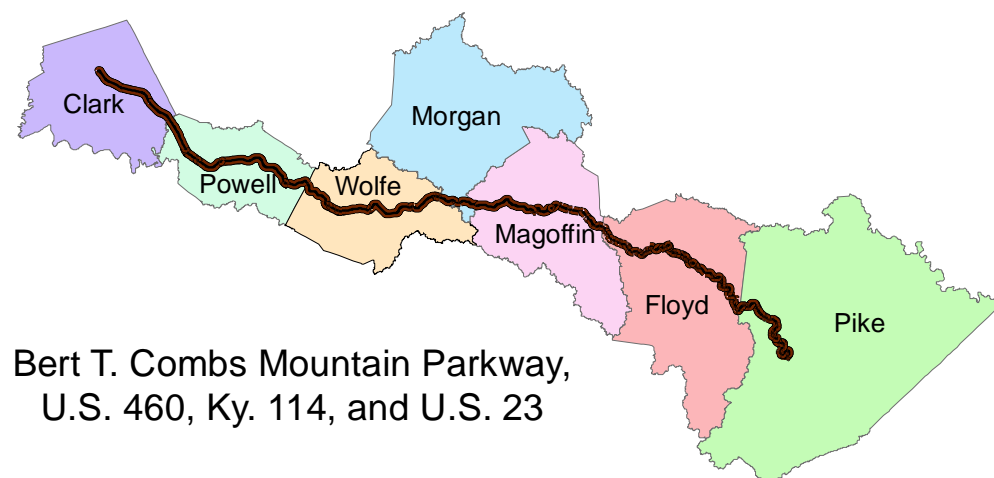


Geology Along the Bert T. Combs Mountain Parkway, U.S. 460, Ky. 114, and U.S. 23

Martin C. Noger, Donald C. Haney, and Daniel I. Carey



Limestone concretion in the Pennsylvanian Hyden Formation or petrified alien spaceship?



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Bert T. Combs Mountain Parkway,
U.S. 460, Ky. 114, and U.S. 23

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Terrain Along the Bert T. Combs Mountain Parkway, U.S. 460, Ky. 114, and U.S. 23

From the beginning of the Mountain Parkway at Interstate 64 to Pikeville, different terrain can be observed. Where natural landforms (lay of the land) differ significantly from one area to another, this generally indicates that each landform is underlain by a different type of rock. These different areas are known as physiographic regions. Figure 1 shows all physiographic regions in Kentucky, as well as the location of the Mountain Parkway/U.S. 460/Ky. 114/U.S. 23.

Mile 0.0–1.0 on the Mountain Parkway is in the Inner Bluegrass Region, underlain by Ordovician limestones. Mile 1.0–10.0, part of the Bluegrass Hills and Outer Bluegrass Regions, is underlain by thin Ordovician limestones, shales, and siltstones.

The parkway goes through the Knobs Region from mile 10.0–35.0. The underlying rocks are shales and dolomites from the Silurian and Devonian Periods. Mile 19.0–35.0 traverses an area of cone-shaped hills, composed of resistant Mississippian siltstones and sandstones and broad shale-floored valleys.

Eastward from mile 35.0 is the Cumberland Escarpment, a narrow band of ridges and deep valleys composed of resistant Pennsylvanian quartz sandstones.

Beyond the escarpment, the parkway passes through the Eastern Kentucky Coal Field, one of the most important coal-producing regions in the world. The rocks are predominantly an alternating sequence of coals, shales, siltstones, and sandstones that were deposited in ancient Pennsylvanian swamps similar to the Florida Everglades.

Natural Bridge State Resort Park is along the parkway near Slade. Located in the Daniel Boone National Forest near the Red River Gorge Geological Area, it is a rugged, scenic region of high sandstone cliffs and spectacular natural sandstone arches. In fall, it is a kaleidoscope of color.

Roadcuts along U.S. 23 from mile 23.8–24.3 were part of a major river diversion project to change the channel of Levisa Fork to control flooding and provide more flat land for the community. A breach was cut across the meander down to river level. Rocks excavated from the cuts were used to fill the old channel and some nearby valleys. Apartment complexes and recreational parks have been built on the valley fills.

