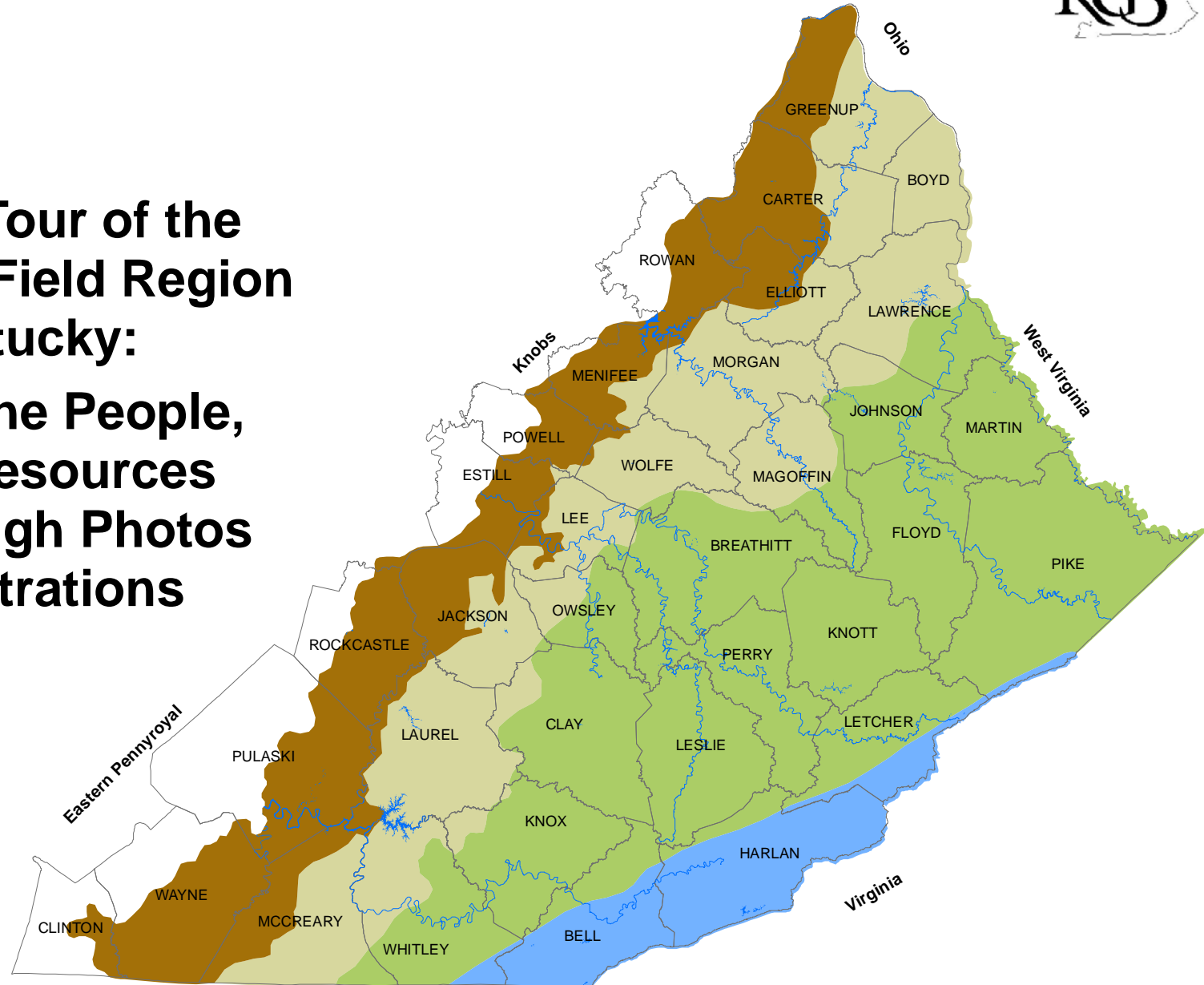


A Pictorial Tour of the Eastern Coal Field Region of Kentucky: The Land, the People, and the Resources Seen Through Photos and Illustrations



Subregion

- | | |
|---|---|
|  Cumberland Escarpment |  Mountain and Creek Bottom |
|  Cumberland Plateau |  Pine Mountain |

Eastern Kentucky Coal Field: The Land, the People, and the Resources

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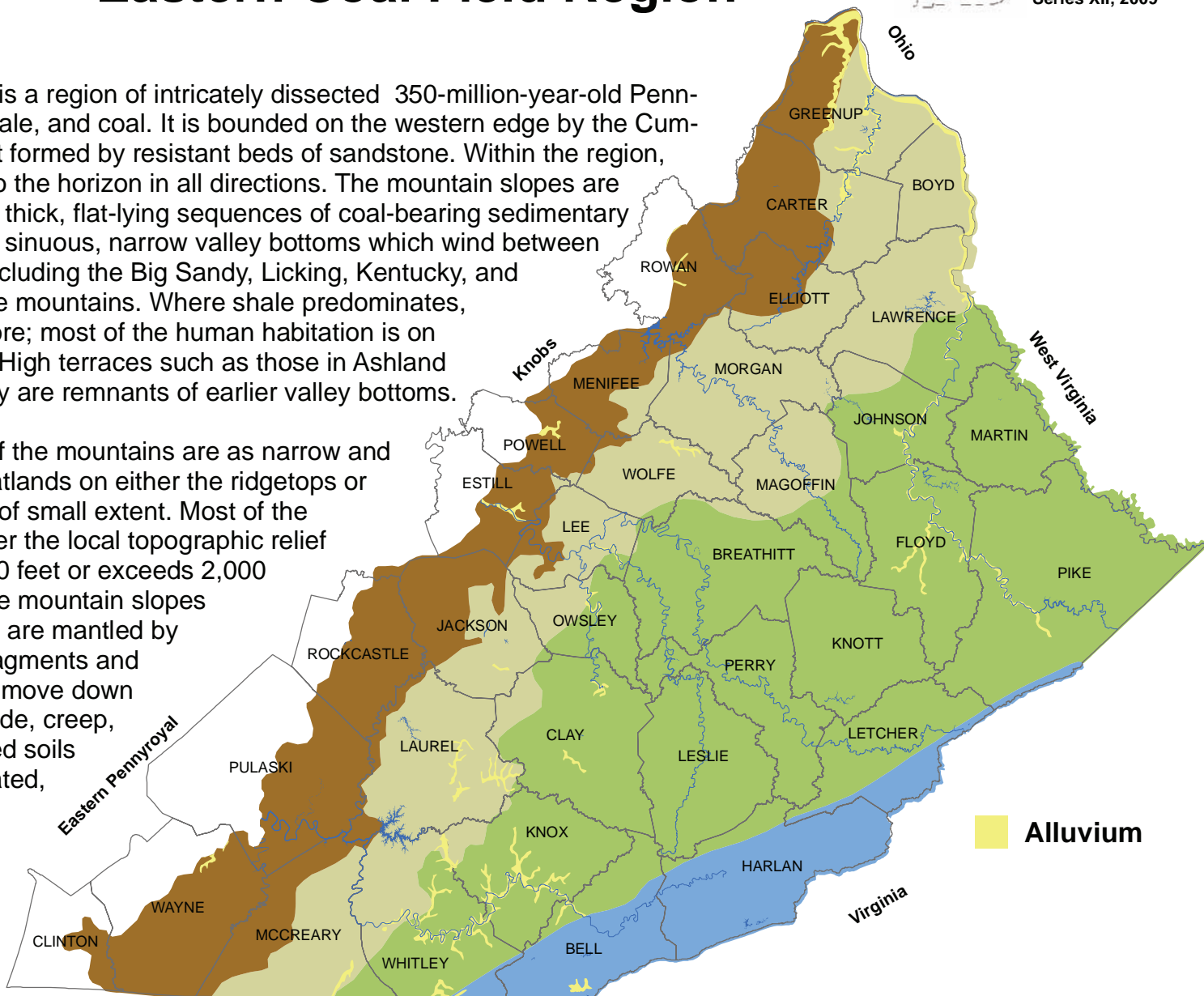
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Eastern Coal Field Region

The Eastern Kentucky Coal Field is a region of intricately dissected 350-million-year-old Pennsylvanian sandstone, siltstone, shale, and coal. It is bounded on the western edge by the Cumberland (or Pottsville) Escarpment formed by resistant beds of sandstone. Within the region, wooded mountain crests extend to the horizon in all directions. The mountain slopes are carved by ravines eroded through thick, flat-lying sequences of coal-bearing sedimentary rocks. The ravines are tributary to sinuous, narrow valley bottoms which wind between steep valley walls. Major rivers, including the Big Sandy, Licking, Kentucky, and Cumberland, meander through the mountains. Where shale predominates, their valleys widen to a mile or more; most of the human habitation is on the flood plains and low terraces. High terraces such as those in Ashland and southeastern Greenup County are remnants of earlier valley bottoms.

Generally, the knife-edge crests of the mountains are as narrow and sinuous as the valley bottoms. Flatlands on either the ridgetops or the valley bottoms are commonly of small extent. Most of the terrain is steep-sided hills. Whether the local topographic relief of this region spans as little as 200 feet or exceeds 2,000 feet, the landforms are similar. The mountain slopes underlain by shale and sandstone are mantled by complex accumulations of rock fragments and weathered debris (colluvium) that move down slope by debris avalanche, landslide, creep, and sheet wash. Deeply weathered soils are uncommon and occur on isolated, nearly level ridge crests and high-level terrace deposits. Cliffs of resistant sandstone cap many ridges and spurs. Scenic erosion remnants include pinnacles or "chimneys," shallow eaves known as "rock houses," and arches or natural bridges.

About 20 percent of the state's population lives on the 28 percent of the state encompassed by this region, or 67 people per square mile.



Subregion

- Cumberland Escarpment**
- Mountain and Creek Bottom**
- Cumberland Plateau**
- Pine Mountain**

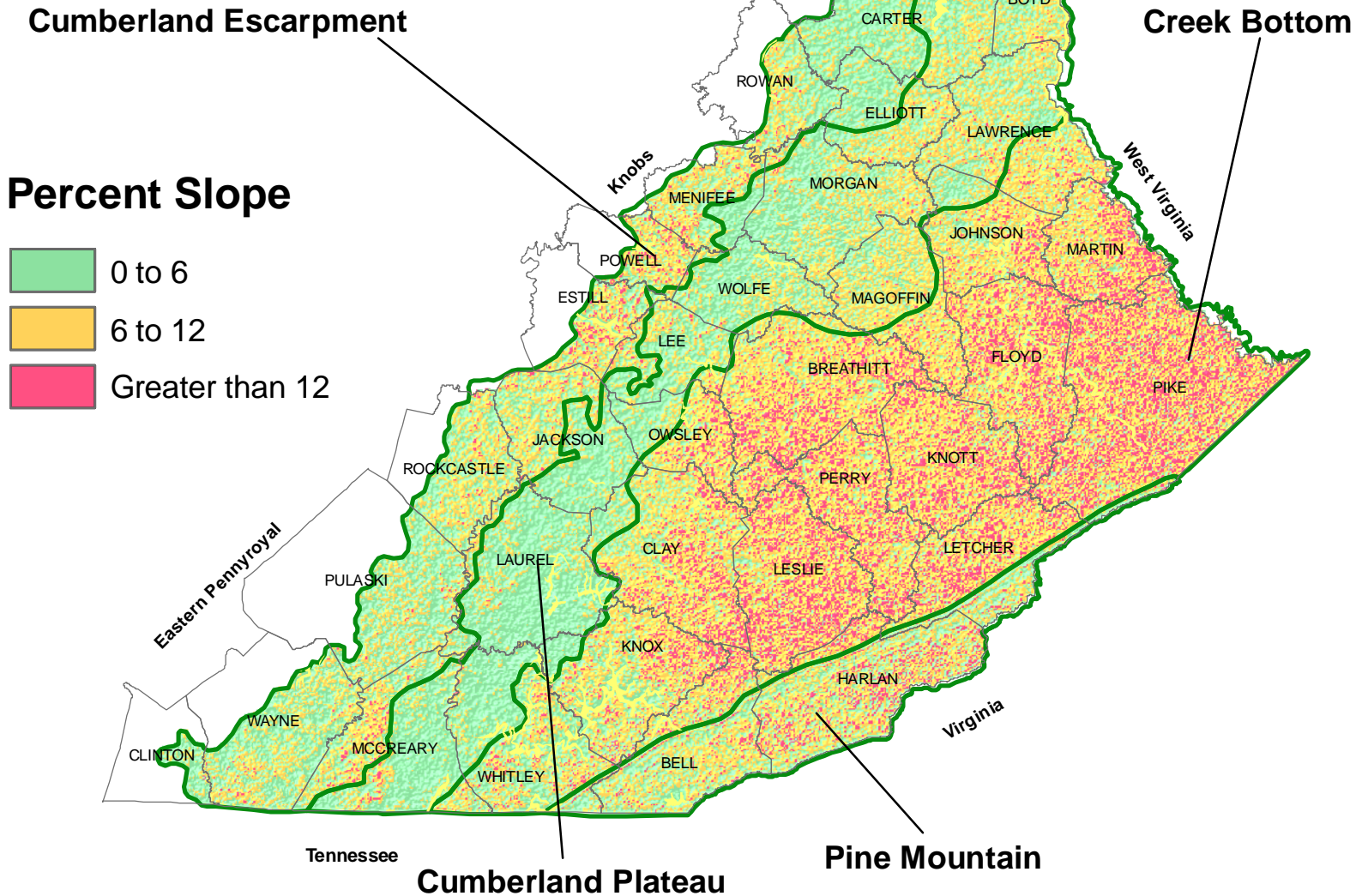
Alluvium

To learn more, click on the symbol for your region

Regional and subregional delineations adapted from GIS data developed by William Andrews, Kentucky Geological Survey.

The Land

Topography Eastern Coal Field Region Land Slope, Percent



Where sandstone dominates, slopes are steep. Where shale is prevalent, the topography is less rugged.

Ridge and Valley, Mountain and Creek Bottom Region

Millions of years of erosion were required to reduce an ancient plateau to the ridges and valleys we now see. Floyd County (right) is completely dissected upland, with valleys and ridges occupying about equal amounts of land and elevation differences between ridge tops and valleys of as much as 900 feet. In Knott County (below right) the ridges are rounder and the hills float like humpbacked creatures in a vast sea. Photos by Dan Carey, Kentucky Geological Survey.



Rolling Terrain—Cumberland Plateau Region



Where shale is more dominant in the bedrock of the Cumberland Plateau Region and the landscape is less rugged and amenable to agriculture, as typified in Morgan County. Photo by Dan Carey, Kentucky Geological Survey.

Cumberland Valley—Pine Mountain Region



The view of Pineville from Chained Rock shows the rugged hills and wide stream valleys typical of the Pine Mountain Region. The flood wall to the right of U.S. 25E that protects the city from Cumberland River floodwaters also symbolizes the threat of flooding to development in stream valleys throughout the region. Photo by Dan Carey, Kentucky Geological Survey.

