely impacted as a result. In addition to these large federal dam projects, the Tennessee Department of Environment and Conservation has inventoried an additional 88 smaller dams across the region that are either 20 feet or greater in height and retain 30-acre feet of water or greater. All of these dams impact water quality, and some no longer serve any practical purpose. A number of neglected dams may even exacerbate flooding or represent safety hazards to paddlers or other river users.

A stormwater drain quickly conveys polluted runoff to a nearby stream. (Photo by Robert Lawton)

What Challenges Are on the Horizon?

The region's water quality will face a number of challenges in the years to come. Devonian shale geology extends across much of the region and may be capable of producing high amounts of natural gas. The siting of production facilities and practices used to extract natural gas is a growing concern in the region. Issues regarding the chemicals used in the extraction process, groundwater contamination, and forest fragmentation are all water-related concerns. Because mineral rights are sometimes owned separately from surface land rights, the potential for extracting natural gas from the region's publicly protected lands exists, which emphasizes the importance of good natural resource planning for all our public lands.



The Bridgestone/Firestone Centennial Wilderness (Photo by Chuck Sutherland)

Like many other aquatic species, smallmouth bass are sensitive to changes in water temperature and erosion. (Drawing by Timothy Knepp; US Fish and Wildlife Service)

Average air temperatures are measurably increasing in the region. By 2080, the Global Change Research Program (GCRP) predicts that average temperatures in the Southeast will rise between 4.5 and 9 degrees Fahrenheit. Higher ambient air temperatures raise water temperatures and can lower dissolved oxygen levels, causing stress to stream and river plants and animals. Hotter weather also increases evapotranspiration rates and dehydrates soils. Already, the GCRP reports, the frequency of spring droughts in the Southeast has increased by 12% and summer droughts have increased by 14% since the 1970s. An expected increase in storm intensity is also a concern in the Appalachian areas of the middle upper basin. Here, a combination of severe storms and steep, deforested slopes already produce dangerous flash floods in places, threatening lives and property and exacerbating erosion problems.