Roadlog and Strip Maps

Geologic units are shown approximately 0.5 mile on either side of the highway. Figure 2 shows the symbols used on all the strip maps. The construction of these continuous strip maps was facilitated by the availability of detailed 1:24,000-scale (1 inch on the map equals 24,000 inches or 2,000 feet on the ground) geologic data in digital form for the entire state; the digital data were converted from geologic quadrangle maps published by the U.S. Geological Survey in a joint project with the Kentucky Geological Survey from 1960 to 1978. The highways' area is covered by 28 of these maps. Figure 3 shows the 7.5-minute quadrangles the parkway passes through.

The roadlog covers the entire extent of the Bert T. Combs Mountain Parkway, highways' U.S. 460 and Ky. 114 from the end of the Mountain Parkway to U.S. 23, and U.S. 23 past Pikeville. All descriptions of rock strata and geologic features are referenced to the highway mile markers that are located at 1-mile intervals along the shoulder of the highways. Mile-marker numbers are the same on both sides of the highway. Some of the roadcuts identified during a survey in the 1990's, particularly into shale, may now be revegetated. The descriptions were nonetheless retained in order to identify what now lies beneath the overgrowth.

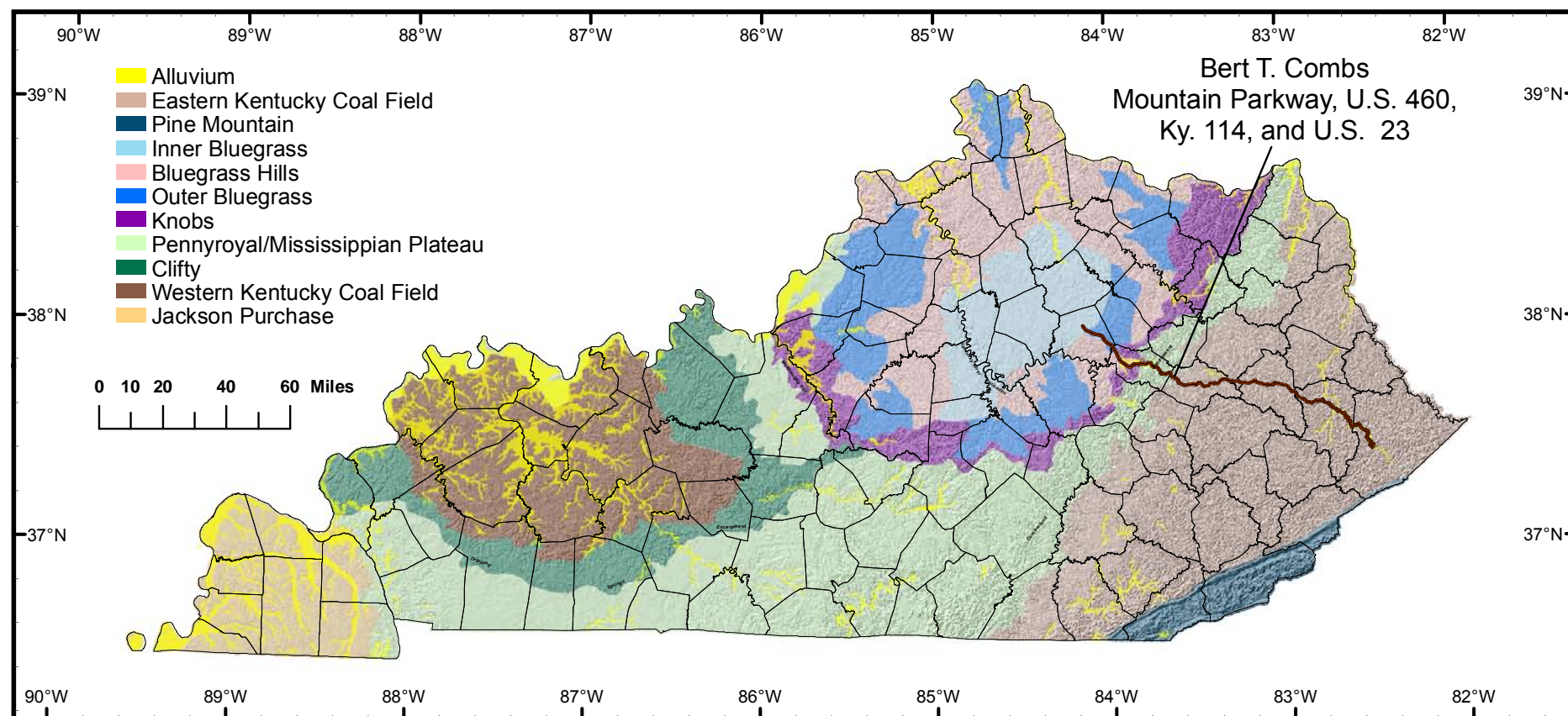


Figure 1. Physiographic regions in Kentucky and location of the Bert T. Combs Mountain Parkway, U.S. 460, Ky. 114, and U.S. 23.

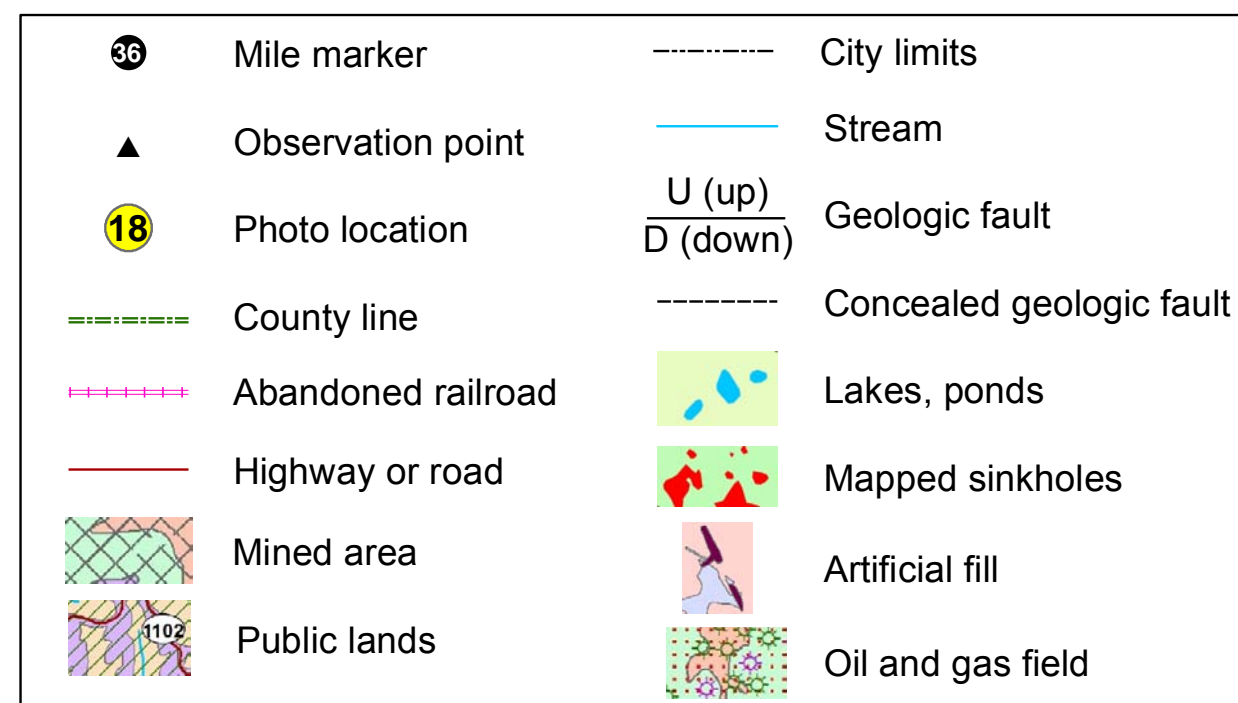


Figure 2. Symbols used on the strip maps.