Sandstone Cliffs, Cumberland Escarpment Region

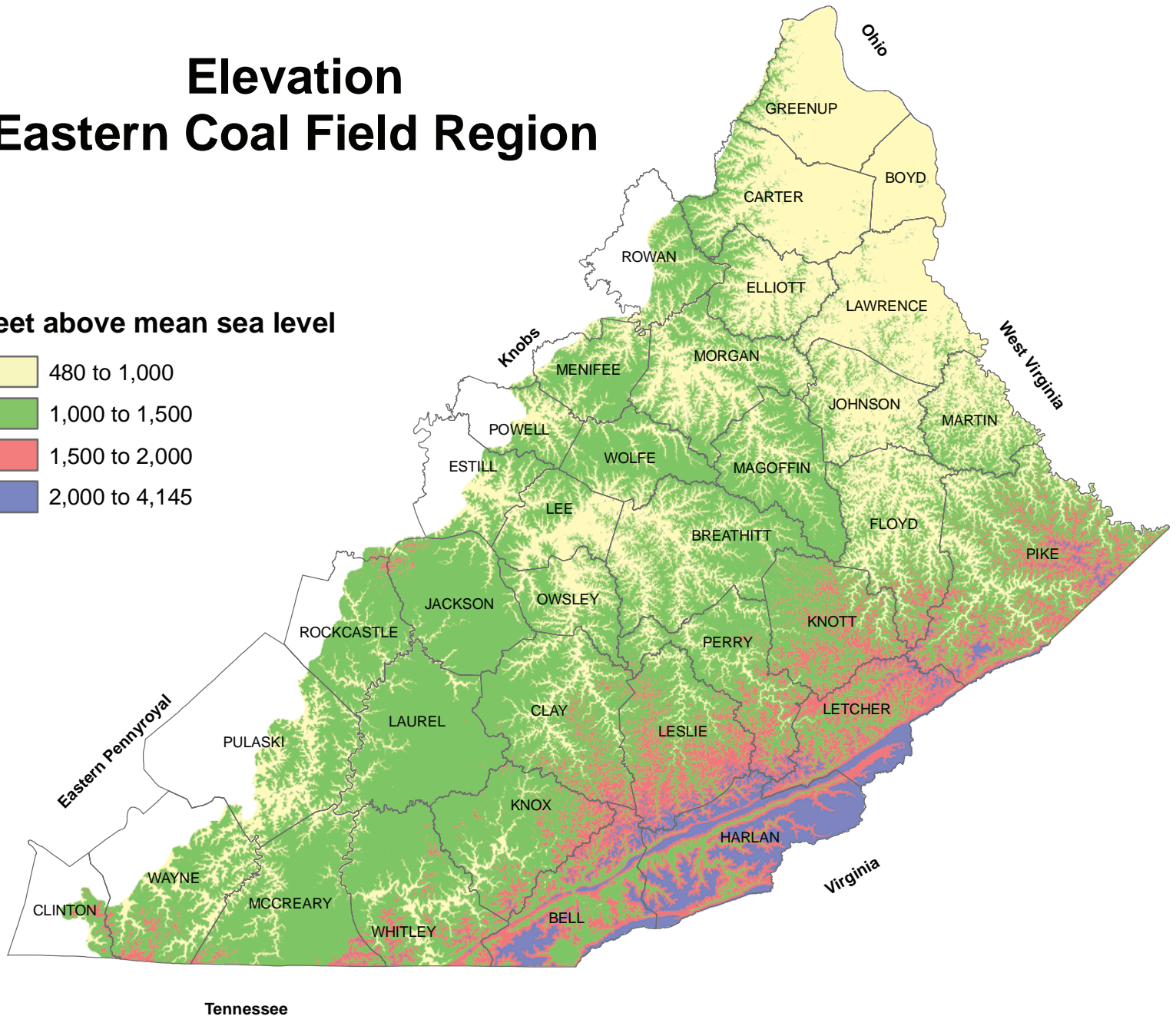
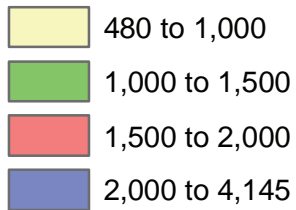


Fortress cliffs of sandstone, like this in Powell County, dominate the landscape of the Cumberland Escarpment. Natural Arch (below), with a span of 100 feet, is made of sandstone in the Rockcastle Conglomerate and is one of the many natural wonders in McCreary County that attracts tourists. Photos by Dan Carey and Bethany Overfield, Kentucky Geological Survey.



Elevation Eastern Coal Field Region

Feet above mean sea level



Elevations in the region increase from northwest to southeast. Black Mountain in Harlan County at 4,145 feet is the highest point in Kentucky.

Coal Train Near Putney, Harlan County, Cumberland Valley



The CSX coal train at Putney in Harlan County looks like a toy when seen from the ridgetop 2,000 feet above. Photo by Dan Carey, Kentucky Geological Survey.

Four Corners Formation, Martin County Mountain and Creek Bottom Region



Sandstone, siltstone, shale, and coal underly the eastern coal field region, as typified in the Four Corners Formation seen in this roadcut along the newly aligned Ky. 645 near Inez in Martin County. Where sandstone predominates, the terrain is rugged. Where shale is the bedrock, the topography is more rolling. Photo by Dan Carey, Kentucky Geological Survey.

Geology—Mountain and Creek Bottom Region



Sandstone, siltstone, shale, and coal are exposed along Ky. 302 near Dewey Lake in Floyd County. Water penetrates cracks and crevices in the sandstone and siltstone and flows downward until it meets the impermeable shale. When the shale is exposed to air and water, it breaks down quickly, leaving no support for the overlying rocks, which soon fall. Repeating the process for millions of years creates the rugged terrain of the Mountain and Creek Bottom Region. Photo by Dan Carey, Kentucky Geological Survey.

**Sandstone,
Pikeville
Formation
Knox County,
Mountain and
Creek Bottom
Region**

**Sandstone in the
Pikeville Form-
ation intrudes on
the landscape in
the rugged hills of
eastern Knox
County, arching
over Acorn Fork
Road (top right)
and lying in
massive boulders
on a hillside along
Ky. 718 (below
right).**

**Photos by Dan
Carey, Kentucky
Geological
Survey.**



Sandstone, Pikeville Formation Johnson County, Mountain and Creek Bottom Region



Sandstone in the Pikeville Formation exposed along Ky. 302 near Van Lear, Johnson County, reveals characteristic vertical cracks along which percolating water flows until it reaches an impermeable shale layer. Photo by Dan Carey, Kentucky Geological Survey.

Calcareous Sandstone—Mountain and Creek Bottom Region



This calcareous sandstone layer exposed along Ky. 321 in Floyd County has unusually high levels of calcium carbonate rarely seen in the Mountain and Creek Bottom Region. Water dissolves the calcium carbonate to form large cavities within the rock in a process similar to the formation of caves in limestone karst regions. Photo by Dan Carey, Kentucky Geological Survey.

Puncheon Camp Creek—Mountain and Creek Bottom Region



Drought conditions reduce Puncheon Camp Creek to a sandstone roadbed in Breathitt County reminiscent of the old rock and puncheon roads in the Mountain and Creek Bottom Region. A puncheon is a plank or board made by hewing instead of sawing. Kentucky pioneers used puncheons in their log buildings. The puncheons used for floors were split logs hewn smooth on the split side only. Rocks and puncheons were used for roadbeds. Photo by Dan Carey, Kentucky Geological Survey.

Sandstone—Cumberland Escarpment Region



The massive Corbin Member of the Lee Sandstone in the Cumberland Escarpment Region is exposed at the Nada Tunnel on Ky. 77 in Powell County. The 900-foot tunnel was carved through the rock in 1910-11 by the railroad. Photo by Dan Carey, Kentucky Geological Survey.

Princess Arch—Cumberland Escarpment Region



Natural erosion in sandstone creates amphitheaters, waterfalls, and graceful arches throughout the Cumberland Escarpment Region. Princess Arch in Wolfe County is but one example. Photo by John F. Stickney.

Broke Leg Falls, Menifee County, Cumberland Escarpment



Broke Leg Falls in winter. The resistant Corbin Sandstone Member lies above erodible shale (look behind the frozen cascade). When the shale erodes far enough, the overlying sandstone will collapse, moving the falls upstream. Photo by Dan Carey, Kentucky Geological Survey.

Cowbell Siltstone, Menifee County, Cumberland Escarpment



Rockfalls are common in the siltstone and shale of the Cowbell Member of the Mississippian Borden Formation along Ky. 1274 in Menifee County. Shale breaks down when wet, destabilizing the siltstone. Photo by Dan Carey, Kentucky Geological Survey.

Carter Caves, Cumberland Escarpment Region



Carter Caves State Resort Park is a popular attraction for tourism, golfing, and business meetings. Beautiful hiking trails and caves can be found in the steep-sided tributary valleys of Tygarts Creek formed by Mississippian limestones. Photo by Dan Carey, Kentucky Geological Survey.

Geology—Cumberland Plateau Region



Shale is more dominant in the bedrock of the Cumberland Plateau Region, as seen in this roadcut along the Hal Rogers Parkway in Laurel County. Photo by Dan Carey, Kentucky Geological Survey.

Red and Green Shales—Cumberland Plateau Region



Red (iron staining) and green shales, seen here in eastern Carter County in the Cumberland Plateau Region, are low strength, sensitive to moisture, and prone to slumping and landslides. Photo by Jerry Weisenfluh, Kentucky Geological Survey.

Sandstone Conglomerate—Pine Mountain Region



Erosion-resistant sandstone conglomerate, Lee Formation, forms hogbacks on Pine Mountain in Bell County. Photo by Dan Carey, Kentucky Geological Survey.

Manmade Landscapes



The manmade area that includes Stonecrest Golf Course—a golfing residential community, athletic fields, and an equine center—stands in stark contrast to the surrounding natural terrain in Floyd County in the Eastern Coal Field Region. Photo by Dan Carey, Kentucky Geological Survey.

Mountaintop Removal, Martin County



Surface mining has changed the face of Martin County. Post-mining land uses have included a federal prison, regional airport, and regional industrial park shown here.

Construction on reclaimed areas may require measures to prevent differential settlement of foundations.

Aerial photos from the U.S. Department of Agriculture Farm Services Administration, National Aerial Imagery Program, 2004.

Post Mine Land Uses, Perry County

The new shopping mall along Ky. 80 in Hazard (top right) is directly in front of a surface coal mine on the Four Corners Formation. Many former coal-mine benches such as this are being developed in Perry County, some for residential use and others for commercial use. Photo by Bart Davidson, Kentucky Geological Survey.



The Perry County airport (below right) is built on a reclaimed mountaintop-removal mine near Ky. 15. 2004 aerial photo from the U.S. Department of Agriculture, Farm Services Administration, National Agriculture Imagery Program.



Mine Reclamation for Residential/Commercial, Letcher County



Raven Rock Development is a 680-acre commercial and residential development located in Jenkins. Built primarily on reclaimed mine land, the development consists of an 18-hole public golf course, residential property strategically located near the course, and commercial development properties located along U.S. 23. Photo by Dan Carey, Kentucky Geological Survey.

Mine Reclamation for Wildlife Fish Pond Lake, Letcher County



Fish Pond Lake was created as part of a strip mining reclamation project in Letcher County. The lake provides for fishing, camping, and wildlife habitat. Photo by Dan Carey, Kentucky Geological Survey.

Mine Reclamation for Regional Development



The Honey Branch Regional Business Park is a public and private development partnership of Floyd, Johnson, Magoffin, Martin, and Pike Counties. Consisting of over 300 acres on a reclaimed mountaintop mining site, the park's tenants include Schlumberger Inc., an oil and gas well services company, and Consolidated Pipe, a pipe supplier to the region. In addition, Martin County Economic Development Authority has a 50,000-square-foot speculative building located in the park. Photo by Dan Carey, Kentucky Geological Survey.

Construction Hazards

Construction at the interface of sandstone overlying shale in the Pikeville Formation in Clay County (top right) presents possible rockfall problems as the shale erodes beneath. Photo by Dan Carey, Kentucky Geological Survey.



In Whitley County (bottom right), a reinforced concrete wall will keep loose rocks from the Pikeville Formation from falling on the highway along Ky. 26. Photo by Bethany Overfield, Kentucky Geological Survey.



Flooding on the North Fork Kentucky River



During the flood of March, 1963, the North Fork of the Kentucky River crested at 37 feet above flood stage at Hazard. Photo courtesy of Shane Sparkman.

Construction in Floodplains

The narrow stream valleys of the Eastern Coal Field Region are often the only areas available for homes, communities, and agriculture—alluvial valleys have played a significant role in the region's development. Flood retarding structures, flood-walls, cutoffs, relocation, and elevation of homes above flood levels, like these in Martin County, are all methods that have been used to reduce flood damages. Photo by Dan Carey, Kentucky Geological Survey.

Below, the city park behind the courthouse in Hyden is an excellent example of the use of flood-prone land for recreational purposes. Photo by Bart Davidson, Kentucky Geological Survey.



Relocation Out of Floodplains



Nine feet of water ran on Main Street in the City of Martin in Floyd County during the 1977 flood. The U.S. Army Corps of Engineers, Huntington District, implemented a redevelopment plan that provided relocation and other nonstructural flood protection measures for home, business, and government buildings. The plan was designed to preserve the cohesiveness of the community. The development of this relocation area outside the floodplain was just part of the plan. After decades of trying to control the sources of flooding throughout the region, it was realized that the most cost-effective way to reduce flood damages was to relocate the properties out of the floodplain. Photo by Dan Carey, Kentucky Geological Survey.

Flood Protection Levees



When rains are heavy, a 26-foot-high, 19,536-foot-long levee and floodgate system protects downtown Barbourville in Knox County from Cumberland River flooding. Photo by Dan Carey, Kentucky Geological Survey.

Flow Diversion—Pikeville Cut-Through

The Pikeville Cut-Through, which began in 1973, was a 14-year engineering achievement second only to the Panama Canal. The channel is 1,300 feet wide, 3,700 feet long, and 523 feet deep. It reroutes the flow of the Levisa Fork away from the oxbow that encircles Pikeville and controls flooding. The 390 acres of flat land that were created have seen extensive development. 2004 photo shows the completed cutoff. Photo from U.S. Department of Agriculture.



Pikeville, 1974



This 1974 photo shows conditions before the cut-through at Pikeville. Photo from U.S. Department of Agriculture.

Road Construction



Road construction on slopes underlain by shale often requires additional foundation support to prevent pavement failure. Proper drainage maintenance is also essential. Photo by Dan Carey, Kentucky Geological Survey.

Building Roads on Shale



Shales in the Pikeville Formation, exposed here along Ky. 172 in Johnson County, provide a poor foundation and are unstable on slopes; additional support was required to prevent pavement failure. Photo by Dan Carey, Kentucky Geological Survey.

Pavement Failure



Mountainous topography can make road construction difficult. Rights-of-way are often extremely steep, and subject to landslides, as in this case in northern Pike County on Ky. 881 built on the Four Corners Formation. Photo by Bart Davidson, Kentucky Geological Survey.

Landslides and Slope Stability



Shales in the Pikeville Formation provide a poor foundation and are unstable on slopes. Hillside construction of roads and homes on shale in Johnson County often requires additional support and drainage management to ensure slope stability. In Whitley County, rock gabions and a chain link fence provide stability to a cut slope in the Pikeville Formation along Doc Siler Road. Photos by Bethany Overfield and Dan Carey, Kentucky Geological Survey.



Construction on Slopes



Construction of homes and buildings on slopes often requires additional support and drainage management. Support for properties on hillsides can not only add strength, but can, when integrated with the landscape, also enhance the beauty of the property. Photo by Dan Carey, Kentucky Geological Survey.

Construction on Shale

Pennsylvanian shales and sandstones are seen in this outcrop on U.S. 23 in Boyd County in the Cumberland Plateau Region.

Shale is more erodible, less stable, and more impermeable to water than sandstone. A home-builder must know which rock lies at the home site.

Sandstone is a mixture of gray and brown. Shale may appear gray, blue, red, or green, depending on its chemistry.

Shales may shrink when dry and swell when wet, causing drainage, foundation, and slope stability problems.

Photo by Richard Smath, Kentucky Geological Survey.



Mine Subsidence



Mine subsidence can be a problem in some areas. A retaining wall was constructed to stabilize the foundation of this home above an abandoned subsiding underground mine in Letcher County. Photo by Dan Carey, Kentucky Geological Survey.

Underground Mine Blowout

Abandoned mine blowout



This blowout occurred on the morning of April 18, 2005 near the Knott-Floyd County line, just west of Garrett. Photos of the blowout were taken just hours after it was reported. It was the Consol James Fork Mine, operated during the late 1980's and early 1990's as an above drainage room and pillar mine in the Hazard No.4 seam. Water from the mine scoured trees and rock from the hillside, covering part of the Hal Rogers Parkway before entering Rock Fork. Water was still flowing at a rate of 300-400 gallons per minute one week after the blowout. The subsurface area of the mine is over 800 acres, with a seam thickness near 5 feet. If the mine were fully flooded, a conservative estimate of the potential water volume would exceed 600 million gallons. Blowouts occur when hydrostatic pressure within flooded, abandoned coal seams becomes too powerful for the coal barriers to withstand. This event happened in an unpopulated area, but other blowouts have caused injury and property damage, as hundreds of thousands of gallons of water have escaped with great velocity. As abandoned deep mines continue to age, erosion of mine barriers will further increase the probability that blowouts will occur. Photos courtesy of the Kentucky Division of Abandoned Mines.

Alluvial Valleys—Northern Cumberland Plateau Region



Alluvium in the meandering floodplain valleys of the Little Sandy River, Tygarts, and other large creeks in the northern Cumberland Plateau Region provides soils for agriculture and level land for development above flood levels. Photo by Dan Carey, Kentucky Geological Survey.

Alluvial Valley, Johnson County Mountain and Creek Bottom Region



Alluvial valleys provide level land for homes and agriculture in Johnson County and throughout the Mountain and Creek Bottom Region. The possibility of flooding and drainage problems must be addressed for any land use in the floodplain. Photo by Dan Carey, Kentucky Geological Survey.

Red River Gorge—Cumberland Escarpment



The Cumberland Escarpment Region is known for its natural beauty, and the Red River Gorge Geological Area is perhaps the most beautiful area in the region. Arches, "rockhouses" (precursors to arches), and natural amphitheatres abound. Photo by Jack Stickney.

**Bad Branch
Nature
Preserve,
Letcher County**

**The severe
drought of 2007
reduced Bad
Branch Falls in
Letcher County to
a 60-foot trickle
down the Bee
Rock Sandstone
cliff.**

**Bad Branch is a
Kentucky Wild
River inside the
2,639-acre state
nature preserve.**

**Photo by Dan
Carey, Kentucky
Geological
Survey.**



Wetlands—Eastern Coal Field Region



Wetlands serve to maintain streamflow, improve water quality, reduce flooding, and provide habitat for fish, wildlife, and plants. Drainage of wetlands degrades stream water quality, increases downstream flooding, and destroys habitat for fish wildlife, and plants. The National Wetlands Inventory by the U.S. Fish and Wildlife Department has mapped 66,000 acres of wetlands in the Eastern Coal Field. Photo by Dan Carey, Kentucky Geological Survey.