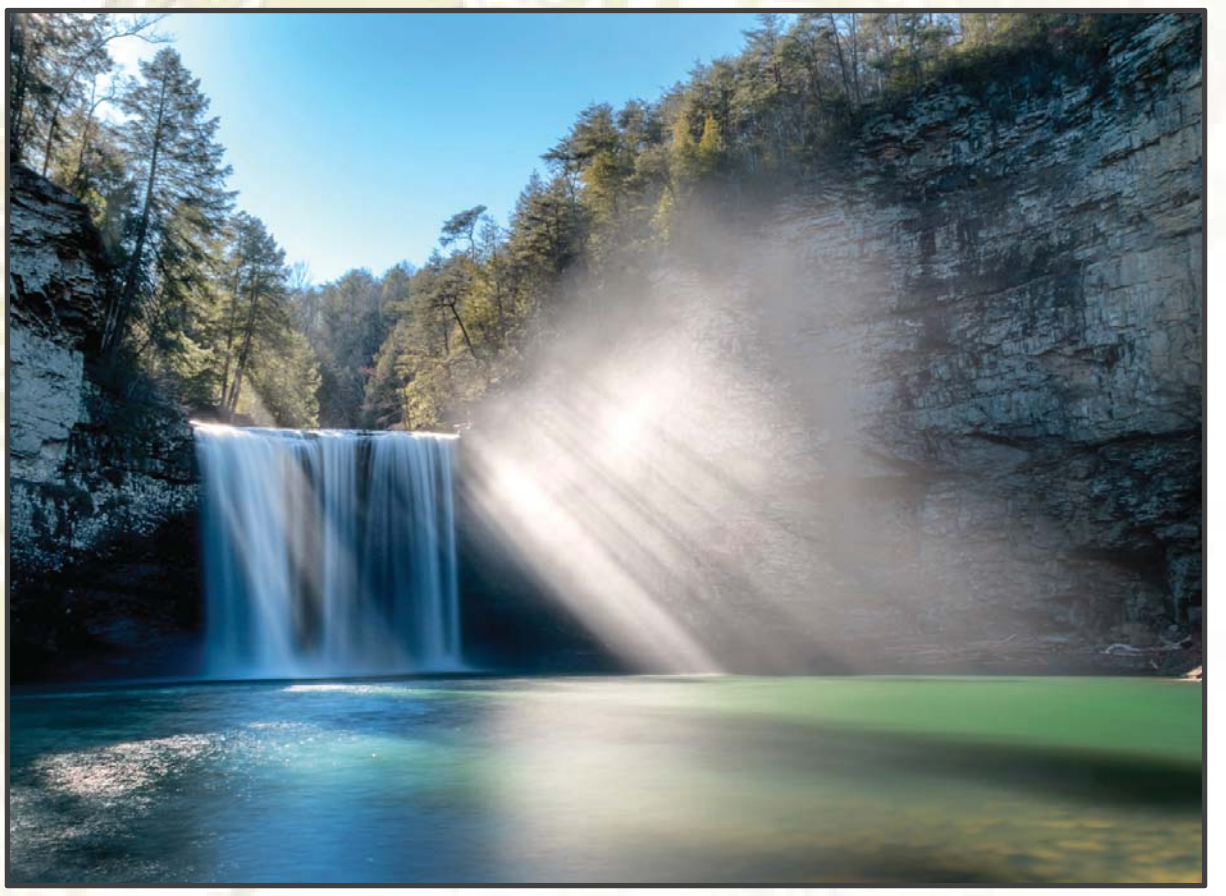
Protecting Our Water Resources

Many local, state, and federal agencies work to enhance the health and enjoyment of water resources in the region. At the local level, riverfront parks in cities such as Sparta and McMinnville, for example, provide scenic, public access to the Calfkiller and Barren Fork rivers respectively.

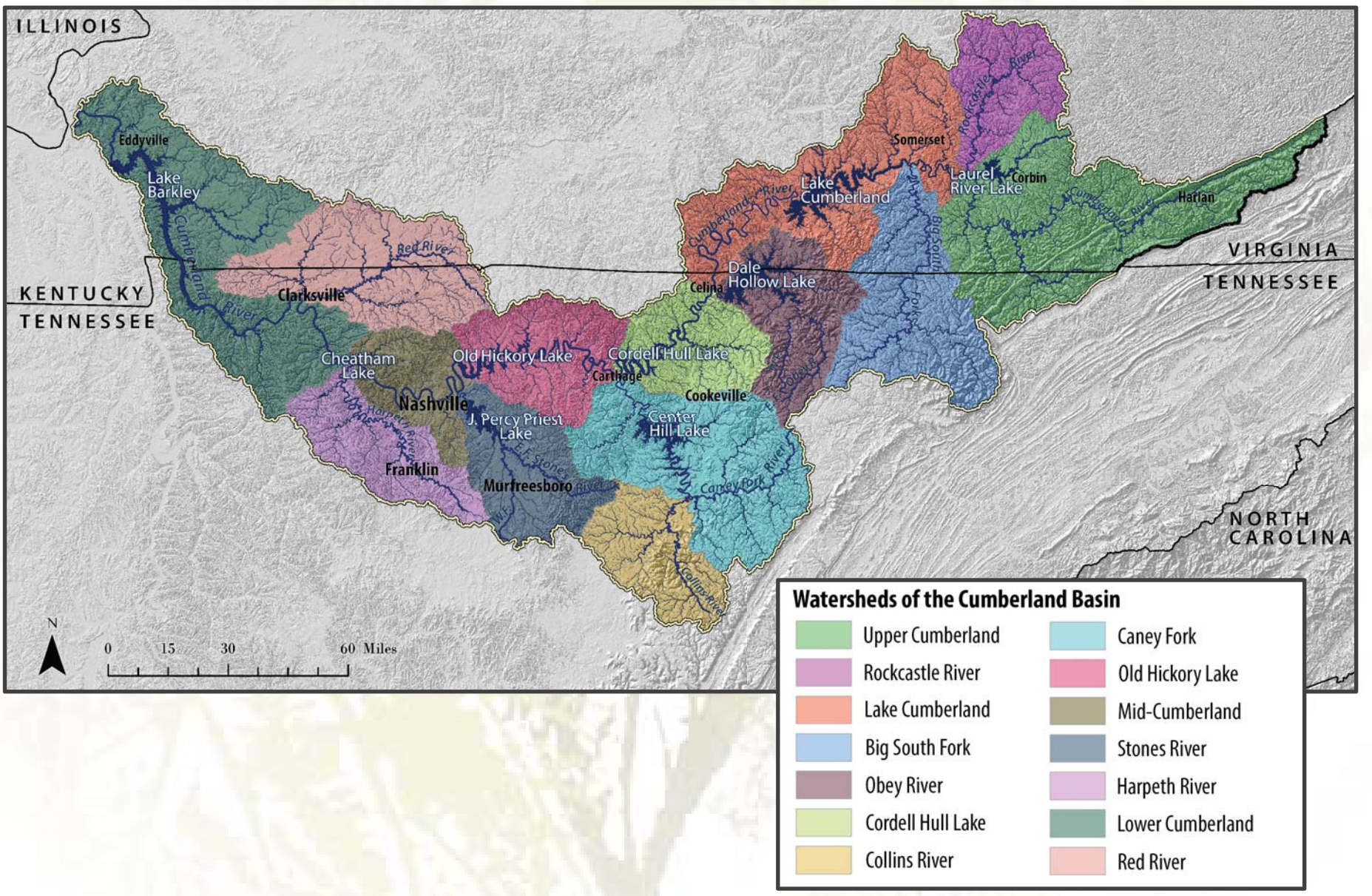
Kentucky and Tennessee state parks in the region protect 108 square miles of land and over 120 miles of streams and rivers. Additional forested lands and wildlife are managed within Bledsoe, Standing Stone, and Pickett state forests. Tennessee's Natural Areas Program protects some of the best examples of intact ecosystems within Tennessee, and there are seven state natural areas in the region. Tennessee's State Scenic Rivers Program safeguards sections of the Collins River, Roaring River, Blackburn Fork, and Spring Creek.

