Our Cumberland River Basin

Part Four: from Ashland City to Smithland

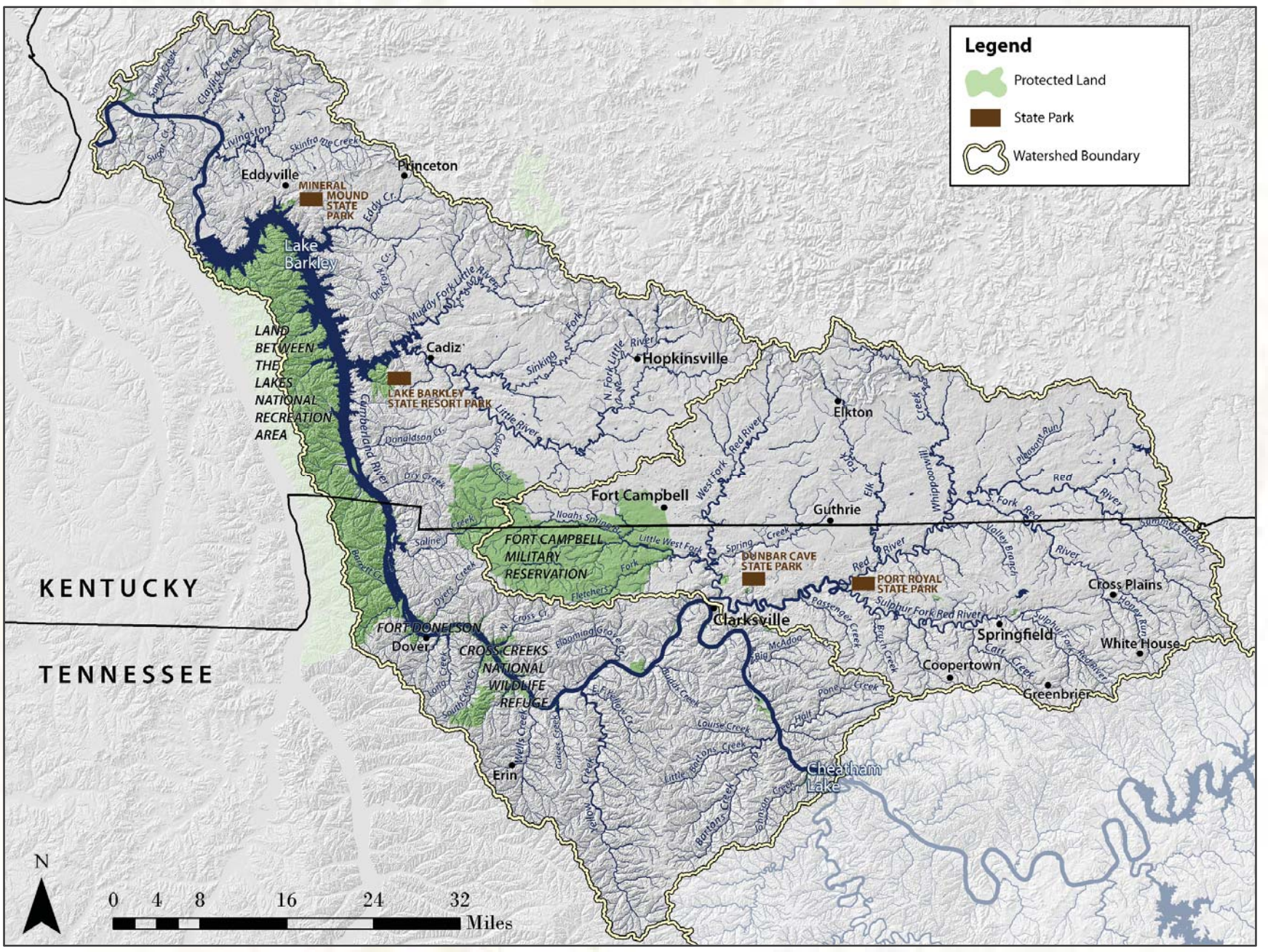
Executive Summary

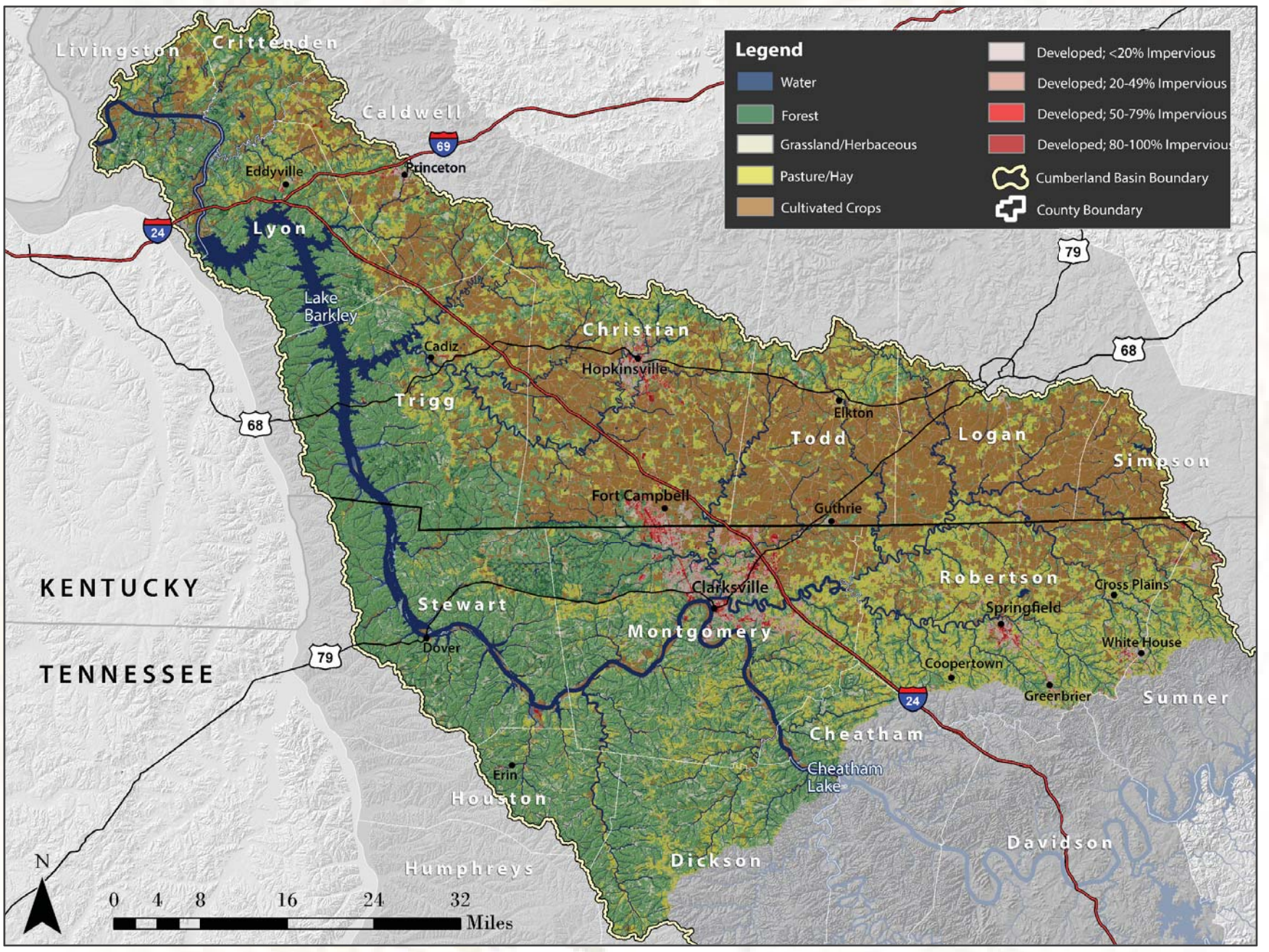
This is the fourth in a series of four introductory profiles of the Cumberland River basin. In partnership, the Cumberland River Compact and The Nature Conservancy of Tennessee have developed these profiles to celebrate the Cumberland basin and to encourage stakeholders across the basin to join together 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 stewardship strategies. The State of the Basin would also provide a platform for annually updated "report cards," which would establish health indices, benchmarks and goals for these indices, and track progress or decline in these indices over time.

In this fourth profile, we provide an introduction to the lower region of the Cumberland Basin. This region is defined by two watersheds in Tennessee and Kentucky. It is home to over 150 miles of the Cumberland River, major tributaries such as the Red River, and large reservoirs including Lake Barkley and Cheatham. Throughout the region's history, water has been essential to the area's communities, economies, and ecologies, and will continue to be essential in the years to come. The conditions of many of the rivers and streams in this region are healthy. That said, over 600 miles of rivers and streams are currently impaired and represent a potential threat to human health, ecosystems, or both. Many individuals, government agencies, and nonprofit citizen groups work to promote and protect water quality in the region. Working together, we can better understand our water resources and collaboratively focus our efforts in a way that will have the greatest impact for the greatest good.