Kudzu, Mountain and Creek Bottom Region

The kudzu plant, an invasive species from East Asia, has expanded rapidly across much of the South, including eastern Kentucky. This stand of kudzu is on Ky. 257 near Dry-hill (near the overpass of the Hal Rogers Parkway) in Leslie County. Kudzu can grow as much as 60 feet in a season, or 12 inches in a day, and vines may extend to over 100 feet. The non-woody parts are edible. Kudzu also serves to prevent erosion of hillsides, although it can kill plants to which it attaches by blocking vital sunlight. Photo by Bart Davidson, Kentucky Geological Survey.



Below right, kudzu blooming in September in Floyd County. Photo by Dan Carey, Kentucky Geological Survey.

Wildlife, Eastern Coal Field

Humans share the land with wildlife throughout the Eastern Coal Field Region, deer in Letcher County (left), and Knox County (below left), and Elk in Knott County.

Elk have been reintroduced in wildlife management areas created on reclaimed surface-mined land.

**Photos by Dan Carey and Bart Davidson,
Kentucky Geological Survey.**



Butterflies, Clay County



Photo by Dan Carey, Kentucky Geological Survey.

Butterfly and Thistle on Pine Mountain, Harlan County



Photo by Dan Carey, Kentucky Geological Survey.

Sunning in Bell County



An Eastern Coal Field native enjoys the sunshine on the conglomeritic sandstone that forms a hogback on Pine Mountain in Bell County. Photo by Dan Carey, Kentucky Geological Survey.

Loretta Lynn Homeplace in Butcher Hollow, Johnson County



Childhood home place of country music singer Loretta Lynn. Described in the song "Coal Miners Daughter" and is located "in a cabin on a hill in Butcher Holler." Butcher Holler (also known as Butcher Hollow) is part of the community of Van Lear in Johnson County. Photo by Dan Carey, Kentucky Geological Survey.

Lost Treasures of Salyersville, Magoffin County Mountain and Creek Bottom Region



Adults, students, and artist Debra Burchett collaborated to produce this beautiful mural near the Justice Center that depicts historic Salyersville, Magoffin County. Photo by Dan Carey, Kentucky Geological Survey.

Iron Furnace, Northern Cumberland Plateau Region



Iron furnaces operated throughout Kentucky in the 18th and 19th centuries. In 1830, Kentucky was the third largest iron producer in the country. The Mount Savage furnace in Carter County ceased operation in 1882. Stone chimneys like this are all that remain of the industry. Photo by Jerry Weisenfluh, Kentucky Geological Survey.

Iron Furnace, Cumberland Escarpment Region



Fitchburg Furnace, Estill County. Located 6 miles north on Ky. 975 from Ky. 52. The Fitchburg Iron Furnace produced pig iron from 1870 to 1874, and was the largest furnace built in Kentucky. It had such a high capacity that the local timber and ore supply was depleted too rapidly, resulting in the closing of the furnace. Kentucky ranked third in the nation in iron production in 1830, and 11th in 1965. Photo by John F. Stickney.

The People

Communities

Wheelwright, a unique community in Floyd County of slightly over 1,000 residents, is undergoing revitalization. In the 1930s, Inland Steel turned Wheelwright into a model coal camp, with a golf course, swimming pool, bowling alley, strong schools, and modern facilities. Following its sale in 1966, the town declined. Former and current residents are now working to develop a museum and tourist, education, and business facilities to restore the town. Photo by Dan Carey, Kentucky Geological Survey.

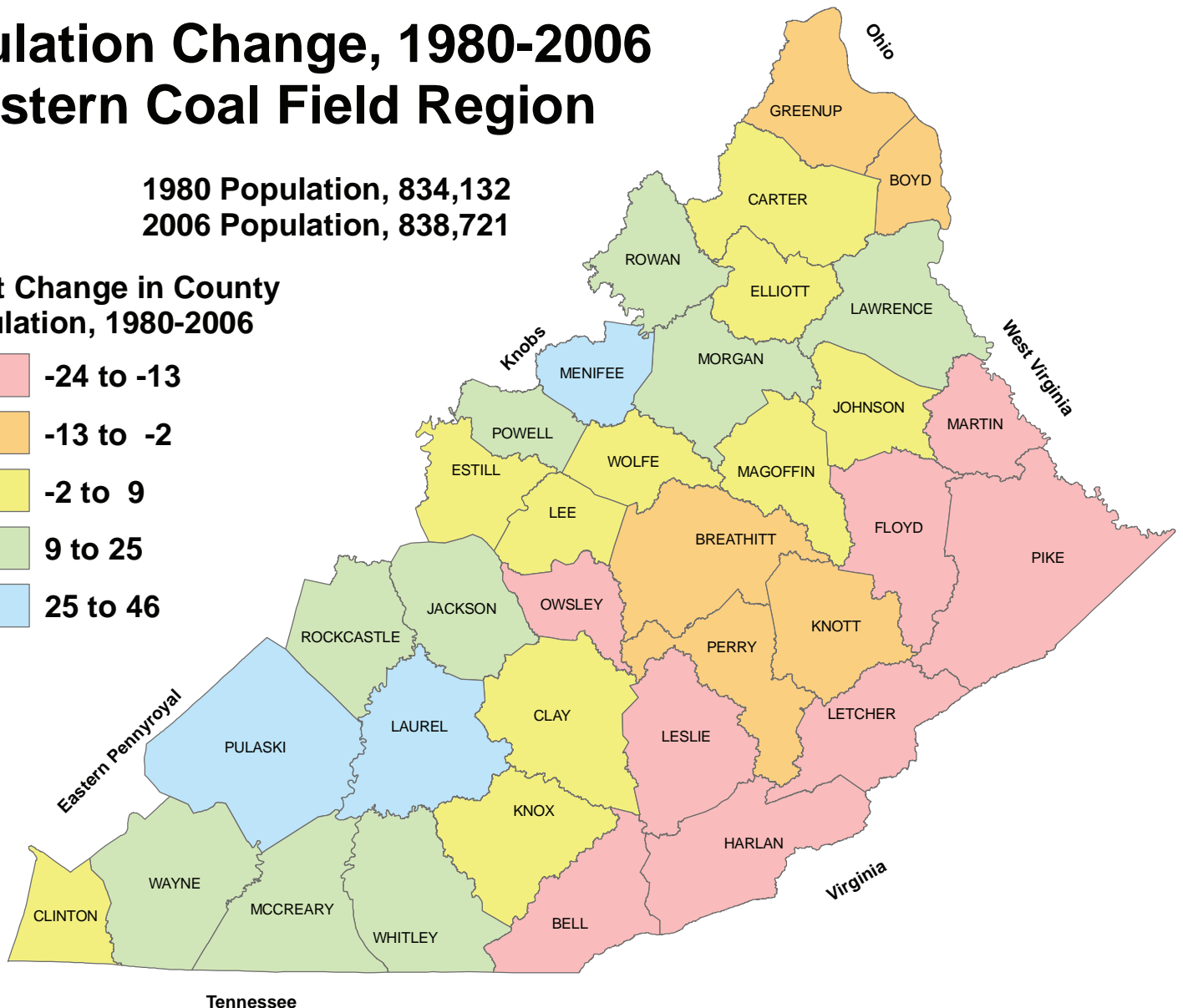
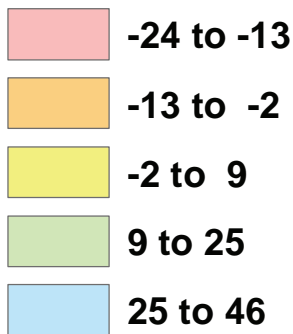


Population Change, 1980-2006

Eastern Coal Field Region

1980 Population, 834,132
2006 Population, 838,721

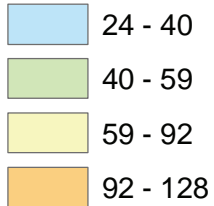
Percent Change in County
Population, 1980-2006



The population in the entire region peaked in 1980, fell in the 1980's, and increased slowly in the 1990's. Counties whose economies rely on coal and heavy industry saw population decreases. The population of Kentucky increased 15.2 percent from 3,660,340 in 1980 to 4,217,544 in 2006.

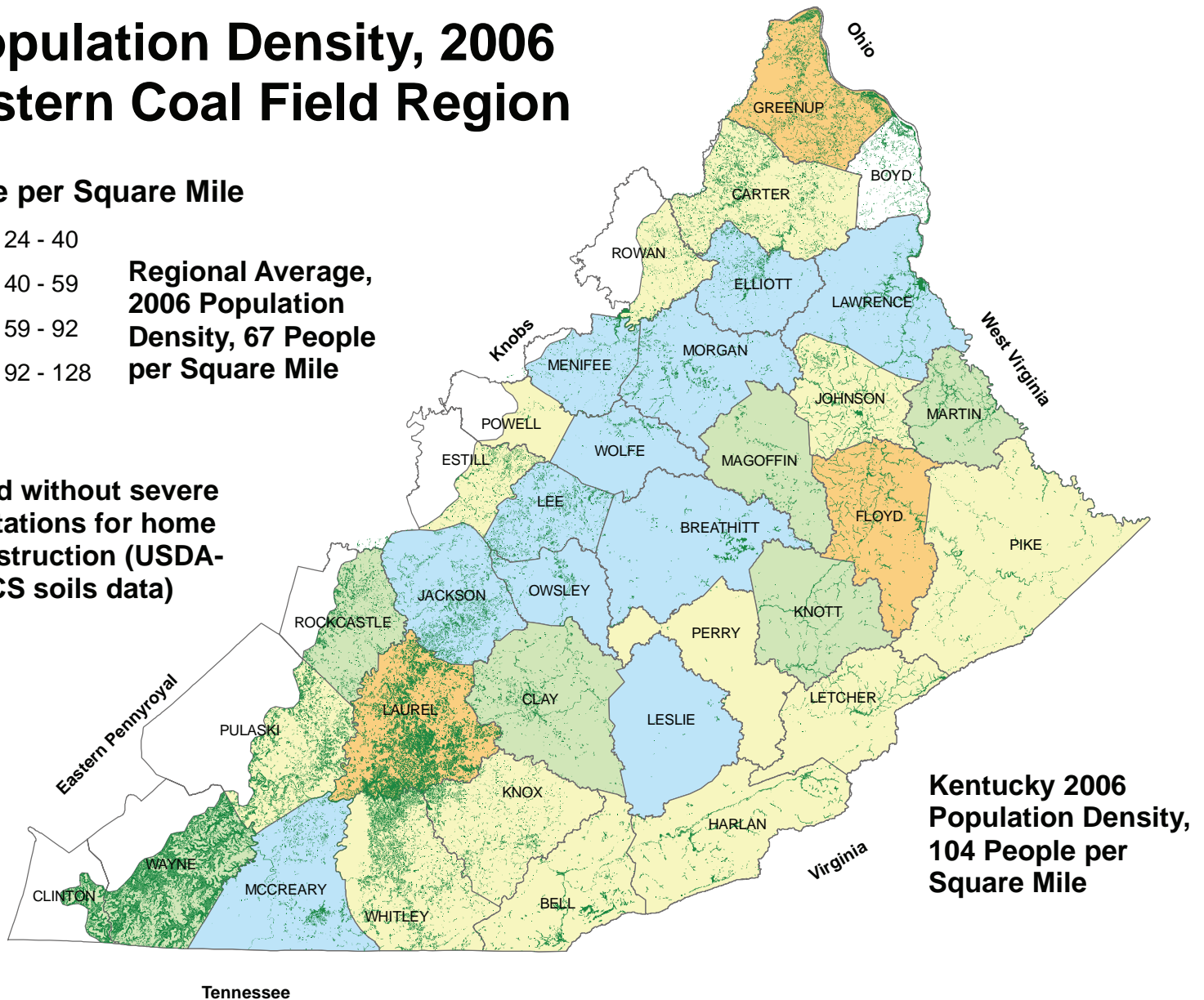
Population Density, 2006 Eastern Coal Field Region

People per Square Mile



**Regional Average,
2006 Population
Density, 67 People
per Square Mile**

**Land without severe
limitations for home
construction (USDA-
NRCS soils data)**



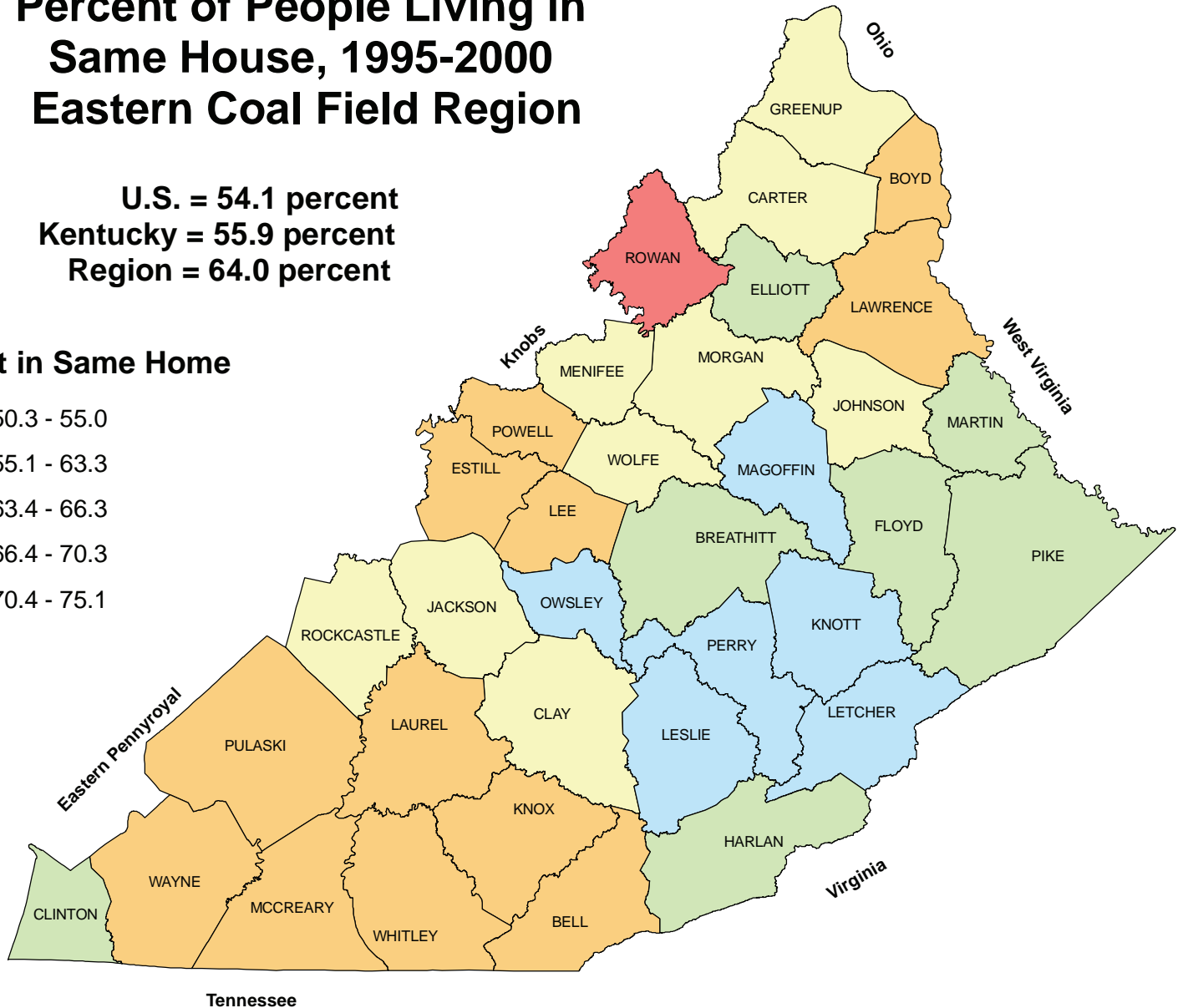
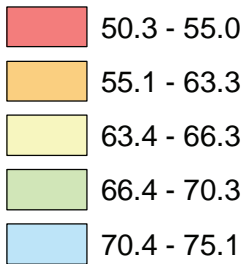
Overall, people in the region have more space than the average Kentuckian. This allows more room for wildlife and peaceful vistas. The region has some of the most spectacular scenery in the eastern U.S.

USDA-NRCS soil evaluations for the region suggest that only 6 percent of the land does not have severe limitations for home construction. If those are the areas of settlement, then the actual population density in settled areas is about 1,100 people per square mile--similar to high-density urban areas of Kentucky.