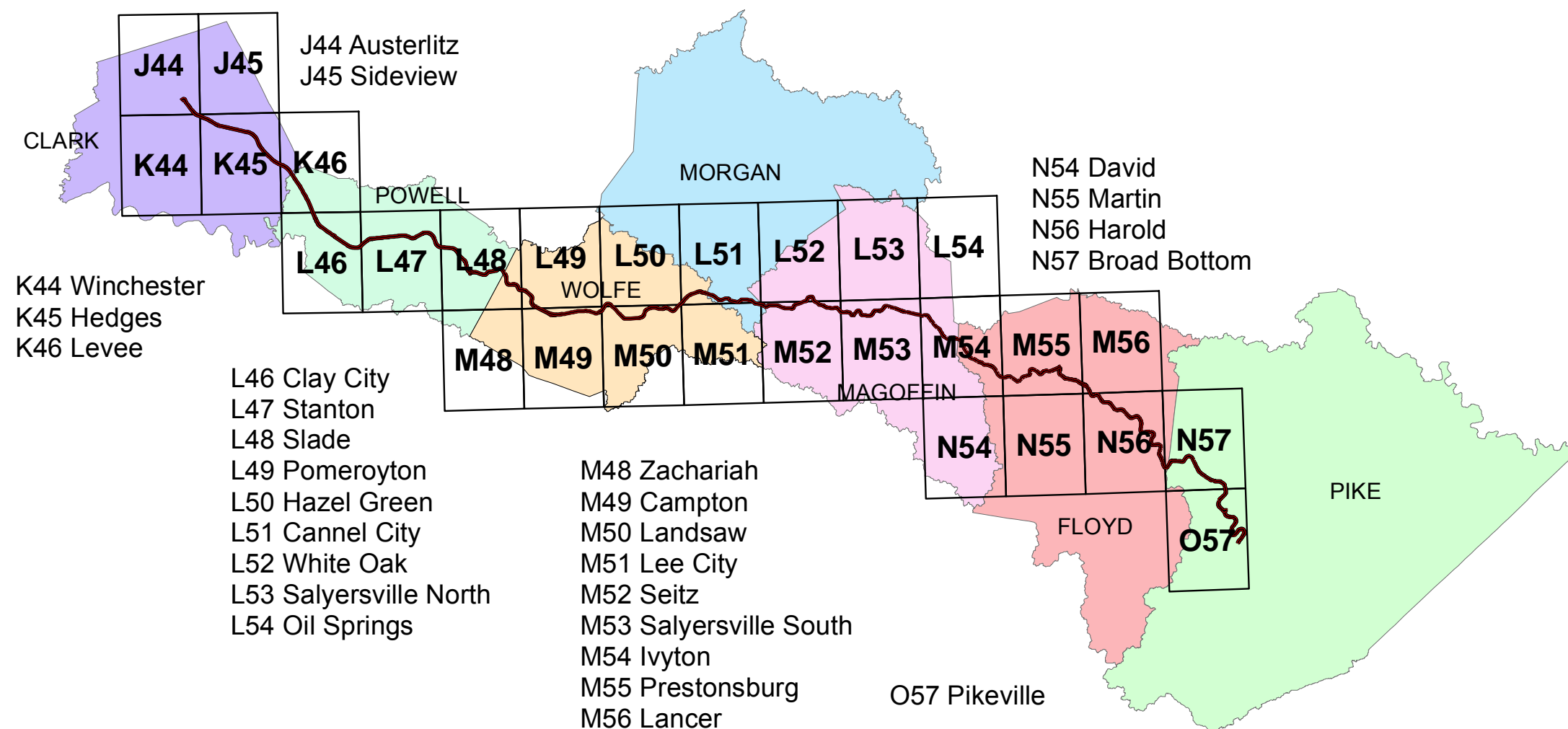


Figure 3. The Mountain Parkway, U.S. 460, Ky. 114, and U.S. 23 pass through these 7.5-minute quadrangles.