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

Photo by Chris Whitis





Our Cumberland River Basin: from Ashland City to Smithland

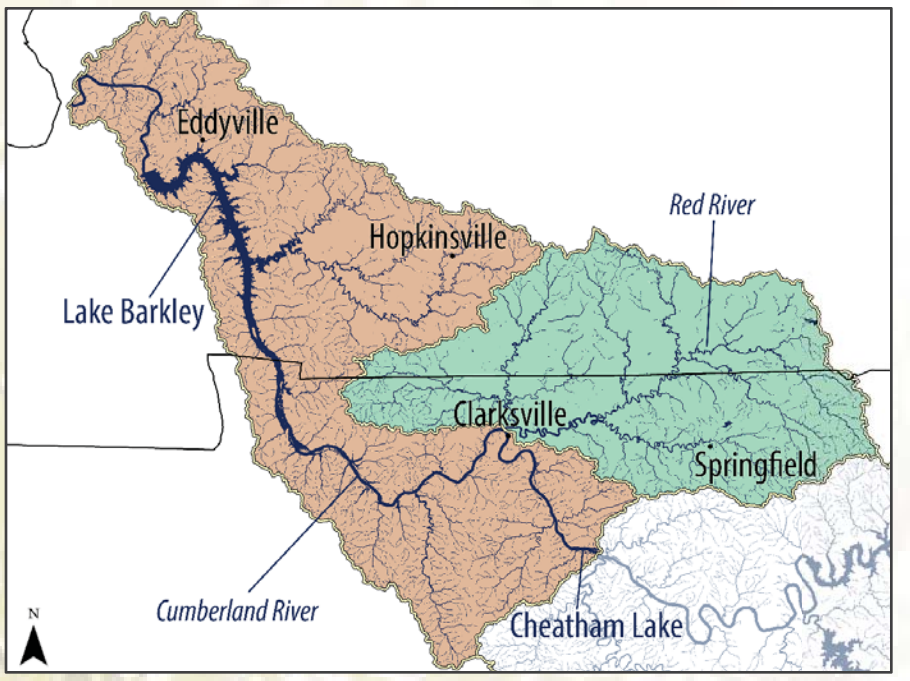
In Smithland, Kentucky the Cumberland River realizes its unending ambition – to join the Ohio. Rounding a final bend, the river's water makes its way downstream, carried by a slow current to the mile wide Ohio. At this great confluence, the Cumberland's water has been amassed from over 20,000 miles of tributary streams and rivers. By the time it reaches Smithland, this water has supported the lives of 2.5 million people and sustained thousands of plant and animal species across one of the most biologically diverse freshwater river basins on earth.

In part four of the Our Cumberland River Basin series, we offer an introduction to the lower region of the Cumberland River basin. Within this area, 3,750 square miles of land and 4,170 miles of tributary streams and rivers drain to a 150-mile section of the Cumberland River between Ashland City, Tennessee and Smithland, Kentucky. The region is home to 400,000 people, and over one-fourth of this population lives within Clarksville, Tennessee. Of the four regions profiled in this series, this region is the least developed, and least forested in the basin. It is also the most agricultural, and contains more cropland than all other regions of the basin combined.

A great blue heron takes flight at Land Between the Lakes. (Photo by A.J. Wells)

Natural Features of the Region

Two major watersheds define the hydrology of our basin's lowest lying region: the Red River watershed and the Lower Cumberland watershed. The eastern and smaller of the two is the 1,450 square mile Red River watershed. Waters here drain to the 97-mile Red River before emptying into the Cumberland River in Clarksville, TN. Flatter than the neighboring Lower Cumberland watershed, the Red's karst-filled terrain interacts with a complex network of above and below ground streams where springs and sinkholes abound. The Red is distinctive in many ways. It has less surface water and less forest per square mile than any other watershed in the Cumberland River basin. It is home to more cropland than other basin watershed. Tobacco farming has a rich, centuries-old history in the area, and farmers grow corn, soybeans, and grain as well. Cattle, chicken, and egg production are also prevalent. At one time, there was a great deal of bluestem prairie in the Red River watershed, but today there is less native grassland than any other watershed in the basin.



The region includes two watersheds: the Red River watershed in green and the Lower Cumberland watershed in brown.

Within the Red River watershed, sections of the Red River, the West and South Fork of the Red, and the Elk Fork and Sulphur Fork are all on the Nationwide Rivers Inventory – a federal listing of streams recognized for having outstanding scenic, recreational, or cultural qualities. Dunbar Cave and Port Royal state parks, as well as the Dunbar Cave State Natural Area, and the Fort Campbell and Cedar Hill Swamp wildlife management areas are all located here. Like other watersheds in the basin, an abundance of wildlife relies on the Red's water resources. Even within the watershed's water-sculpted caves and caverns, there are fascinating species such as translucent "blind cave crayfish" and endangered gray bats.

Dunbar Cave is home to translucent blind cave crayfish. (Photo by Dante Fenolio)

The Lower Cumberland is the most downstream watershed of the Cumberland River basin. It is home to the Cumberland River basin's outlet, where water from 18,000 square miles of basin land and 22,000 miles of basin streams and rivers empty into the Ohio River. The watershed itself is 2,332 square miles – just shy of being the largest watershed in the basin. That said, it doesn't lack for superlatives. It is home to more surface water and more wetlands than any other watershed in the Cumberland River basin. All 118 miles of the Cumberland River's longest impoundment, Lake Barkley, are within the watershed, as well as a short stretch of the Lake Cheatham impoundment, and 32 miles of free-flowing Cumberland River. All together, over 150 miles of the Cumberland River flow through the watershed, accepting roughly 2,750 miles of tributary streams and rivers. East of the Cumberland River, the topography closely resembles that of the neighboring Red River watershed. Nearer the Cumberland, though, and in the watershed's south and west areas, the landscape is more rugged. In these areas, an abundance of streams thread hills and ridges before meandering through level bottomlands. The area is less suitable for farming and water quality benefits from the dense oak-hickory forests and low levels of human activity.