Percent of People Living in Same House, 1995-2000 Eastern Coal Field Region

U.S. = 54.1 percent
Kentucky = 55.9 percent
Region = 64.0 percent

Percent in Same Home

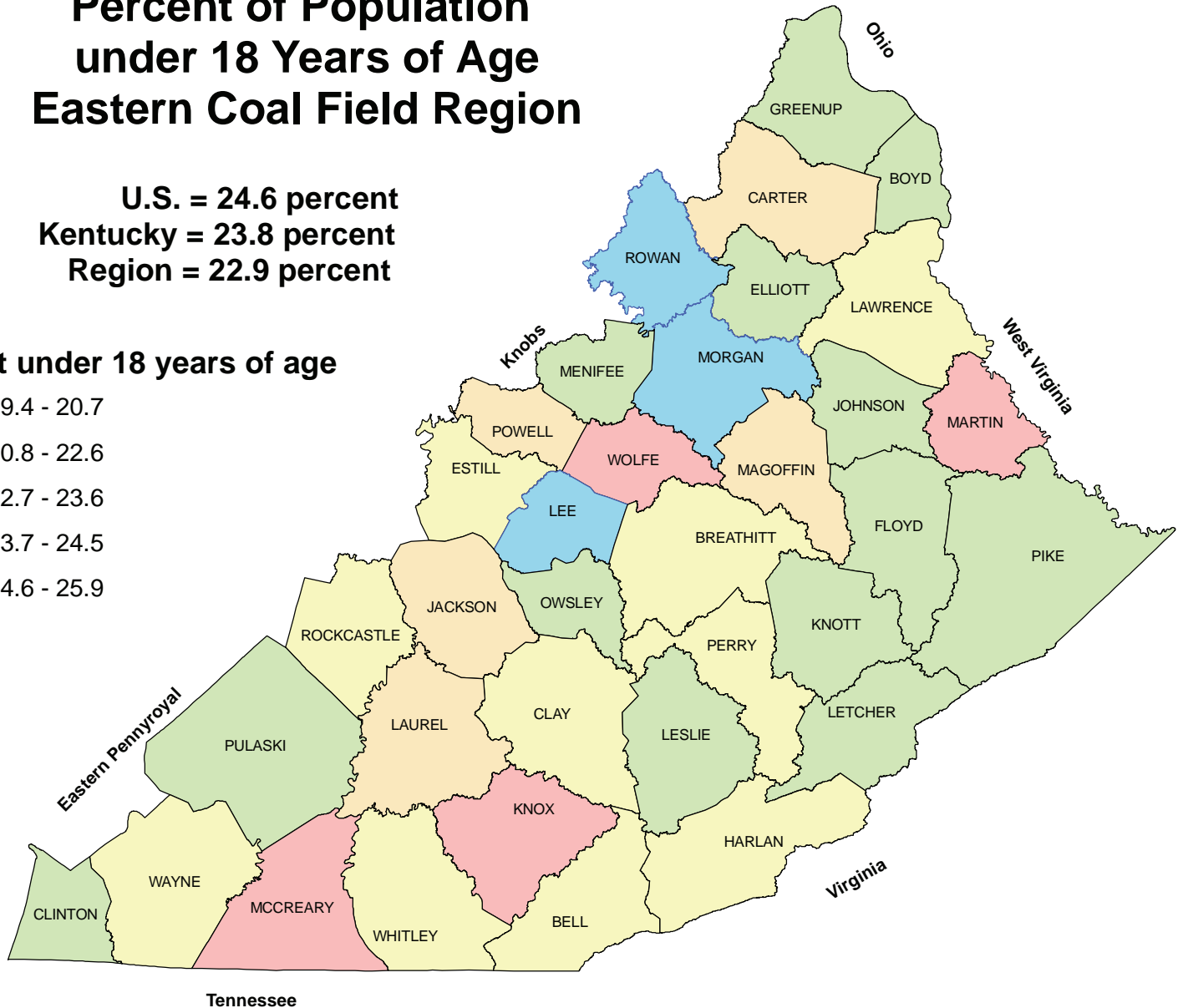
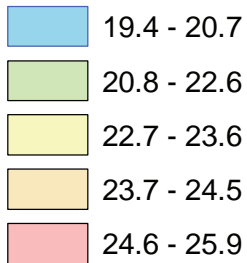


Only Rowan County was as mobile as Kentucky and the U.S.
Most people in the region tend to stay where they are.

Percent of Population under 18 Years of Age Eastern Coal Field Region

U.S. = 24.6 percent
 Kentucky = 23.8 percent
 Region = 22.9 percent

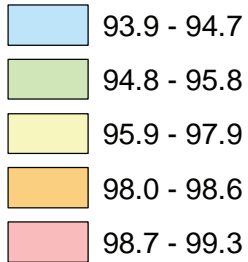
Percent under 18 years of age



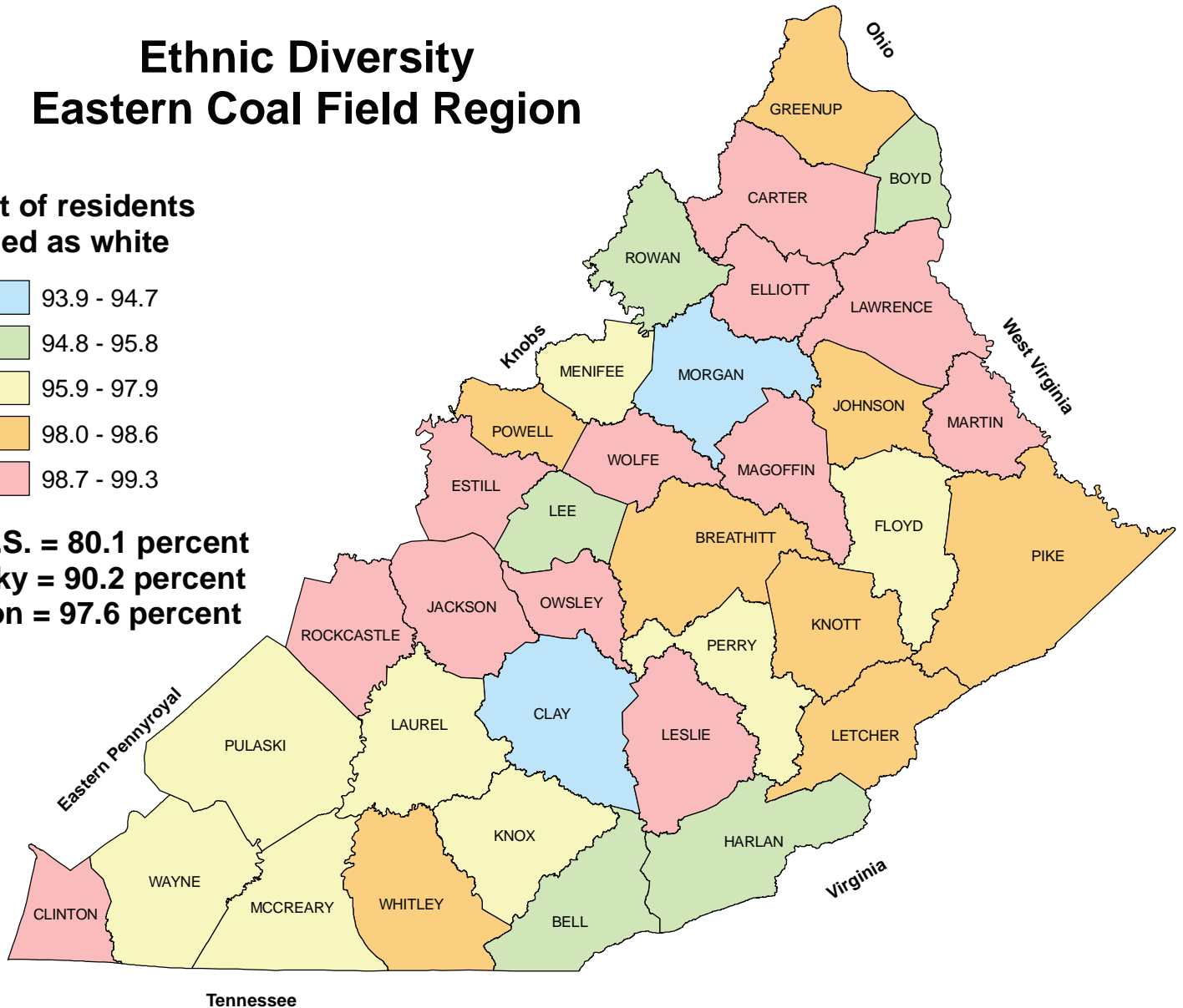
The percentage of the population under 18 is less in the region than for the state or nation, except in McCreary, Knox, Martin, and Wolfe Counties.

Ethnic Diversity Eastern Coal Field Region

Percent of residents
classified as white



U.S. = 80.1 percent
Kentucky = 90.2 percent
Region = 97.6 percent

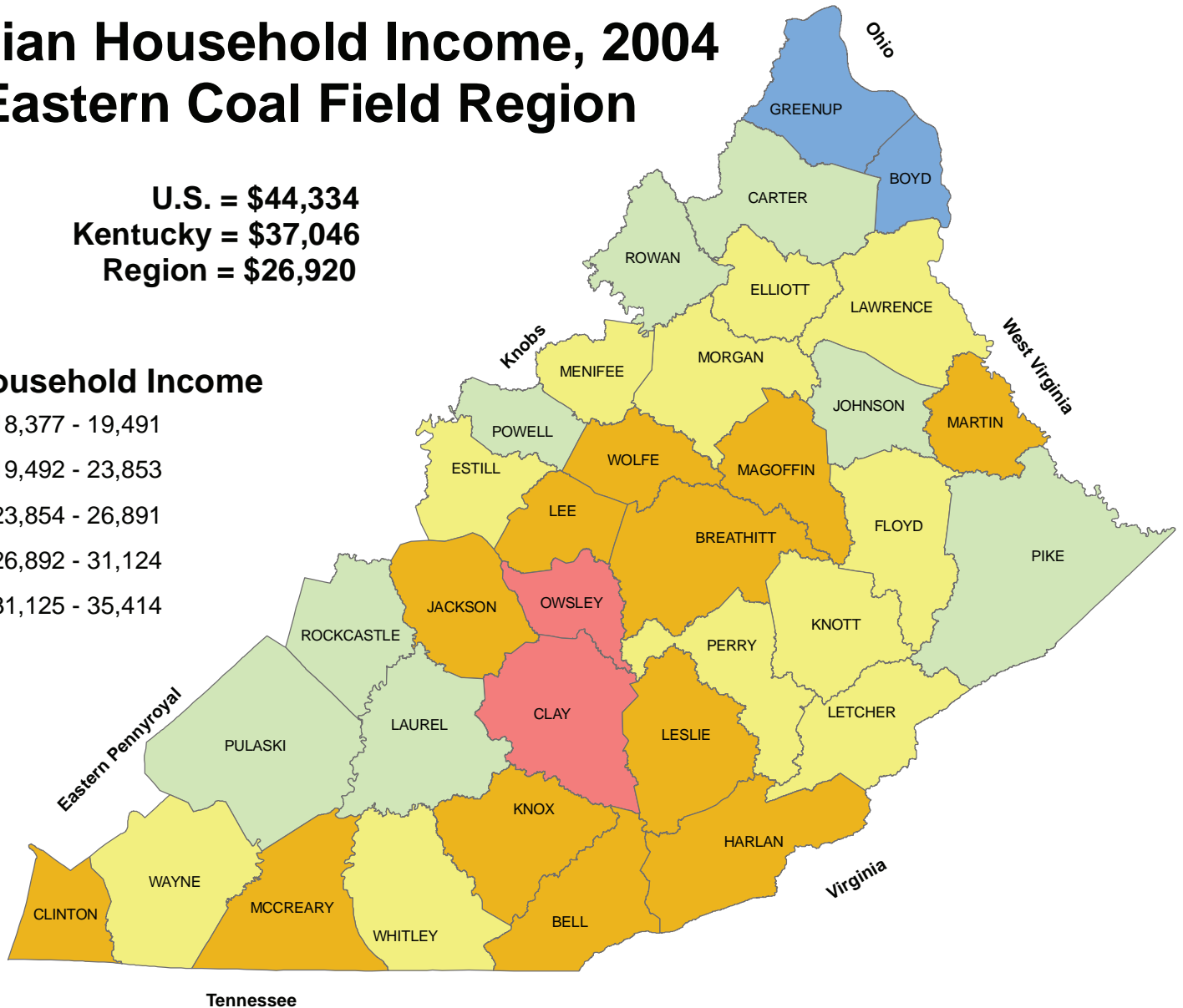
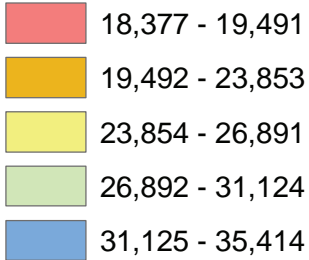


The region is less ethnically diverse than Kentucky or the U.S., with the percentage of the residents classified as white greater throughout the region.

Median Household Income, 2004 Eastern Coal Field Region

U.S. = \$44,334
 Kentucky = \$37,046
 Region = \$26,920

2004 Household Income



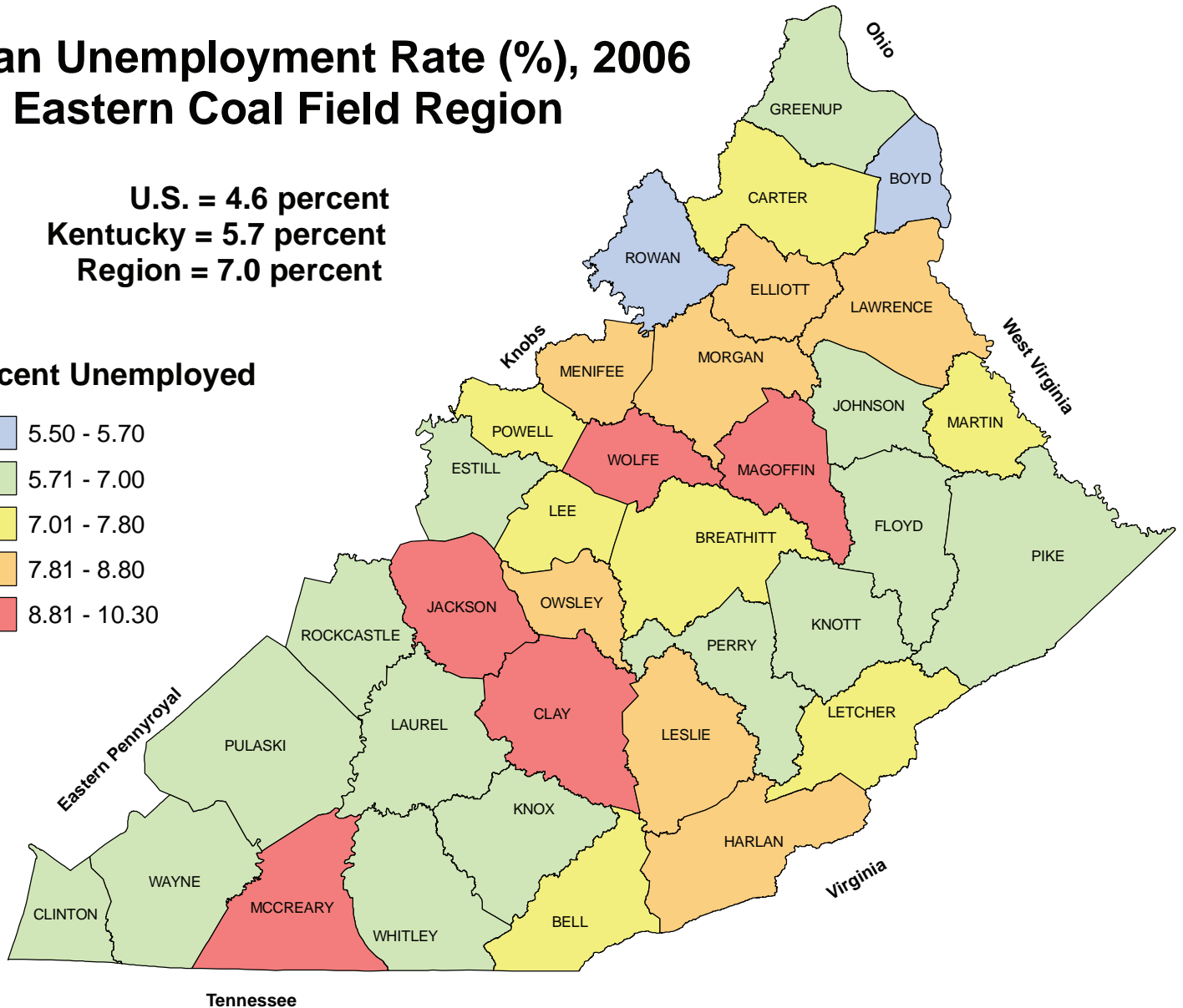
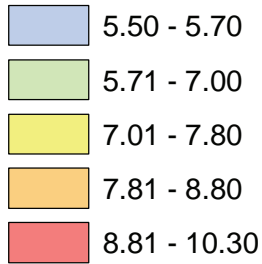
The median household income in the region, \$26,920, about 75% that of Kentucky and 60% that of the U.S.