Stratigraphy

A stratigraphic column (Fig. 4) is a generalized graphic representation of the rock layers present at the earth's surface. Figure 4 shows the rock units exposed along the Mountain Parkway, U.S. 460, Ky. 114, and U.S. 23, and indicates the units' geologic ages. To make it easier to study and describe these stratigraphic units, geologists have subdivided them into groups, formations, members, and beds. A group is a major stratigraphic unit containing two or more formations. A formation is a unit of rock that has characteristic and distinctive rock types and layering that are mappable. A member is a subdivision of a formation that is distinguishable from adjacent parts of the formation. A bed is a rock unit lower in rank than a member, which has a distinctive lithology (for example, a coal bed). The abbreviations used on geologic maps to designate specific rock units are indicated in parentheses after the unit name in Figure 4.

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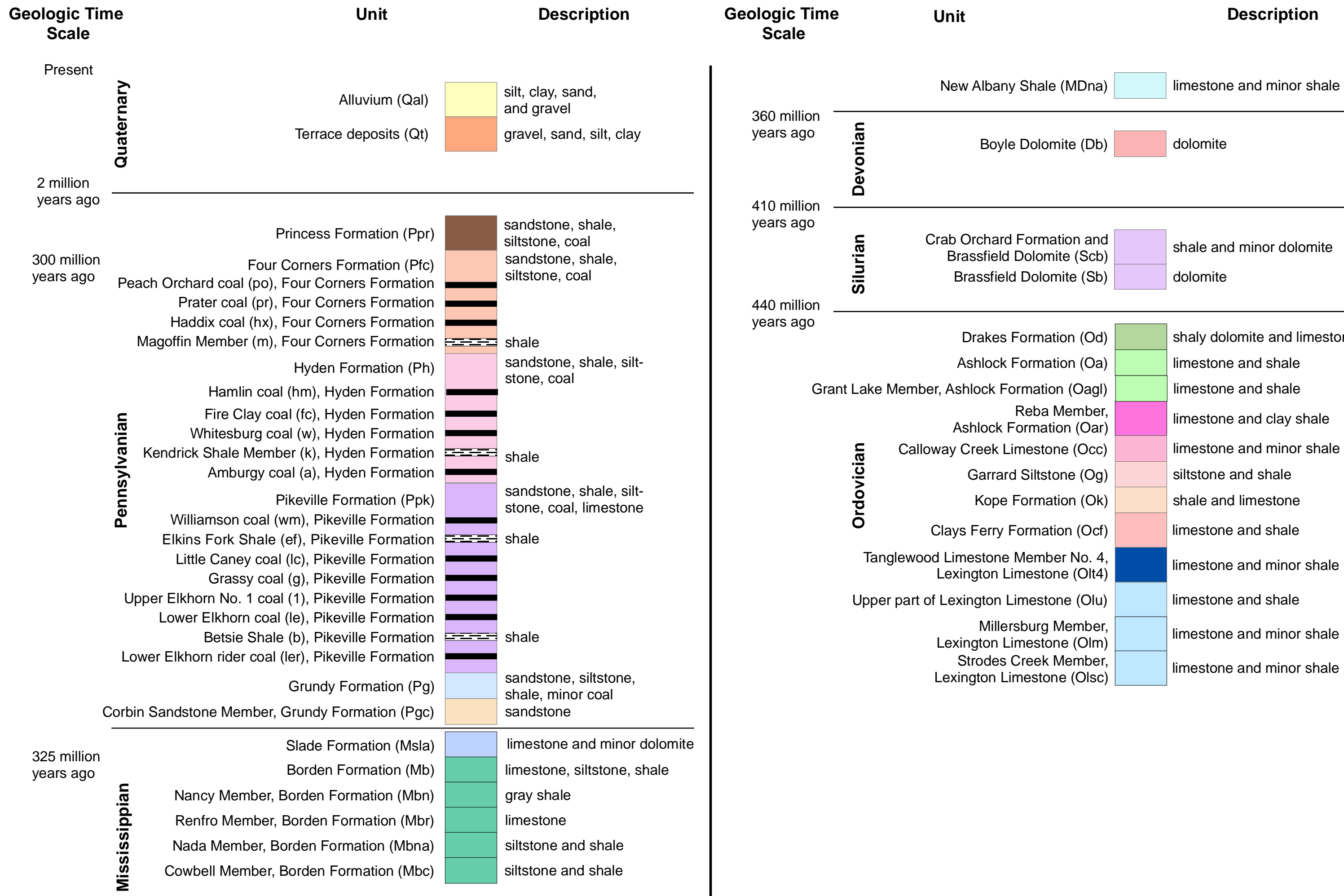