The free flowing section of the Cumberland River, as well as sections of Long Creek, Yellow Creek, the Little River, and the Muddy Fork of the Little River are all listed on the Nationwide Rivers Inventory. The watershed hosts an abundance of protected areas, including a majority of the 170,000-acre Land Between the Lakes National Recreation Area. In addition to Land Between the Lakes, federally protected lands include the Cross Creeks National Wildlife Refuge, Fort Donelson National Military Park and Fort Campbell Military Reservation. Protected state lands include Mineral Mound and Lake Barkley state parks, Stewart State Forest, Barnett's Woods and Livingston County state natural areas, as well as seven state wildlife management areas or wildlife refuges. The watershed is rich in biodiversity. Barnett's Woods alone is home to 443 vascular plant species, including one of only 13 known populations of Price's potato bean.

Top left: Sulphur Fork as seen from Port Royal State Park. (Photo by Jed Grubbs)

Top right: The Lower Cumberland is the least developed watershed in the Cumberland River basin, and the absence of city lights allows for exceptional stargazing in many places. (Photo by A.J. Wells)

Bottom: Native Americans and early European settlers ate the tubers of Price's Potato Bean. This incredibly rare species still blooms on the steep embankments of streams in the Lower Cumberland watershed. (Photo by KY State Nature Preserves Commission)

The Value of Our Water Resources

People have inhabited and utilized the region's water resources for thousands of years. Archeological evidence of prehistoric occupation dates back 6,000 years at Land Between the Lakes, 8,000 years at Cross Creeks National Wildlife Refuge, and as much as 10,000 years at Dunbar Cave. For the Mississippian peoples who occupied the region between 1000 to 1700 A.D., the Cumberland and its tributaries were invaluable. The region's abundant water supply sustained their agrarian lifestyle and trade-based economy.

By the late 1700s, the region's first Euro-American communities had begun forming along area waterways. Longhunters established a camp and trading post at Port Royal in the 1770s and 1780s.

Clarksville was founded in 1785 at the confluence of the Red River and the Cumberland. Princeton was first named Eddy Grove, after the source of the community's spring water. Water supported each of these early communities in many ways and quickly enabled the growth of a robust tobacco industry in the region. By the early 1800s, the advent of steamboats allowed tobacco, cotton, and corn to be shipped to ports in New Orleans and Pittsburgh. Soon after, the region's "dark-fired" tobacco was reaching international markets as far away as England, France, Italy, and Germany.

The region was traversed by thousands of Native Americans in the 1830's during the forced relocation required by President Andrew Jackson's Indian Removal Act. The sites of streamside camps in Port Royal, Hopkinsville, and Princeton are today historic landmarks on what became known as The Trail of Tears. Over 4,000 died on the trail. During the Civil War, Grant's victory on the banks of the Cumberland River at Fort Donelson made him a famous and feared general. It also gave the Union Army a strategic base on the river and opened an avenue of invasion into the south. Both Clarksville and Nashville eventually fell to the Federals, and the Cumberland became a vital supply line to the Northern troops.

Grant's victory at Fort Donelson gave the Union a strategic base on the Cumberland River and opened an avenue of invasion into the South.

Water continued to have a dramatic influence on the region's 20th century history. In 1966, the completion of Barkley Dam created the 118-mile long Lake Barkley impoundment and left the original locations of Eddyville and Kuttawa underwater. Cheatham Dam, on the region's eastern border, was completed in 1951.

For the majority of the region's 400,000 residents, the public water supply is provided by the Cumberland River. Clarksville, Hopkinsville, White House, Guthrie, and Elkton all obtain public water from the Cumberland directly. Other communities withdraw from the Cumberland's tributaries. Springfield, for example, obtains water from the Red River.

Beyond the residential needs of today's communities, the region's water supports major industries. Farms use the resource to grow the region's world famous dark-fired tobacco, as well as corn, soybeans, and wheat, and to raise cattle and hogs. The Cumberland also remains a valuable transportation corridor. In 2008, shipments on the river were worth nearly $4 billion dollars.

The Cumberland Fossil Plant generates enough electricity to meet the needs of roughly 1.1 million people and consumes over 2.7 billion gallons of water a year in the process. Barkley and Cheatham dams use water to generate hydroelectricity and produce enough to meet the needs of about 43,000 people.

Barges ship billions of dollars in commodities on the Cumberland River every year. (Photo by Jed Grubbs)

Water also supports a sizable tourism industry. Land Between the Lakes National Recreation Area is one of Tennessee and Kentucky's most visited destinations, drawing 1.4 million people every year. The recreation area is the driving force behind a $600 million dollar tourism industry. Elsewhere in the region, Fort Donelson (on the banks of the Cumberland River) attracts over 200,000 per year and Cross Creeks National Wildlife Refuge attracts 45,000 visitors annually. Every year, Clarksville hosts a free riverside music and arts festival known as Riverfest, which attracts 30,000 people.