Civilian Unemployment Rate (%), 2006

Eastern Coal Field Region

U.S. = 4.6 percent
 Kentucky = 5.7 percent
 Region = 7.0 percent

Percent Unemployed

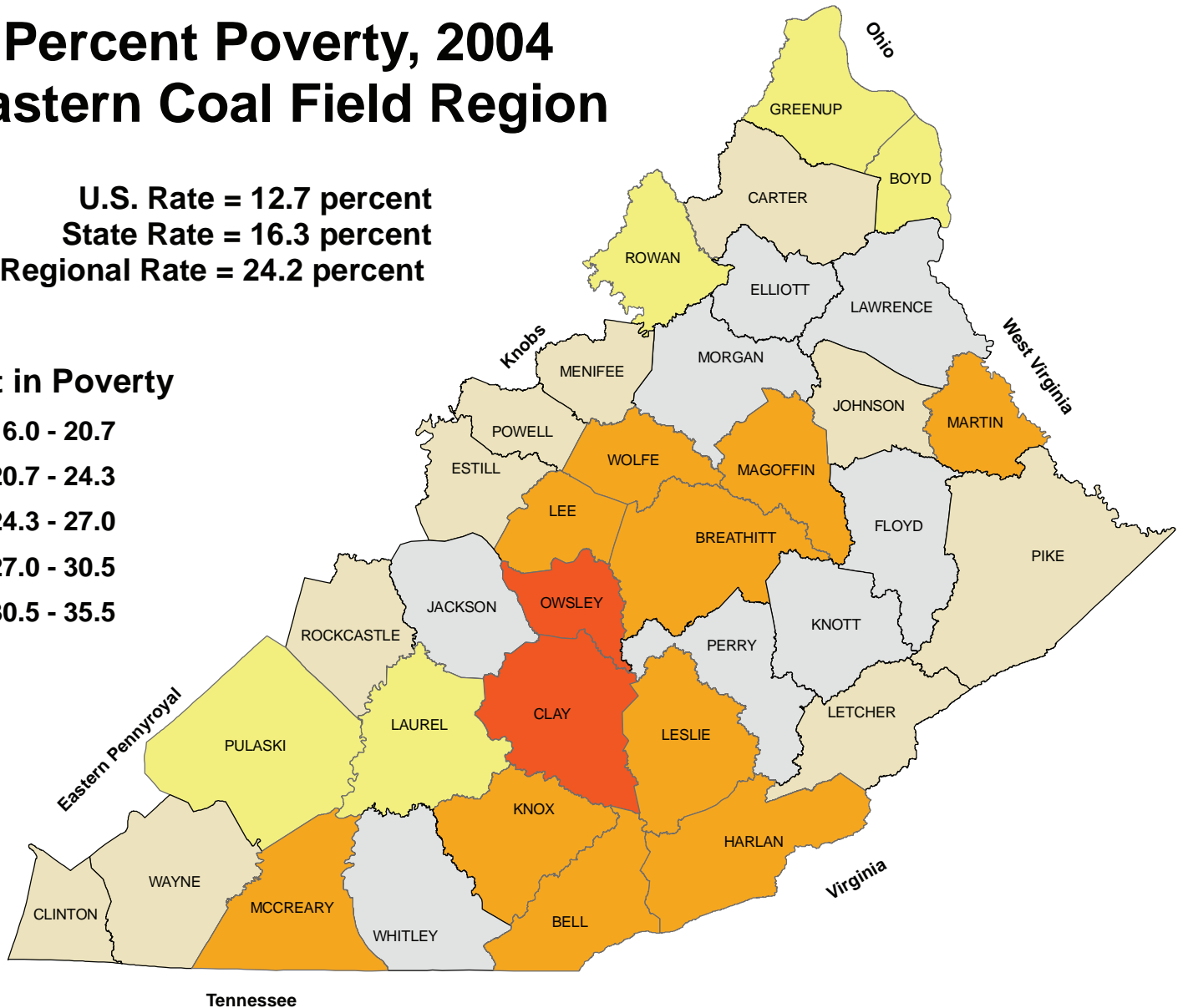
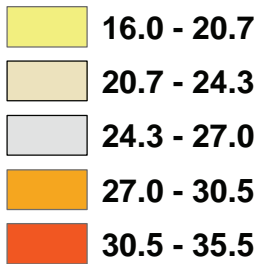


No county in the region was below the national unemployment rate in 2006, and only Boyd and Rowan Counties were at or below the state rate.

Percent Poverty, 2004 Eastern Coal Field Region

U.S. Rate = 12.7 percent
 State Rate = 16.3 percent
 Regional Rate = 24.2 percent

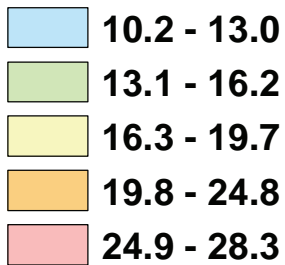
Percent in Poverty



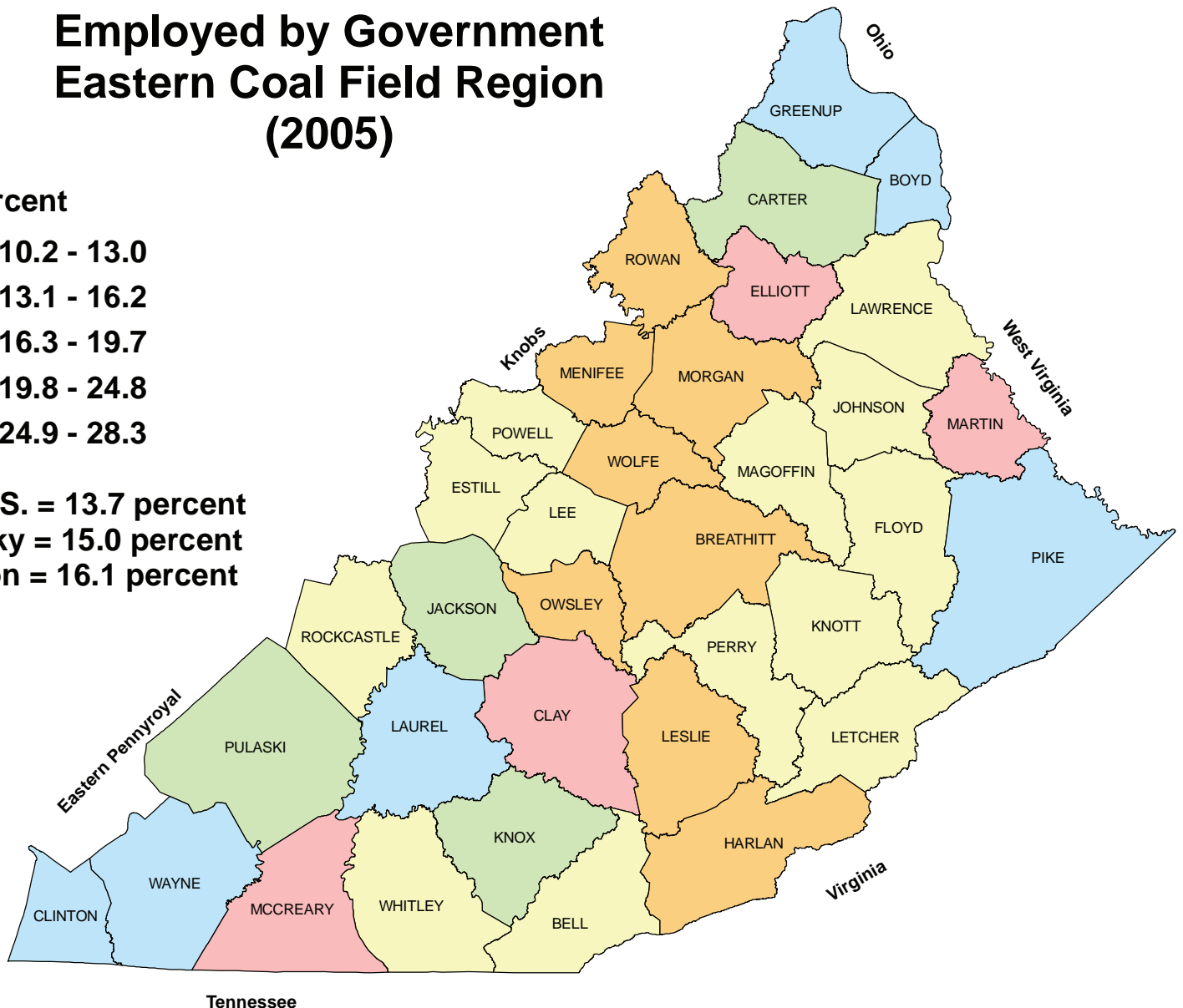
The poverty rate across the region is 50 percent higher than the state rate, and nearly double the national rate. No counties were below the national rate, and only Greenup County was below the Kentucky rate.

Percent of Workforce Employed by Government Eastern Coal Field Region (2005)

Percent



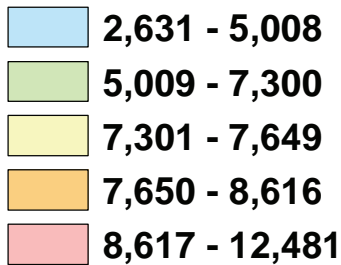
U.S. = 13.7 percent
 Kentucky = 15.0 percent
 Region = 16.1 percent



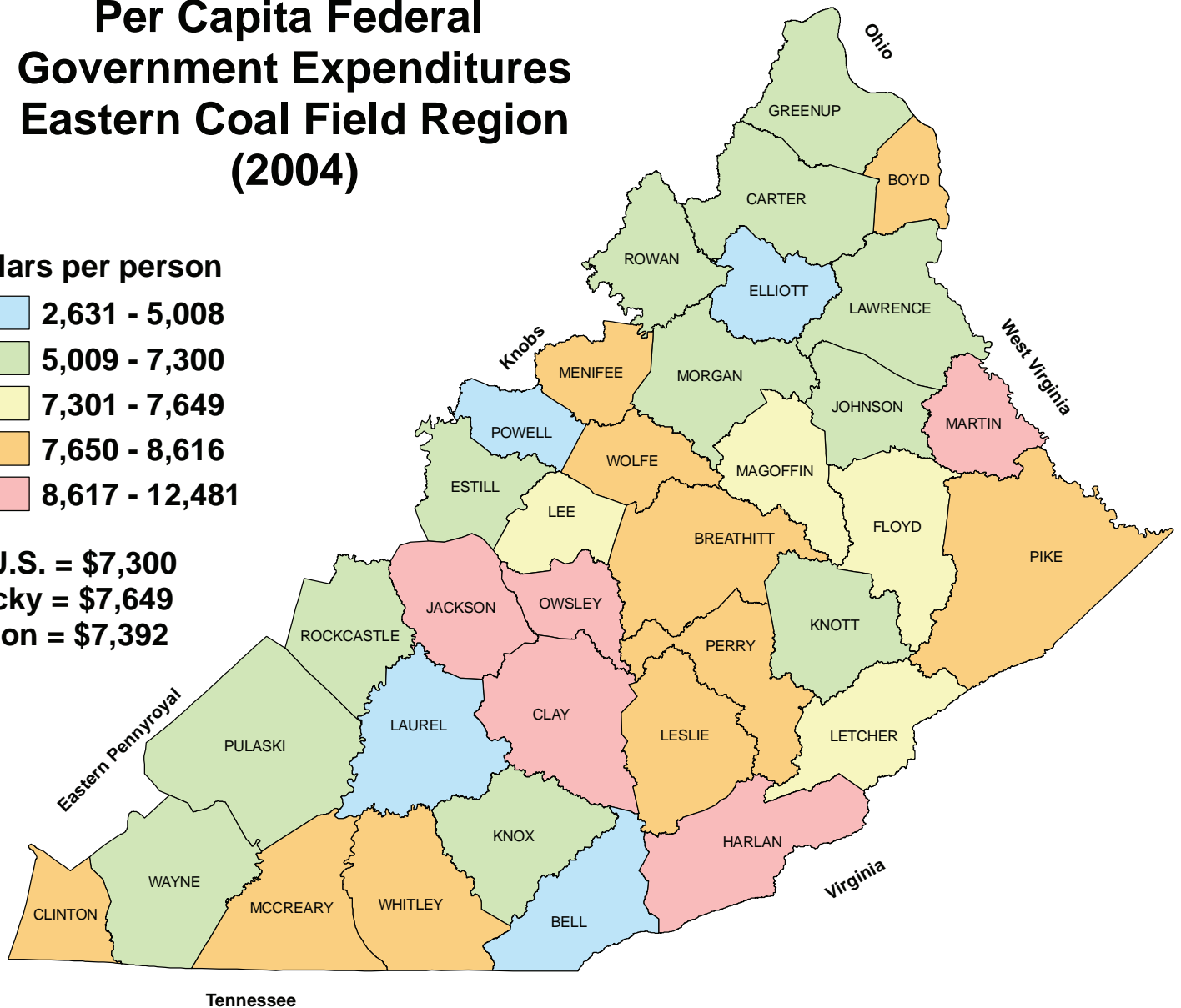
The percentage of workers employed by government is higher in most of the region than for the rest of Kentucky or the U.S. For some counties it is significantly higher. Government services are important to the region.

Per Capita Federal Government Expenditures Eastern Coal Field Region (2004)

Dollars per person



U.S. = \$7,300
Kentucky = \$7,649
Region = \$7,392



Per capita federal expenditures in 2004 for the region were nearly the same as for the nation, and slightly less than for the state as a whole. There were differences within the region.

Education—Eastern Coal Field Region

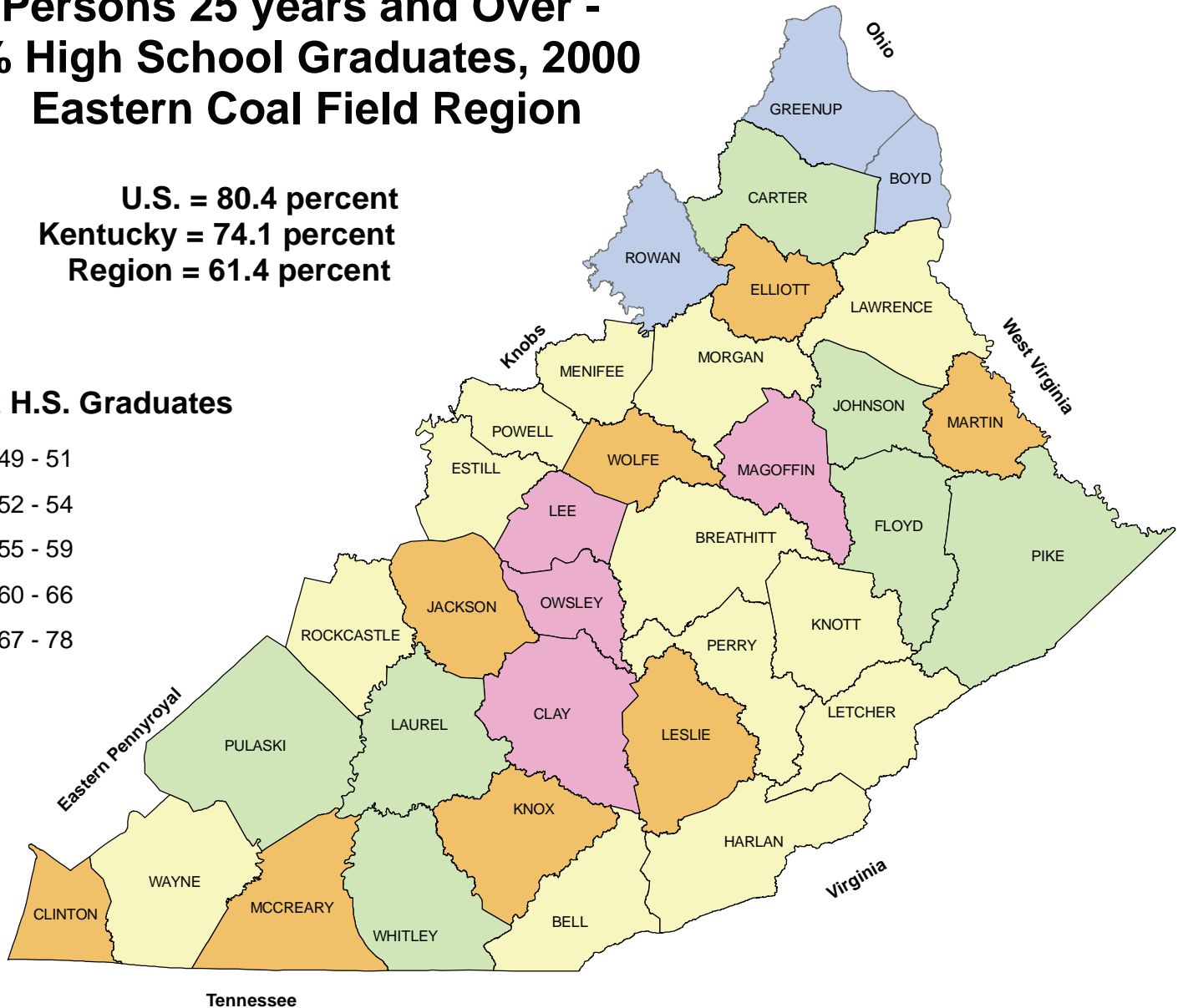
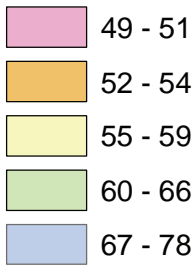


Alice Lloyd College in Knott County is widely recognized as a highly respected, private, four-year, liberal arts institution dedicated to providing leadership education to some of the brightest and best students in the Appalachian region. Photo by Dan Carey, Kentucky Geological Survey.