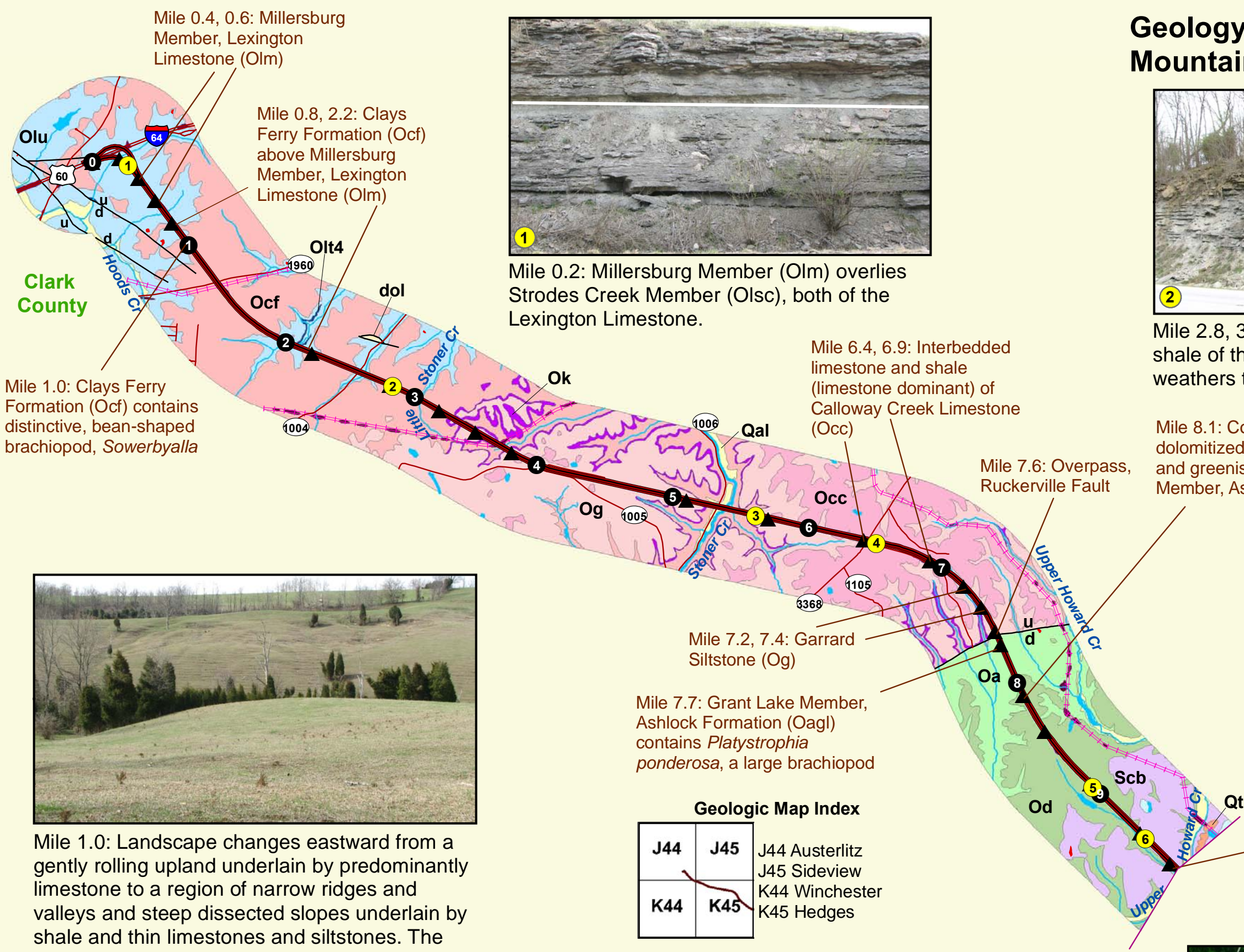
Figure 4. Generalized stratigraphic column. Nearly 300 million years of the geologic record are absent in Kentucky, either from nondeposition or erosion, including the Tertiary, Cretaceous, Jurassic, Triassic, Permian, and part of the Pennsylvanian Periods.