The region's waterways support outstanding recreation opportunities. Land Between the Lakes boasts an astounding 500 miles of trails that wind their way through woods, along streams, and on lakeshores. Lake Barkley State Resort Park, Stewart State Forest, and Rotary Park in Clarksville all offer miles of hiking trails, as well as biking trails along or near water. Communities with local streamside greenways and nature trails are increasingly common. Clarksville, Hopkinsville, Springfield, and White House all offer residents a chance to enjoy a stroll through the great outdoors without leaving town. Popular paddling destinations include the Cumberland River, the Red River, and the West Fork of the Red River. Blueway Adventure, Red River Canoe, Run-a-Muck Outfitters and Bell Witch Cave all offer guided canoe trips and/or rentals. It's also possible to rent canoes and kayaks at the Land Between the Lakes Nature Station between Memorial Day and Labor Day weekends.

The region is home to several premiere birding destinations. Roughly 200 species of birds can be found at Land Between the Lakes, while 250 can be seen at Cross Creeks National Wildlife Refuge. Sections of Cross Creeks close in the winter to prevent the disturbance of critical wintering habitat for waterfowl – as many as 90,000 ducks flock to the refuge each winter. Golfers enjoy one of the nation's most highly regarded courses on the Cumberland River at Mineral Mound State Park. In 2009, the course was ranked #5 in Golf Digest magazine's list of "Best Courses You Can Play."

Fishing and hunting opportunities abound. Anglers can take their pick from a seemingly endless number of coves, lakes, wetlands, and river stretches within Land Between the Lakes or Cross Creeks National Refuge. Common catches at Port Royal State Park include bass, bream, and catfish in the Sulphur Fork and Red River. A similar variety of fish can be caught at Lake Barkley State Resort Park. If it's trout you're after, head to Fort Campbell or to Casey Creek in Trigg County, Kentucky. Duck hunting is possible at Barkley Wildlife Management Area and Haynes Bottom Wildlife Management Area.

The Cumberland, Tennessee, and Mobile river basins contain more aquatic species than all other freshwater systems in North America. Several of these basins' rivers contain nearly 200 different native fish species and dozens of mussel species. When our freshwater ecosystems are diverse and healthy, they provide a tremendous array of benefits to our communities. 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 at an alarming rate. Within the region, a startling 87 different species are at risk.

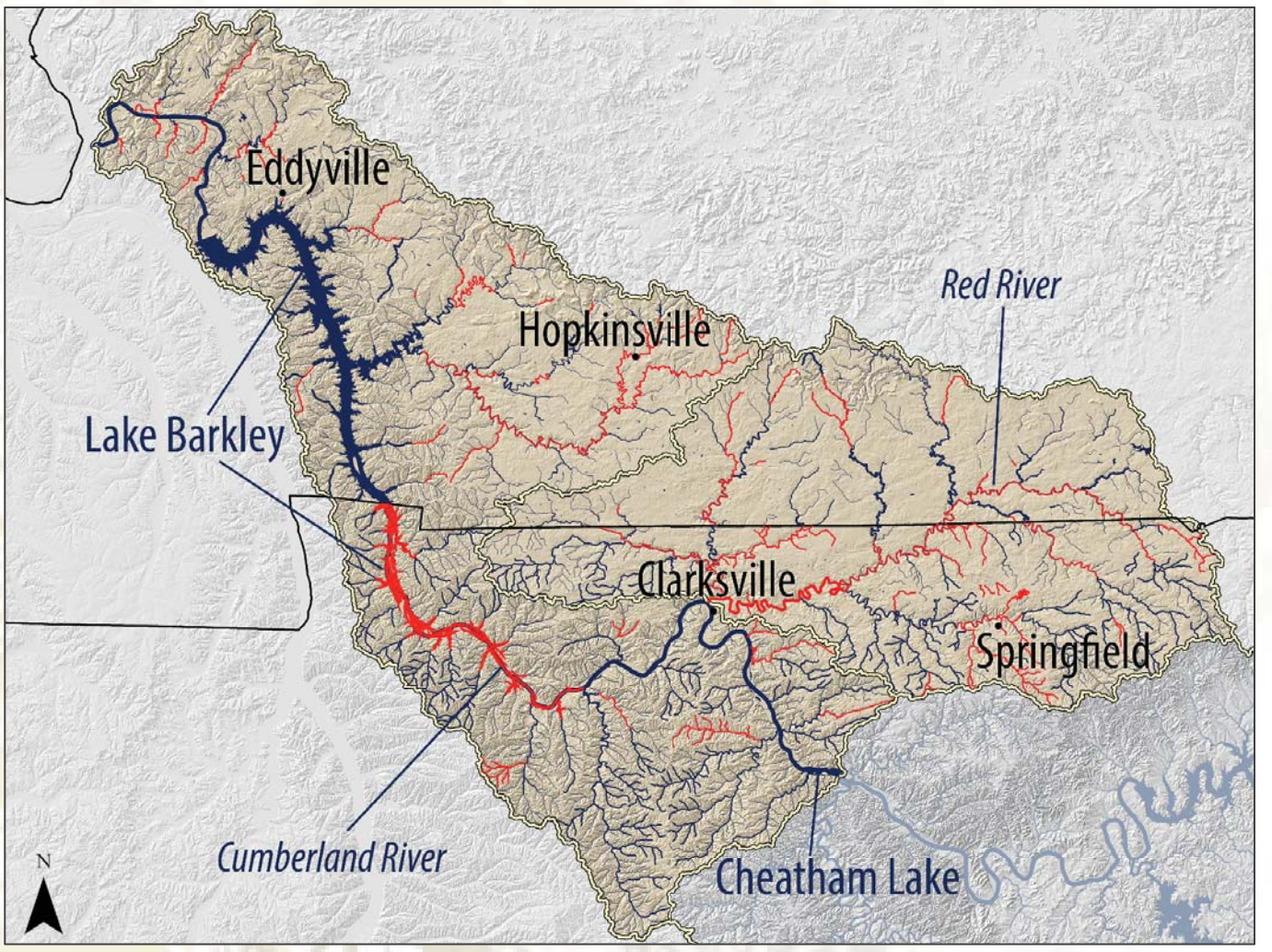
Contestants in Clarksville's Riverfest Regatta race across the Cumberland in self-styled boats made from cardboard and bottles. (Photo by Nicole June-ClarksvilleNow.com)