Persons 25 years and Over - % High School Graduates, 2000 Eastern Coal Field Region

U.S. = 80.4 percent
Kentucky = 74.1 percent
Region = 61.4 percent

Percent H.S. Graduates



The percentage of high school graduates 25 and over in the region is 13 percent below that of the state and 19 percent below that of the U.S.

Union College, Barbourville, Knox County

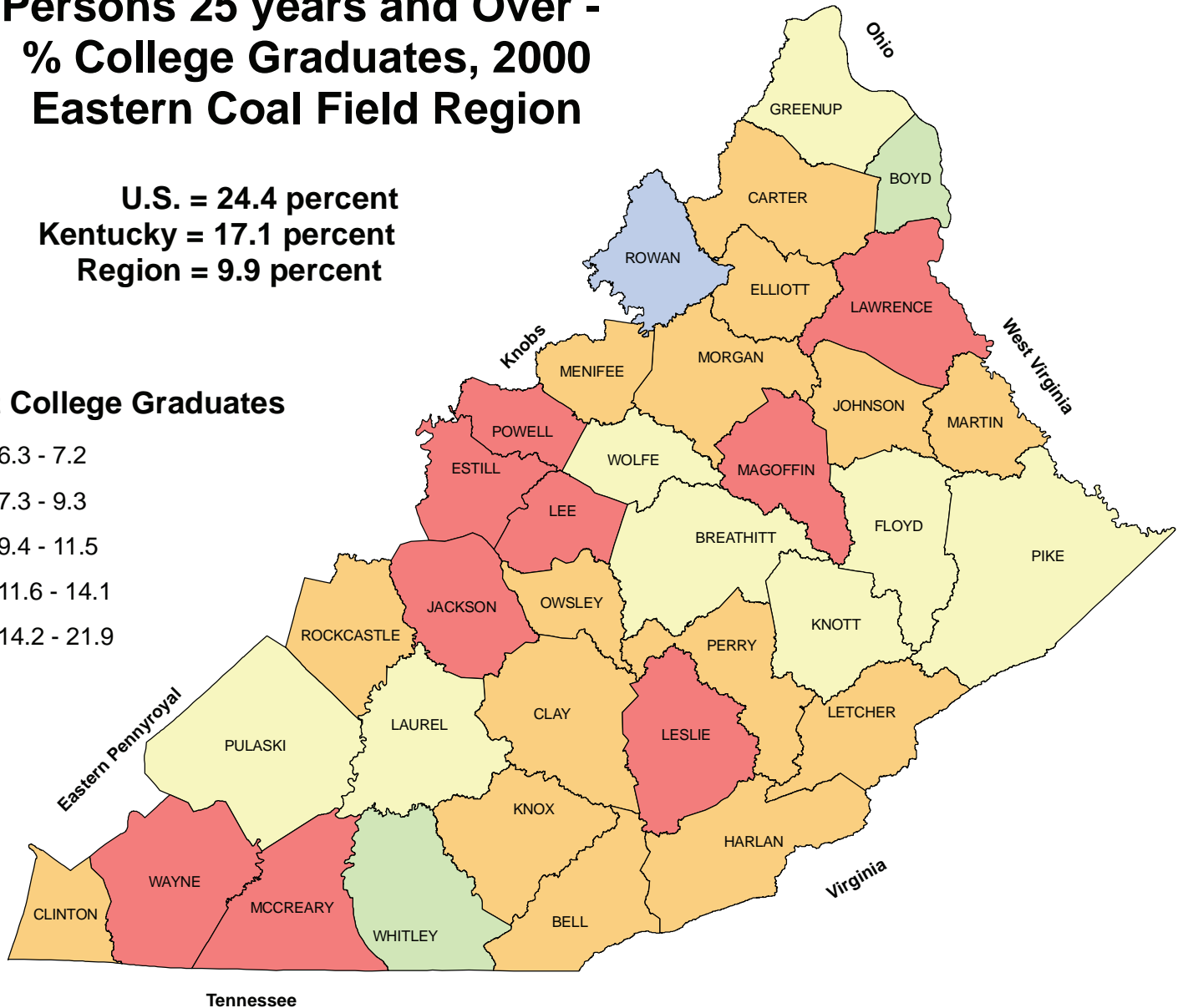
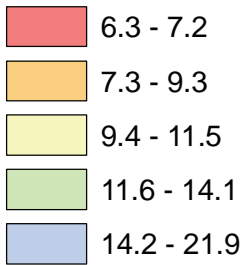


Union College, a liberal arts United Methodist college with 600 undergraduate and 300 graduate students, was founded in Barbourville in 1879. It has 20 buildings on a 100-acre campus. The faculty-to-student ratio is 1:13. Photo by Dan Carey, Kentucky Geological Survey.

Persons 25 years and Over - % College Graduates, 2000 Eastern Coal Field Region

U.S. = 24.4 percent
 Kentucky = 17.1 percent
 Region = 9.9 percent

Percent College Graduates



The percentage of college graduates 25 and over is less in every county than the national rate, and less in every county but Rowan than the state rate. Across the region, percentage of graduates is about 1/3 the national rate and 1/2 the state rate.

Resources

Fishtrap Lake, Pike County

U.S. Army Corps Of Engineers
Huntington District

Date Of Photography
July 06, 2001



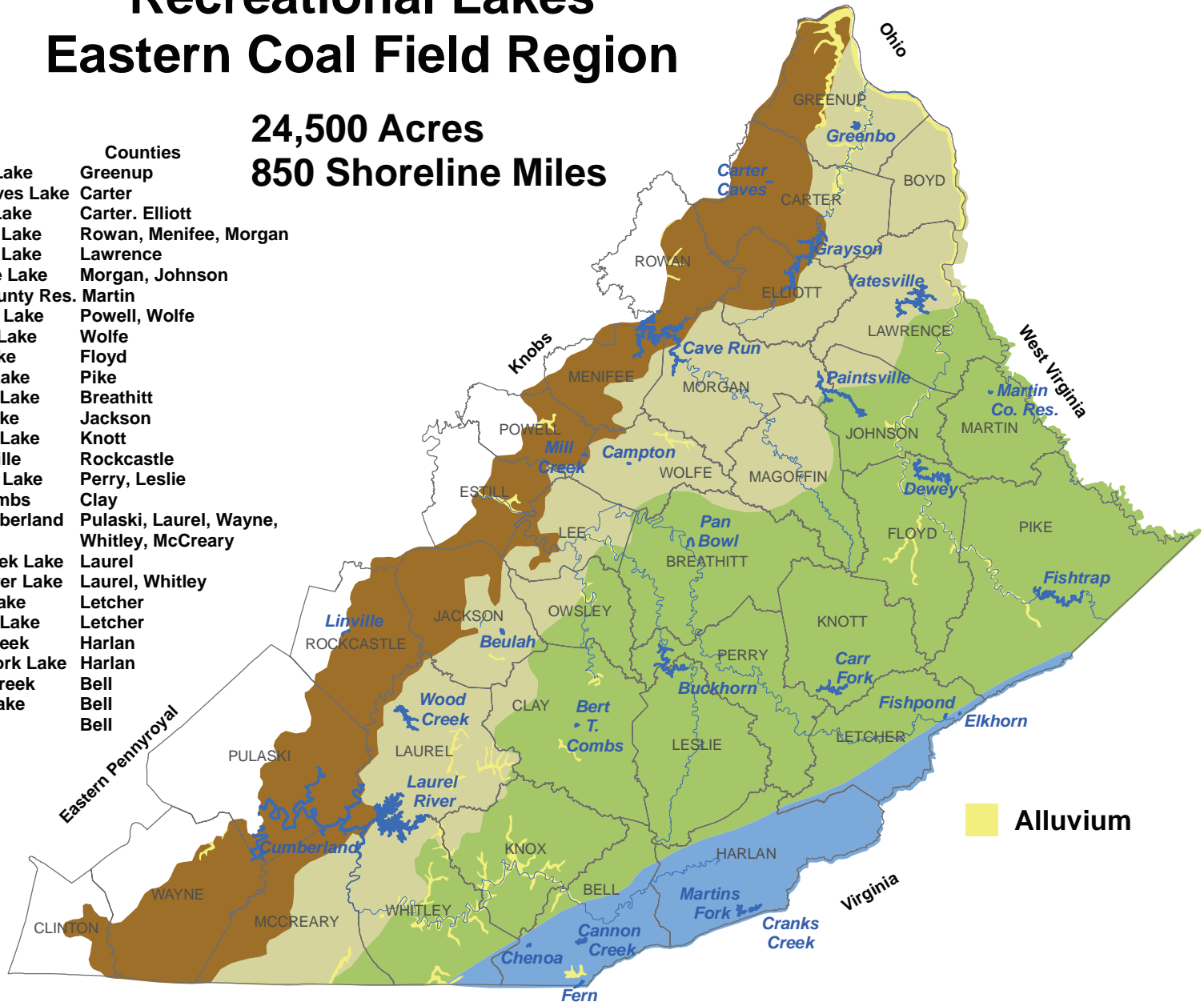
Fishtrap Lake, with a surface area of 1,130 acres, provides for fishing and boating. The surrounding recreational area affords biking, hiking, and camping. Fishtrap Lake Dam, completed in 1968, protects the valley of the Levisa Fork of the Big Sandy River from flooding. It is situated about 6 miles east of Pikeville near the small community of Millard, and is the highest dam in eastern Kentucky. Built of native rock on a clay waterproof core, the dam is 195 feet high and 1,000 feet long. The job required moving 5 million cubic yards of rock and earth. The U.S. Army Corps of Engineers manages the dam and lake, in conjunction with the Commonwealth of Kentucky. Photo courtesy of the Huntington District, U.S. Army Corps of Engineers.

Recreational Lakes Eastern Coal Field Region

24,500 Acres
850 Shoreline Miles



- | Lake | Counties |
|--------------------|---|
| Greenbo Lake | Greenup |
| Carter Caves Lake | Carter |
| Grayson Lake | Carter, Elliott |
| Cave Run Lake | Rowan, Menifee, Morgan |
| Yatesville Lake | Lawrence |
| Paintsville Lake | Morgan, Johnson |
| Martin County Res. | Martin |
| Mill Creek Lake | Powell, Wolfe |
| Campton Lake | Wolfe |
| Dewey Lake | Floyd |
| Fishtrap Lake | Pike |
| Pan Bowl Lake | Breathitt |
| Beulah Lake | Jackson |
| Carr Fork Lake | Knott |
| Lake Linville | Rockcastle |
| Buckhorn Lake | Perry, Leslie |
| Bert T Combs Lake | Clay |
| Lake Cumberland | Pulaski, Laurel, Wayne, Whitley, McCreary |
| Wood Creek Lake | Laurel |
| Laurel River Lake | Laurel, Whitley |
| Elkhorn Lake | Letcher |
| Fishpond Lake | Letcher |
| Cranks Creek | Harlan |
| Martins Fork Lake | Harlan |
| Cannon Creek | Bell |
| Chenoa Lake | Bell |
| Fern Lake | Bell |



Alluvium

Subregion

- | | | | |
|--|------------------------------|--|----------------------------------|
| | Cumberland Escarpment | | Mountain and Creek Bottom |
| | Cumberland Plateau | | Pine Mountain |

Carr Fork Lake, Knott County



Carr Fork Lake, 710 acres and 24 miles of shoreline, provides swimming, fishing, boating, water sports, camping, hiking, and wildlife habitat to visitors to Knott County. Mining activities can be seen in the background. Photo by Dan Carey, Kentucky Geological Survey.

Dewey Lake, Floyd County



Dewey Lake provides 1,100 acres of boating, water sports, swimming, and fishing. Adjacent Jenny Wiley State Resort Park offers swimming, hiking, camping, disc golf, elk viewing, cabins, and meeting facilities. Photo by Dan Carey, Kentucky Geological Survey.

Panbowl Lake, Breathitt County



When an old oxbow meander of the North Fork of the Kentucky River was cutoff by the embankment for Ky. 15, it created the 98-acre Pan Bowl Lake. The lake is renowned for its largemouth bass and also supports bluegill, catfish, crappie, and sunfish. Photo by Dan Carey, Kentucky Geological Survey.

Tourism, Eastern Coal Field Region

HELMETS REQUIRED

KENTUCKY MOUNTAIN TRAILS
OF HARLAN COUNTY

BTH
Trail Head

TRAIL RULES
HARLAN COUNTY OUTDOOR RECREATION BOARD AUTHORITY, INC.
THIS PARK OPERATES, AND EVERYONE RIDES AT HIS OR HER OWN RISK UNDER KRS 411.190. KNOW YOUR LIMITATIONS AND DO NOT EXCEED THE CAPABILITIES OF YOUR VEHICLE

① WEATHER AND REQUIRED PREPARATION TO RIDE
② IMPROVISED PROTECTIVE GEAR INCLUDING, BUT NOT LIMITED TO THICK STEEL LITER BY THE MANUFACTURER AND THE USE SAFETY FACTORIES AND STRENGTH RECOMMENDATION
③ CONSUMPTION OF ALCOHOL WHILE OR BEFORE OPERATING A MOTORIZED VEHICLE

④ ALL OFF ROAD VEHICLE DRIVERS AND RIDERS SHOULD FOLLOW THE MANUFACTURERS SAFE OPERATING PROCEDURES, PLANS, BE SURE THAT YOUR GEAR HAS THE APPROPRIATE EQUIPMENT NEEDED TO OPERATE ON THE RUGGA TERRAIN IN THE PARK

⑤ FIREWORK USE MUST BE READ WITHIN ONLY
⑥ THE BOARD MUST APPROVE ALL SPECIAL EVENTS INCLUDING VEHICLES
⑦ PETS SHOULD BE KEPT ON LEASH AT ALL TIMES

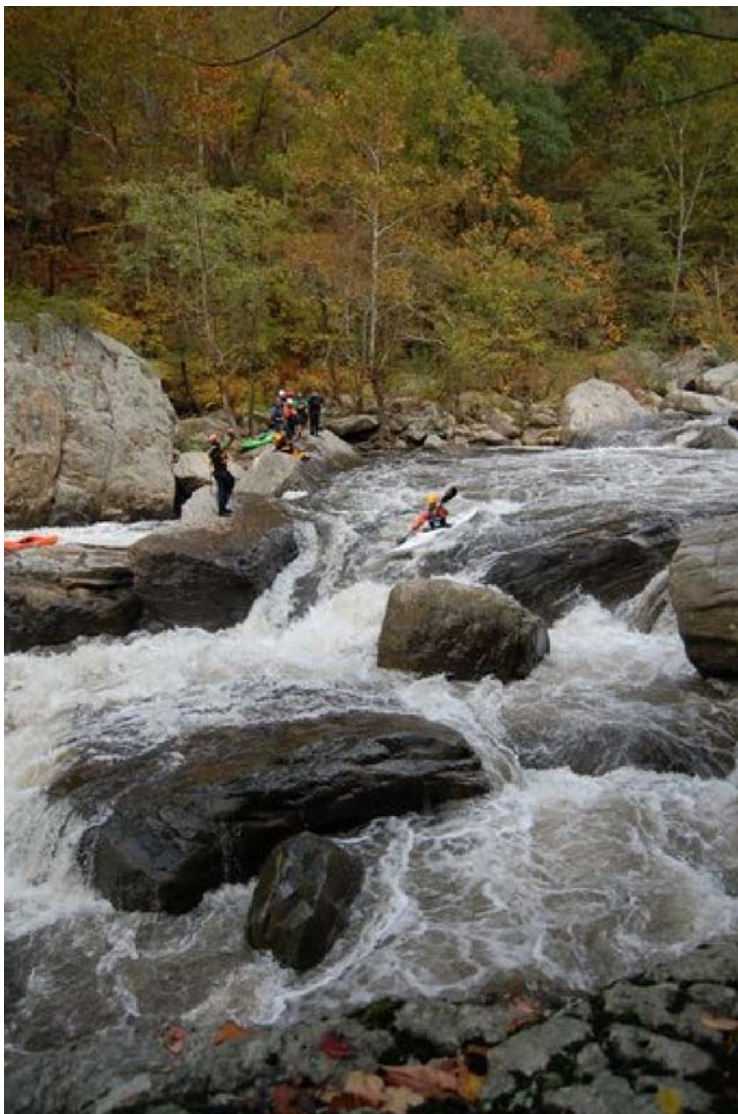
With a wealth of natural beauty and miles of off-road sport vehicle and hiking trails, campsites, and spectacular ridge-top views, the Eastern Coal Field Region is promoting itself as "nature's playground" in an attempt to diversify its economy. Photo by Dan Carey, Kentucky Geological Survey.

Russell Fork River

Kayakers run the Class V water on the Russell Fork River in the Lord of the Fork race.

The Breaks Interstate Park is one of two interstate parks in America and encompasses 4,500 acres of woodland. The Breaks, home of the deepest gorge east of the Mississippi River, also rises to lofty heights where golden eagles make their home. The Towers and other rock formations, caves, flora and wildlife make the Breaks Park a unique tourist destination. The park offers hiking, bike and driving trails, picnic and recreation areas, a lake with pedal boats, a swimming pool, horseback riding and an amphitheater. A rustic lodge, cottages and a large campground are available for extended visits. The Breaks Park also has a modern conference center, restaurant, gift shop and visitor's center.