At the federal level, 20 waterways in the region are on the National Rivers Inventory. This inventory lists rivers that have one or more exemplary natural or cultural values, and these rivers benefit from federal protection. Also at the federal level, the Army Corps of Engineers manages three recreation areas in the region and employs measures to improve water quality at its dams and reservoirs. The agency, for example, uses turbine venting, auxiliary air supply valves, and higher dissolved oxygen concentration releases to improve dissolved oxygen levels below its dams, and also maintains minimum flow levels needed by aquatic life on rivers below its reservoirs.

Beyond these agencies, many private landowners, businesses, and non-governmental organizations promote water quality. Many landowners manage their timber and agricultural lands in collaboration with the Natural Resources Conservation Service. Between 1998 and 2000, the Bridgestone Corporation gifted 10,000 acres of unbroken wilderness in Scott's Gulf to the State of Tennessee. The Centennial Wilderness, as it is called, is open to the public and features premier fishing, paddling, hiking, and camping opportunities, as well as breathtaking vistas over Scott's Gulf and the Caney Fork.



Cane Creek Falls (Photo by Michael Hicks)



Join Us!

The future of the Cumberland River basin offers countless possibilities for its residents. From our earliest arrival, water has been our lifeline; and it will continue to be the lifeline of future generations. Our water nourishes and feeds us, transports our commodities, defines our cultural heritage, and allows us to teach our children the joy of fishing, swimming, and exploration. Our basin is also home to some of the earth's most diverse communities of freshwater animals that depend on clean water every second of every day in order to survive.

Recognizing our basin's extraordinary value, the Cumberland River Compact and The Nature Conservancy of Tennessee have come together to publish this profile and to urge stakeholders throughout the basin to help develop a comprehensive, action-oriented State of the Cumberland Basin resource. The State of the Basin will identify and explain critical issues in the region, identify opportunities for resource stewardship, and prioritize shared watershed stewardship strategies. A "report card" will be included with health indices, benchmarks and goals for these indices, and a report of progress or decline in these indices over time. We invite you and members of your community to join us in this effort.

We believe this work will significantly deepen our understanding of the basin, from the Cumberland's headwaters in eastern Kentucky to its confluence with the Ohio, and will allow the many stakeholders and agencies working in the basin to collectively make strategic decisions that target implementation efforts on those that will have the greatest impact for the greatest good. Working together, we can make great strides in improving water quality. As a result, our region will be a healthier place for our people, economy, and environment.

Please join us in our efforts to become better stewards of the Cumberland basin. For more information or to get involved, please contact the Cumberland River Compact at 615-837-1151 or The Nature Conservancy of Tennessee at 615-383-9909.

CUMBERLAND RIVER COMPACT & The Nature Conservancy
Protecting nature. Preserving life.®

The Cumberland River Compact and The Nature Conservancy of Tennessee thank both the Kentucky Division of Water and the Tennessee Department of Environment and Conservation for their assistance in the completion of this document, as well as the many photographers who generously donated their work.

Cover photo: Chuck Sutherland

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