Our Impacts

Whether they are being used for drinking water, recreation, local industries, or for producing hydro-power, our lives are enriched by the valuable uses we make of the region's water resources. Yet, while many waterways in the region remain healthy, past and current 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 nearly 700 miles of streams and rivers have been impacted to the point they are no longer healthy. These waters represent a threat to people, ecologies, or both. Most commonly, these unhealthy streams are a result of excess nutrients, sediment, and bacteria.

Notably, the karst nature of the region (especially within the Red River watershed) complicates water-quality concerns. The course of waterborne pollution in karst terrain is difficult to track, and flow paths can take unexpected routes that contradict the topography of the land. This makes it difficult to identify the source of the pollution and, therefore, difficult to fix.



Watershed	Most Common Impairments	Most Common Sources of Impairment
Red River	Nutrients, bacteria, and sediment	Agriculture, urban stormwater runoff, sewage treatment plants
Lower Cumberland	Sediment, nutrients, bacteria	Agriculture, sewage treatment plants, loss of reparian habitat

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 certain agricultural practices, sewage treatment plants, and urban storm-water runoff.

Certain agricultural practices have impaired many stream miles in the region. On farms where overgrazing of livestock 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 practices for livestock can also lead to sediment problems and can allow animal waste containing bacteria to reach water. When these bacteria are present in surface or groundwater, people who come into contact with that water are at risk of ear or eye infections, vomiting or dysentery. The adverse impacts of these agricultural practices are especially pronounced where streams and rivers lack sufficiently forested stream banks. Without these natural forest buffers, rainfall can quickly and easily wash pollution into nearby waters.

In urban areas, impervious surfaces, such as roads, buildings, parking lots or other paved areas that do not allow water to soak into the landscape, negatively impact water quality. Water rushes off these surfaces, rather than slowly infiltrating into the soil as it would in a forest or field. As it runs off, trash, petrochemicals, pet waste, sediment, nutrients, or other pollution are quickly carried into nearby water-ways. This rush and volume of storm-water erodes banks, and the pollution it carries can 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.

To obtain operating permits, municipal sewage treatment plants must safe-guard our basin's waters. However, municipal wastewater systems can contribute nutrients and bacteria to waters through collection system over-flows or when wastewater discharges are not fully treated.

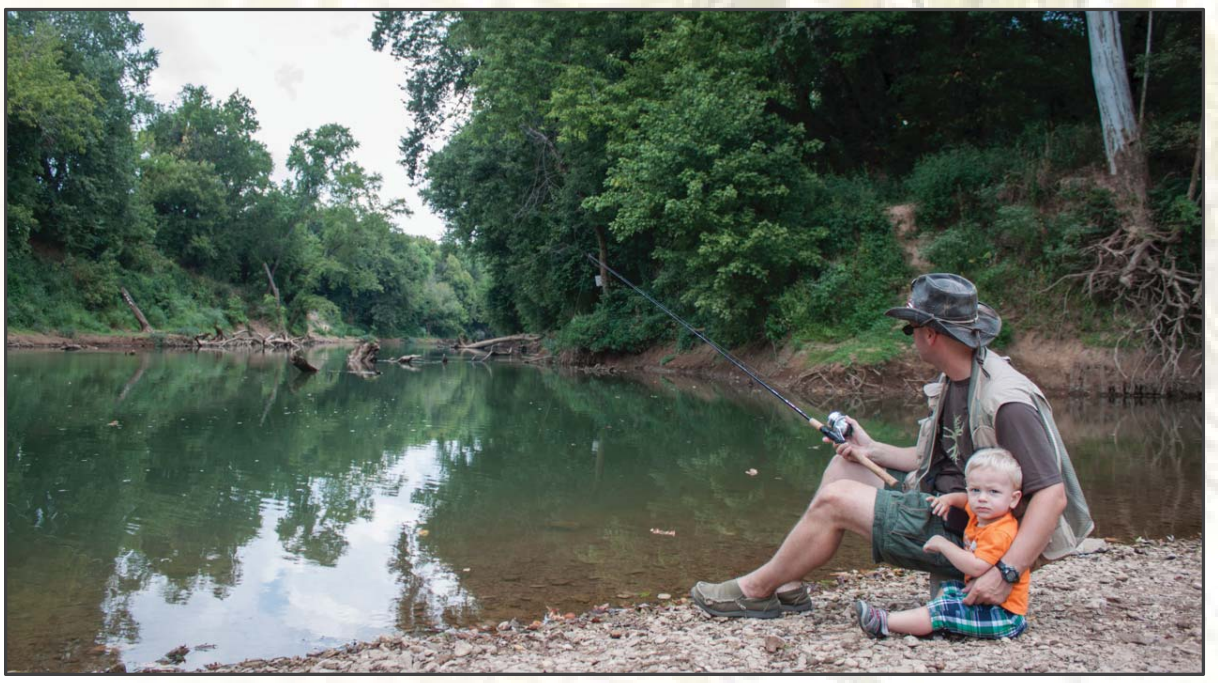
Excess nutrients in our water can lead to algal blooms. These blooms kill aquatic organisms and can impact the quality and cost of our drinking water. (Photo by USGS)