Photo by Bethany Overfield, Kentucky Geological Survey.



Recreation, Mountain and Creek Bottom Region



The Barbourville Recreation Park offers a wave pool, lazy river pool, water slide, fishing, paddle boats, putt-putt golf, exercise and walking tracks, tennis courts, sports fields, playground, picnic shelters, RV hook-ups, a wedding chapel, and more!

The Paul Hunt Thompson Golf Course and adjacent Stumbo Park near Allen in Floyd County are floodplain uses that minimize flood damages. Photos by Dan Carey, Kentucky Geological Survey.



Coal, Eastern Coal Field

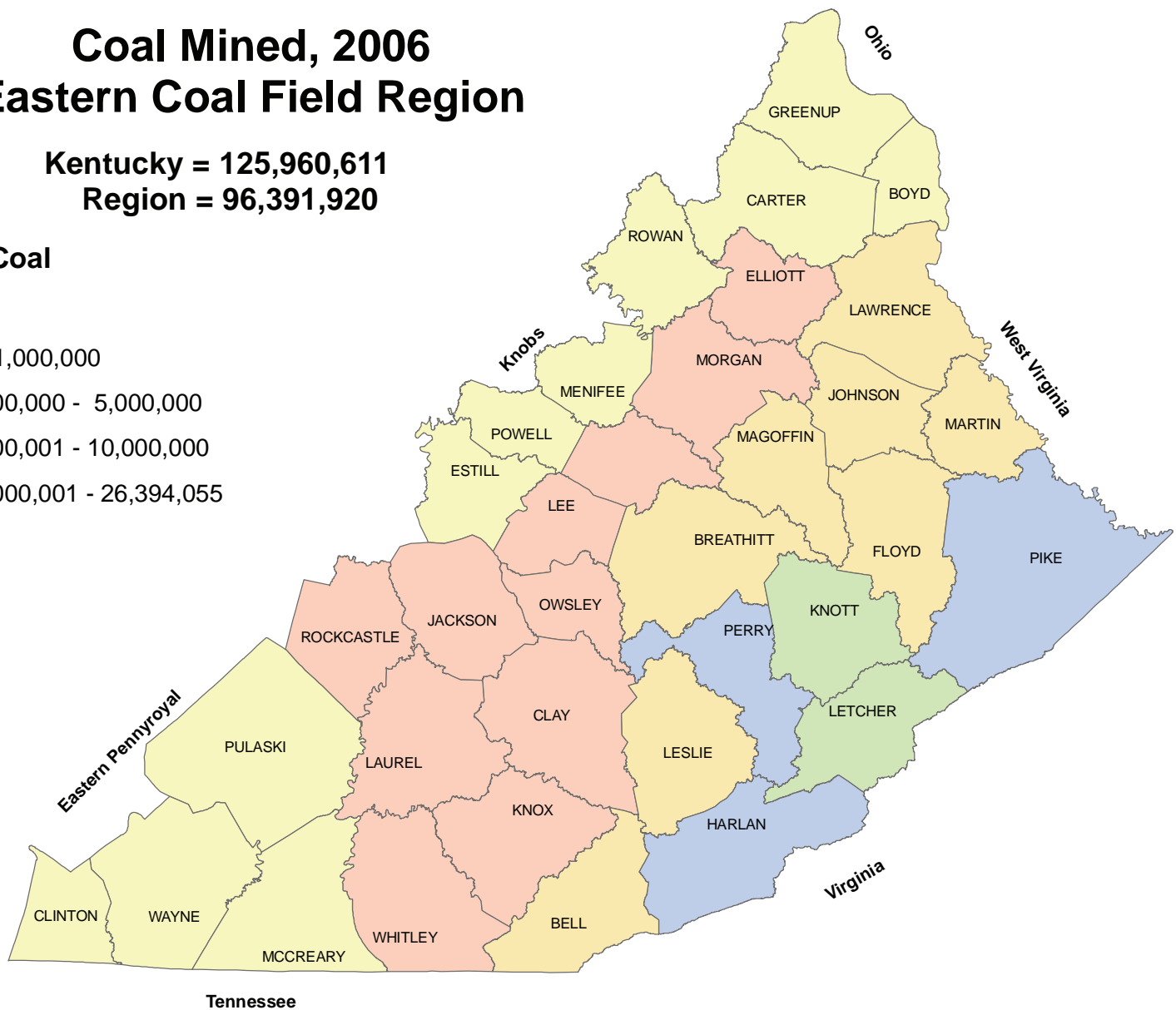
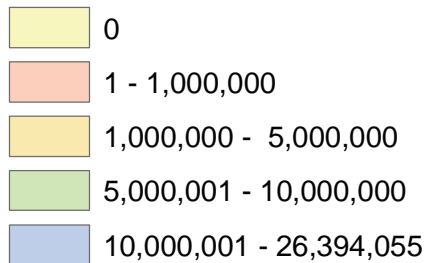


Coal plays a central role in the Eastern Coal Field economy; from 1790–2006, 6.3 billion tons—1.9 from surface and 4.4 from underground and other methods—was mined. Photo by Dan Carey, Kentucky Geological Survey.

Coal Mined, 2006 Eastern Coal Field Region

Kentucky = 125,960,611
Region = 96,391,920

Tons of Coal

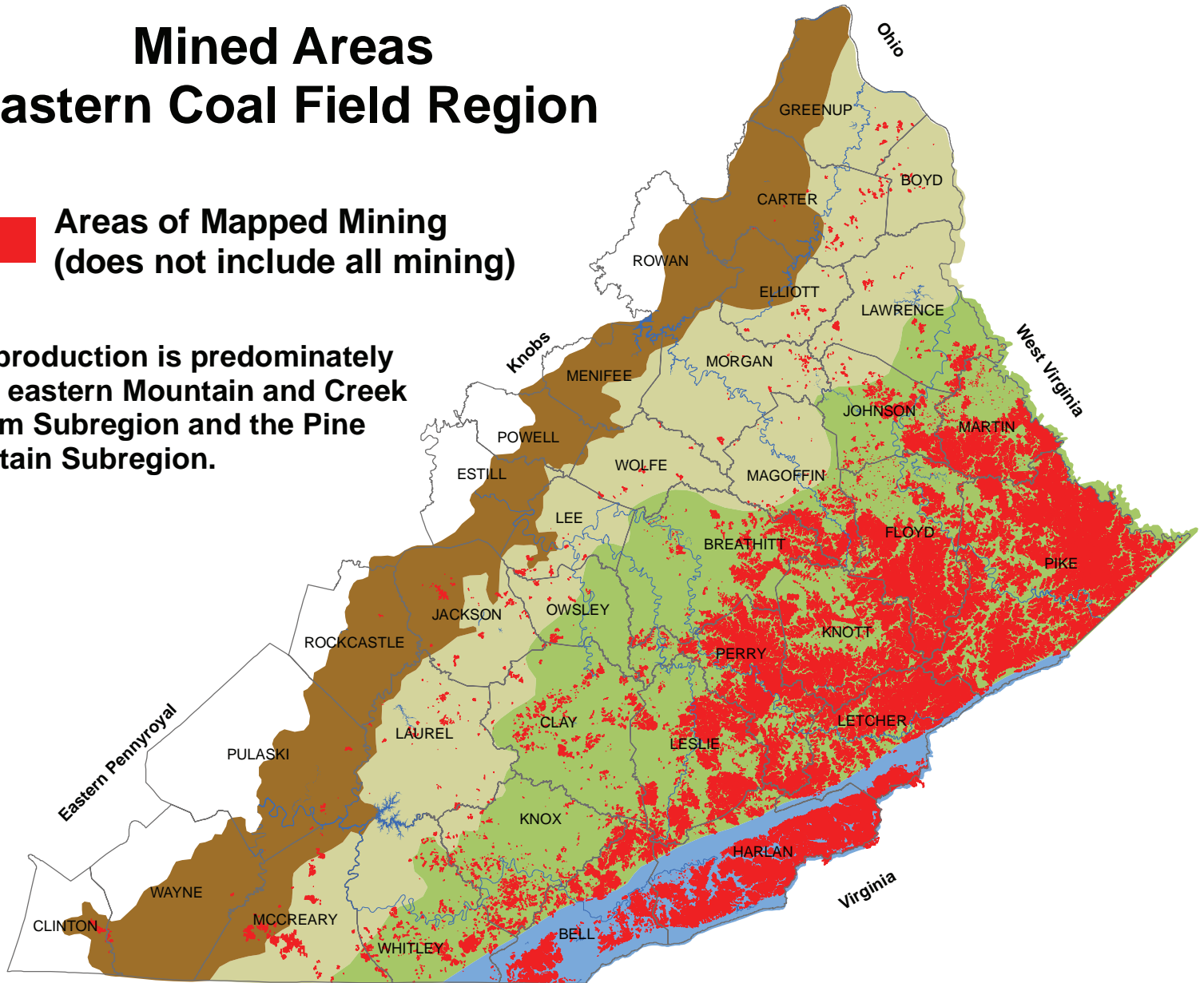


Eastern Kentucky mined about 3/4 of the coal produced in Kentucky in 2006. 6,055 employees at 328 surface mines produced 45.5 million tons (7,520 tons per employee). 8,997 employees at 287 underground mines produced 50.8 million tons (5,650 tons per employee). The five leading producers in the region--Pike, Perry, Harlan, Letcher, and Knott counties--mined 71 million tons of coal in 2006. Pike County, with over 26 million tons, mined nearly twice as much coal as any other county in the state.

Mined Areas Eastern Coal Field Region

 **Areas of Mapped Mining
(does not include all mining)**

Coal production is predominately in the eastern Mountain and Creek Bottom Subregion and the Pine Mountain Subregion.



Subregion

 **Cumberland Escarpment**

 **Mountain and Creek Bottom**

 **Cumberland Plateau**

 **Pine Mountain**

Surface Mining, Floyd County



Surface mining south of Hippo in Floyd County is seen in aerial photography. 2004 photo by the U.S. Department of Agriculture, Farm Services Administration, National Agricultural Imagery Program.

Auger Mining, Knott County

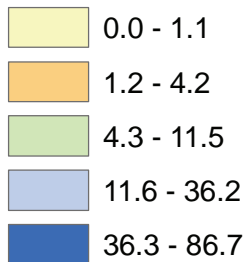


Auger mining in the Pikeville Formation in Knott County. Auger mining is usually associated with contour strip mining. The coal is removed by drilling auger holes from the last contour cut and extracting it in the same manner that shavings are produced by a carpenter's bit. Coal recovery rates approach 60 percent. The cutting heads of some augers are as large as 8 feet. Augers can penetrate up to 1000 feet into the mountainside. Photo by Dan Carey, Kentucky Geological Survey.

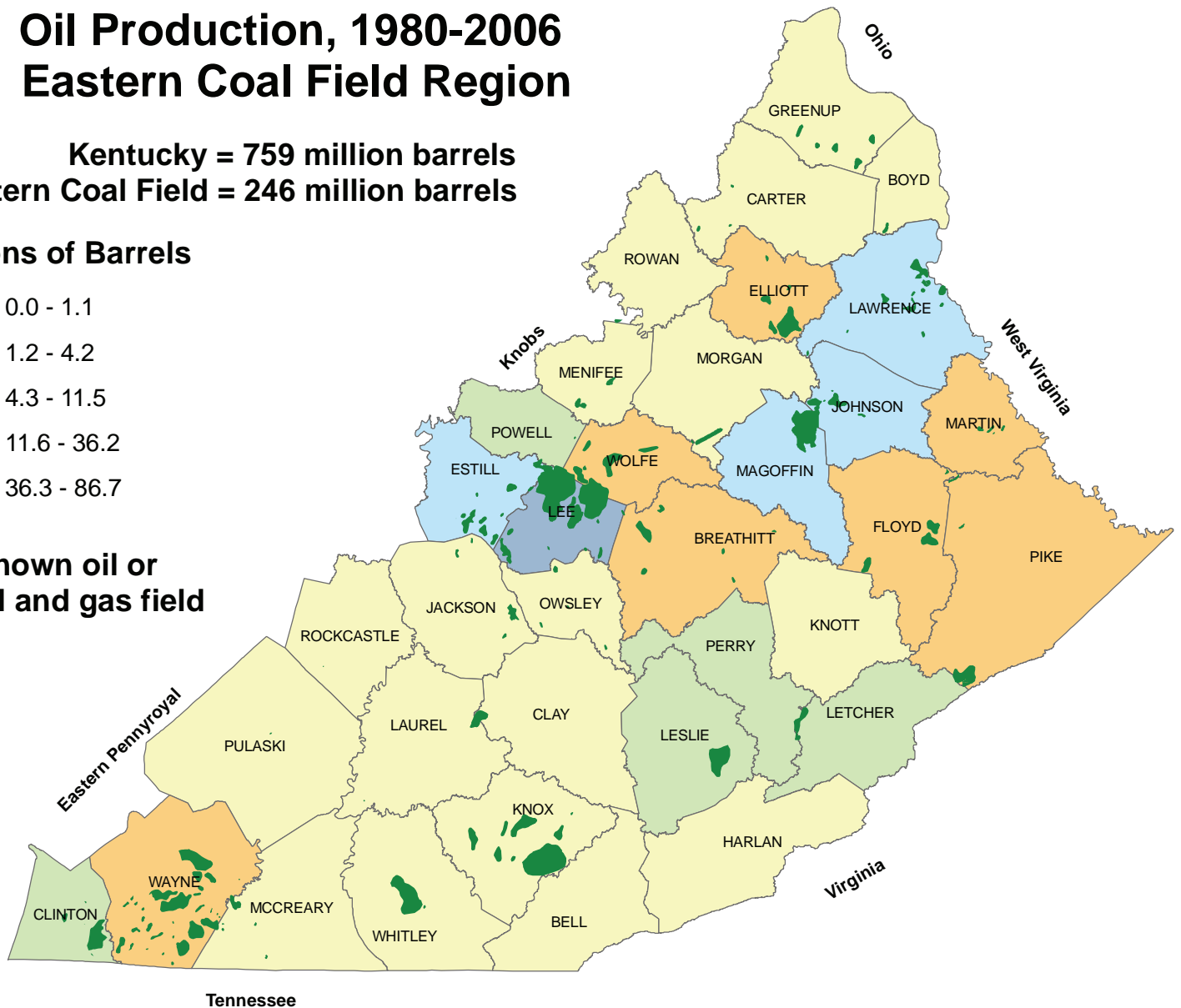
Oil Production, 1980-2006 Eastern Coal Field Region

Kentucky = 759 million barrels
Eastern Coal Field = 246 million barrels

Millions of Barrels



 **Known oil or oil and gas field**



From 1980 through 2006 the region provided 1/3 of the oil production in Kentucky. Lee County led the region with 86.7 million barrels.

Timber and Lumber, Eastern Coal Field Region



The lumber industry is a very important part of the Eastern Coal Field Region economy. Much of the region is wooded, and provides excellent timber for the industry. Coalfield Regional Industrial Park on Ky. 15 near Chavies in Perry County accommodates an influx of commercial enterprises, particularly those dealing with timber. Photos by Bart Davidson, Kentucky Geological Survey.



