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.

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