When stormwater washes earth from development sites, pastures, or elsewhere into streams, the excess sediment can smother aquatic ecosystems. (Photo by Paul Sloan)

What Challenges Are on the Horizon?

Average air temperatures are already 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 Fahrenheit degrees. Higher ambient air temperatures warm waters and can lower dissolved oxygen levels, negatively impacting aquatic plants and animals. Hotter weather also increases evapotranspiration rates and dries out 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. Coupled with an increasing population, this trend could increase competition in the region for finite water resources. The GCRP also reports that storm intensity is increasing. This is troubling news for a region that already suffered millions of dollars in damages as a result of the May 2010 flood.

Clarksville, within Montgomery County, is one of the fastest growing cities in Tennessee. The University of Tennessee predicts that by 2050, Montgomery County's population will more than double. This increased population will place significant strain on the quality and quantity of the region's water resources. Aging sewer systems can fail, especially if they handle flows that are beyond their designed capacity,



A father and son enjoy a lazy Sunday fishing on the Red River at Port Royal State Park. (Photo by Jed Grubbs)

Four Rivers Watershed Watch is a volunteer group that monitors stream health in the region. (Photo courtesy of Jackson Purchase Foundation and the Lyon County Conservation District)

and this can cause bacteria impairments. When floodplains and streambanks are deforested and developed, communities face increased risk of flood damage, erosion, and water pollution. Regional collaboration, public education, and careful land management are essential if the region hopes to maintain or improve its water quality in the coming years.

Emerging contaminants are another rising concern. These contaminants are chemicals found in pharmaceuticals, personal care products, pesticides, and elsewhere. They can find their way into our water – when we wash medicine or shampoo down the drain, for example, or when rainwater washes insecticides or fertilizers from our gardens into a nearby creek. Once they're in water, the chemicals (or new combinations of chemicals) threaten our drinking water and stream ecologies.