Industry, Boyd County



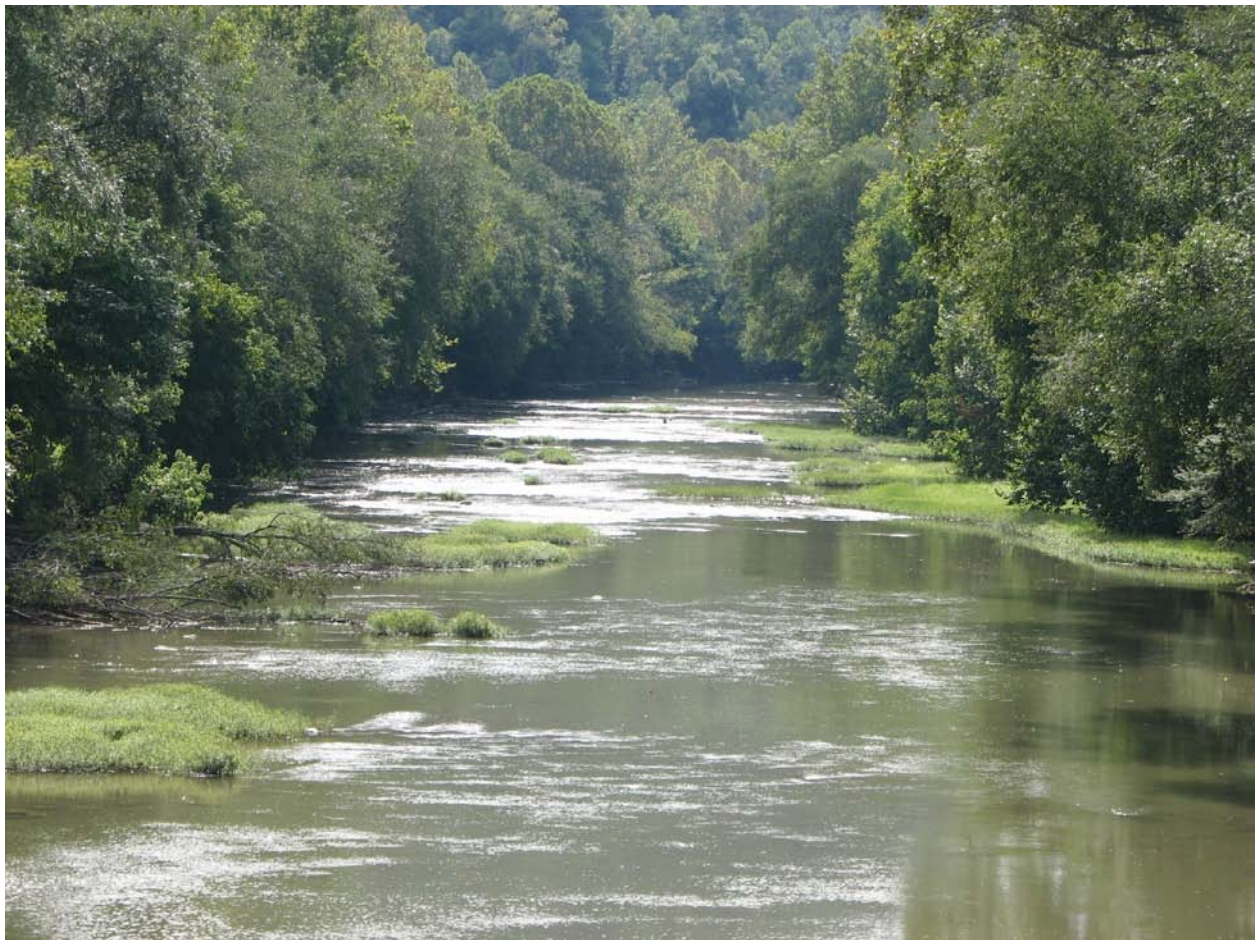
The Calgon Carbon Corp. Big Sandy plant at Catlettsburg manufactures activated carbon, used in water purification. The broad alluvial floodplain along the Big Sandy River provides farmland and access to river transportation to the Ohio River for heavy industry. This is not typical of the Eastern Coal Field Region. Photo by Richard Smath, Kentucky Geological Survey.

Limestone, Carter County



Active limestone quarries near Boone Furnace in Carter County supply the region with construction aggregate and other lime products. Photo by Dan Carey, Kentucky Geological Survey.

Cumberland River, Bell County, Pine Mountain Region



The Cumberland River and its tributaries provide water scenic beauty, fishing, water supply, and level land for agriculture and communities in Bell County and throughout the Pine Mountain Region. Photo by Dan Carey, Kentucky Geological Survey.

Public Water Supplies—Eastern Coal Field Region



Bert T. Combs Lake lies within the Beech Creek Wildlife Management Area in Clay County. The lake provides recreational fishing and serves as a water source for Manchester Water Works. Thousands of acres of manmade lakes provide drinking water for public water systems in communities throughout the Eastern Coal Field Region. Maintaining the quality of that water is vital to the region. Photo by Bart Davidson, Kentucky Geological Survey.

Water Resources, North Fork Kentucky River

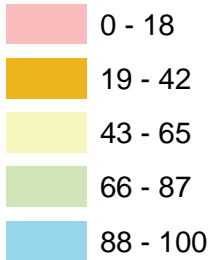


The North Fork of the Kentucky River, seen here at low-flow during the drought of 2007, provides water for Jackson Municipal Water Works in Breathitt County. The river provides water for many communities in the Eastern Coal Field Region. The water quality of rivers and streams in the region continues to be degraded by coal mining activities and untreated domestic wastewater. Photo by Dan Carey, Kentucky Geological Survey.

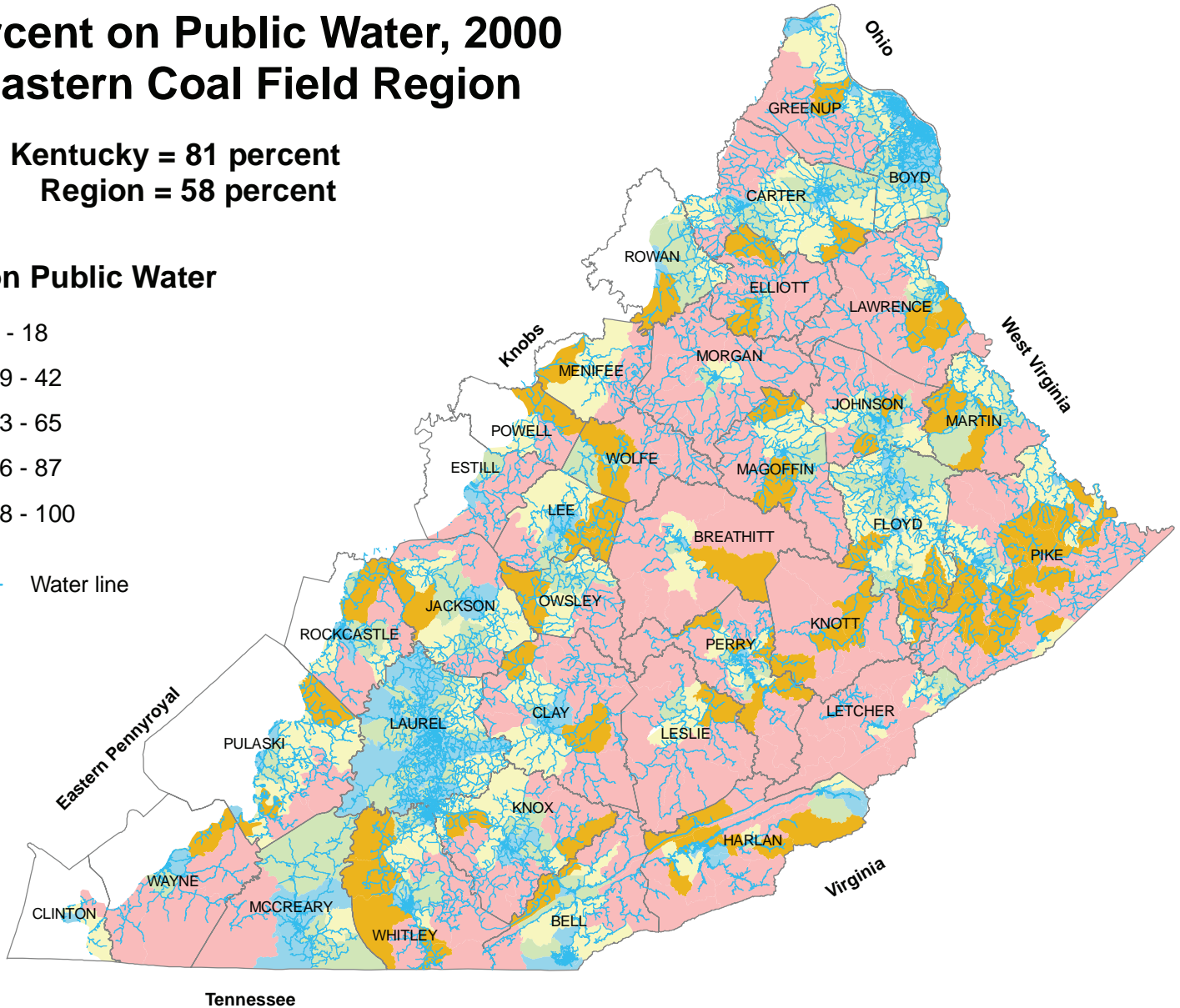
Percent on Public Water, 2000 Eastern Coal Field Region

Kentucky = 81 percent
Region = 58 percent

Percent on Public Water



Water line



Placing the 2008 water line data (11,474 miles of pipeline) over 2000 public water census data shows areas where the expansion of public water service occurred during the eight-year period. The terrain of the region makes it a challenge to provide cost-effective public water to homes distant from communities.

Groundwater, Eastern Kentucky Coal Field

About 42 percent of the people in the Eastern Coal Field Region rely on private domestic wells for their water.

Many areas of the region have high levels of iron or sulfur in the groundwater. Iron in water flowing from underground precipitates out with the characteristic iron oxide red color below in Letcher County.

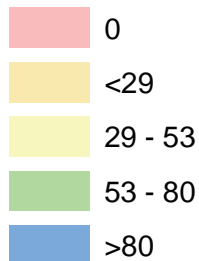
Photos by Dan Carey, Kentucky Geological Survey.



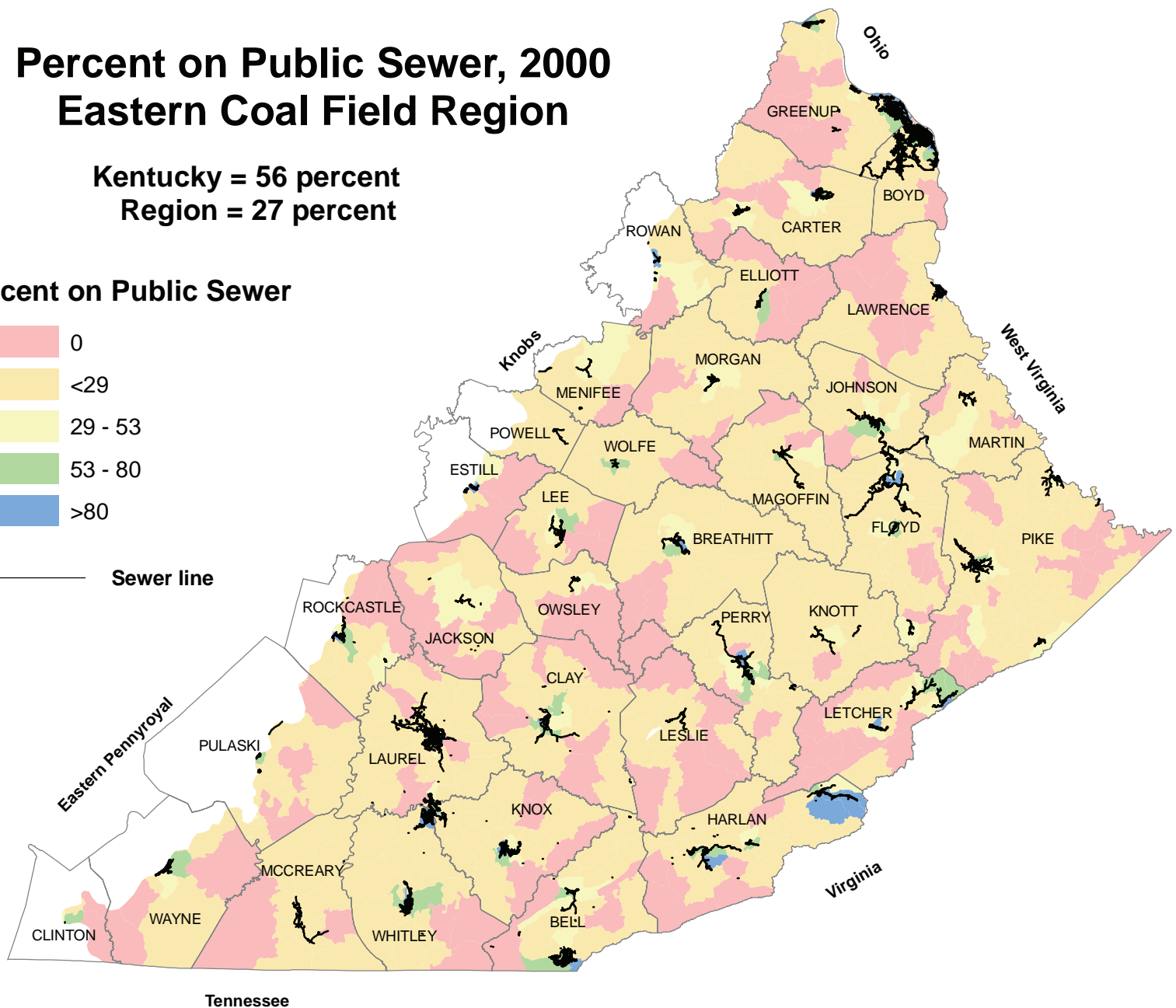
Percent on Public Sewer, 2000 Eastern Coal Field Region

Kentucky = 56 percent
Region = 27 percent

Percent on Public Sewer



— Sewer line



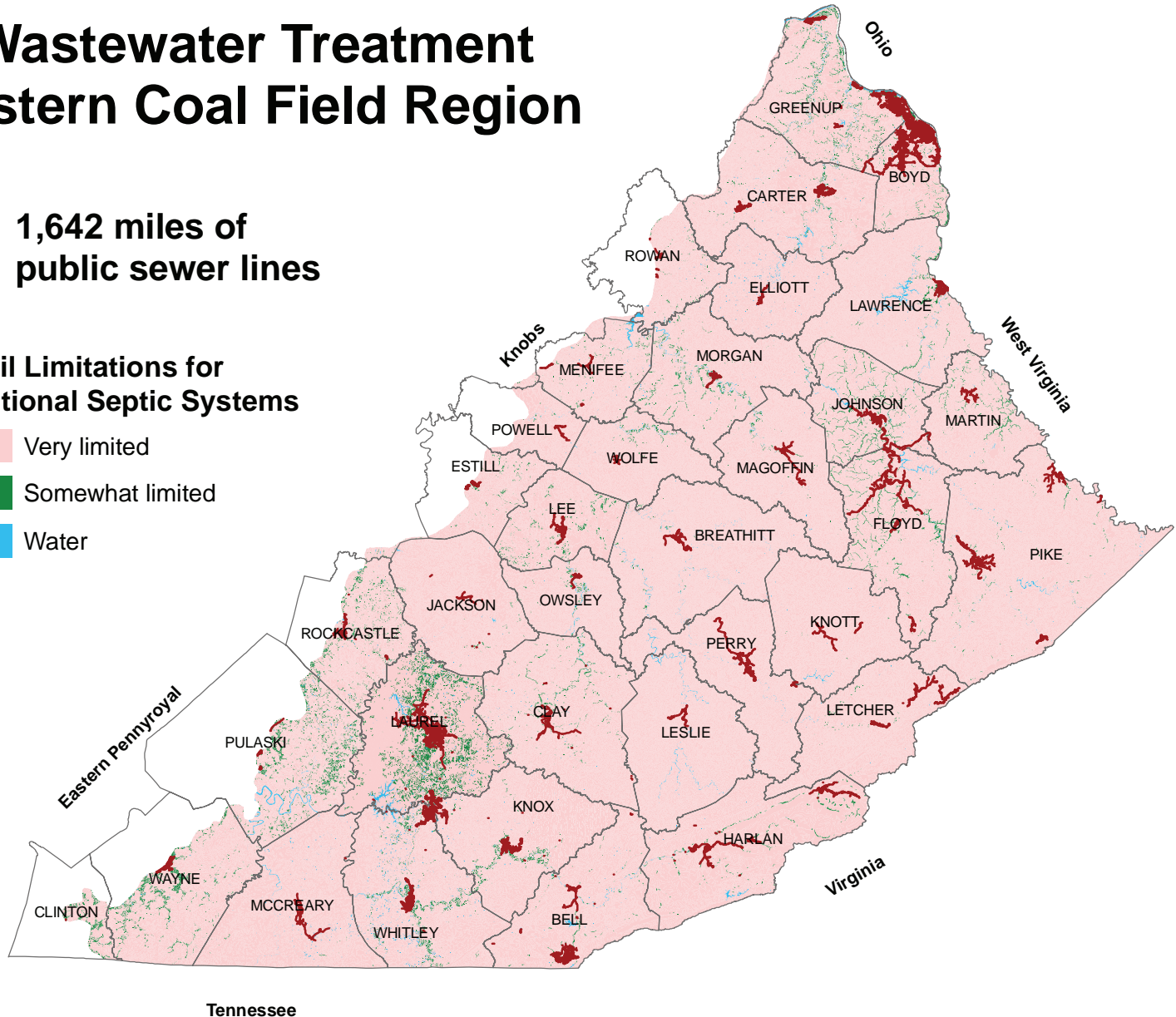
Nearly 200,000 homes are on public water, but only 85,000 are on public sewer. Wastewater treatment is a challenge in the region. Public sewer is expensive for homes distant from communities. Mapping 2008 sewer line data (1,642 miles) on 2000 sewer census data reveals relatively little sewer line extension during the period 2000-2008.

Wastewater Treatment Eastern Coal Field Region

— 1,642 miles of
public sewer lines

Soil Limitations for Conventional Septic Systems

- Very limited
- Somewhat limited
- Water



There are nearly 7 times as many miles of water lines in the region as there are of sewer lines. The bedrock and soils of the region are, in general, not suitable for traditional on-site septic systems. Innovative treatment systems for homes outside areas of public sewer must be installed to prevent continued contamination of water supplies, lakes, and streams.

Goose Creek, Eastern Coal Field Region



Goose Creek in Clay County is one of the countless streams in the Eastern Coal Field Region that offer scenes of quiet beauty to refresh the visitor. Photo by Dan Carey, Kentucky Geological Survey.