Protecting Our Water Resources

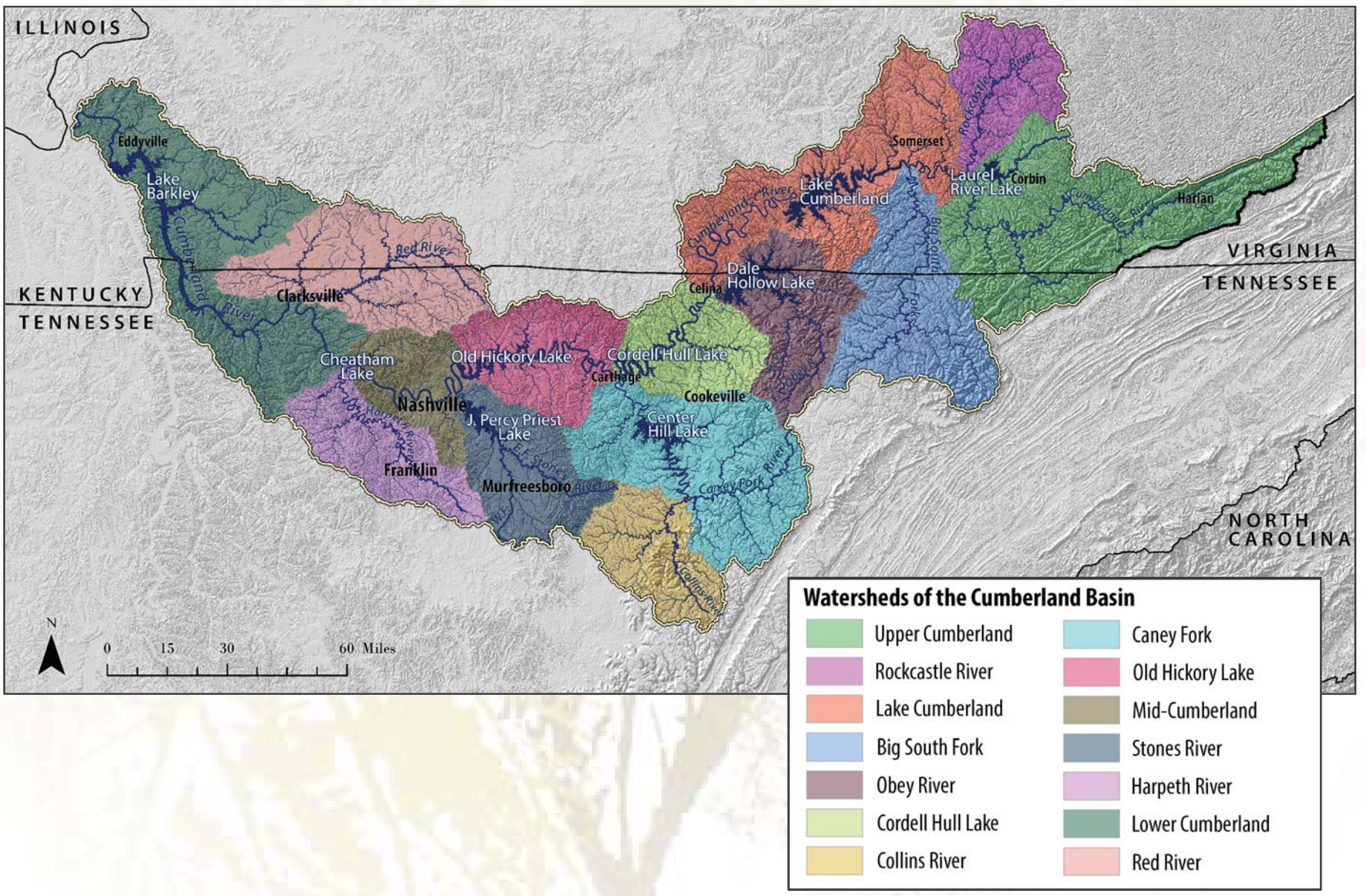
Many local, state, and federal agencies work to enhance the health and enjoyment of water resources in the region. At the local level, cities develop and implement stormwater management programs to prevent stormwater runoff pollution and illegal discharges from entering the region's waters. Local streamside greenways protect floodplains from development and provide treasured public trails. Greenways exist along the Little River at Little River Park in Hopkinsville, along the Cumberland at McGregor Park in Clarksville, along Sulphur Fork Creek in Springfield, along Honey Run Creek in White House, and elsewhere. Each of these greenways provides flood protection, while also benefiting the quality of life and of water in these communities.

Between them, Tennessee and Kentucky have four state parks in the region, and Tennessee's Stewart State Forest is also found here. Tennessee and Kentucky state natural areas protect some of the best examples of intact ecosystems within the region, and there are three state natural areas in the region: Barnett's Wood's, Livingston County, and Dunbar Cave state natural areas. Tennessee and Kentucky's wildlife management areas protect additional lands and are available to the public for hunting and trapping, though certain restrictions do apply. There are nine wildlife management areas in the region. Many streams and rivers flow through or adjacent to these state protected areas, and the region's water quality benefits thanks to the services provided by these natural spaces.

At the federal level, ten waterways in the region are on the National Rivers Inventory, and federal agencies must attempt to avoid or mitigate actions that would impact these waters. Also at the federal level, the Army Corps of Engineers employs measures to improve water quality at its dams and reservoirs. The agency, for example, uses turbine venting and auxiliary air supply valves to improve dissolved oxygen levels below its dams for the benefit of aquatic animals. The Corps also maintains minimum flow levels needed by aquatic life on rivers below its reservoirs.

In addition to the Cumberland River Compact and The Nature Conservancy of Tennessee and of Kentucky, many other nonprofit citizen groups, as well as private landowners and businesses, promote water quality in the region. The Four Rivers Basin Team was created by a partnership between the Jackson Purchase Foundation and the Kentucky Division of Water. The team includes members from a wide variety of backgrounds and interests including forest, agriculture, and wildlife agencies, local government, and local conservation groups. The organization aims to "protect, maintain and restore the ecological composition, structure and function of watersheds in the Four Rivers Region of Kentucky" – a region that includes all Kentucky land within this region of the Cumberland River basin. Founded in 2000, the Red River Watershed Association has organized stream clean-ups, bank restoration projects, educational workshops, and other activities as part of an effort to promote water quality in the Red River watershed. The Kentucky Waterways Alliance works with communities across Kentucky to promote watershed health and advocate for effective water policy. Within the region, the organization has held water quality education and demonstration projects in Princeton and Cadiz. Every day, more landowners, local businesses, and farmers are planting rain gardens and trees, harvesting rainwater in rain barrels, and protecting natural lands within conservation easements, and the region's water stands to benefit.

In 1983, Cross Creeks was the site of Tennessee's first successful bald eagle rehabilitation. Today, our national bird has made an incredible recovery and nests can be spotted up and down the Cumberland. (Photo by Yathin Krishnappa)



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: A.J. Wells

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