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Geology Along the Bert T. Combs Mountain Parkway: Mile 0.0–9.9



Mile 0.4, 0.6: Millersburg Member, Lexington Limestone (Olm)

Mile 0.8, 2.2: Clays Ferry Formation (Ocf) above Millersburg Member, Lexington Limestone (Olm)

Mile 1.0: Clays Ferry Formation (Ocf) contains distinctive, bean-shaped brachiopod, *Sowerbyalla*

Mile 0.2: Millersburg Member (Olm) overlies Strodes Creek Member (Olsc), both of the Lexington Limestone.

Mile 6.4, 6.9: Interbedded limestone and shale (limestone dominant) of Calloway Creek Limestone (Occ)

Mile 7.6: Overpass, Ruckerville Fault

Mile 7.2, 7.4: Garrard Siltstone (Og)

Mile 7.7: Grant Lake Member, Ashlock Formation (Oagl) contains *Platystrophia ponderosa*, a large brachiopod

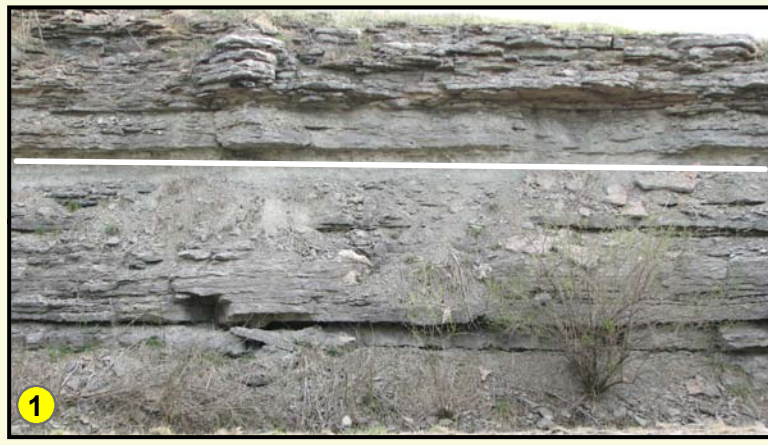
Mile 8.1: Contact between micrograined, dolomitized limestone of Drakes Formation (Od) and greenish gray, shaly dolomite of the Reba Member, Ashlock Formation (Oar)

Mile 6.5: Calloway Creek Limestone (Occ).

Mile 9.7: Contact between dolomite and shale of the Crab Orchard Formation and Brassfield Dolomite (Scb)

Geologic Map Index

J44	J45	J44 Austerlitz J45 Sideview
K44	K45	K44 Winchester K45 Hedges



Mile 1.0: Landscape changes eastward from a gently rolling upland underlain by predominantly limestone to a region of narrow ridges and valleys and steep dissected slopes underlain by shale and thin limestones and siltstones. The boundary marks the change between the Inner Bluegrass and Bluegrass Hills Regions.



Mile 3.5, 3.8, 5.1, 5.7: Garrard Siltstone (Og) contains flow rolls (rounded, pillow-like sandstone body formed by deformation).



Mile 8.4, 8.9: Drakes Formation (Od).



Mile 9.4: Contact between cherty dolomite of the Silurian Brassfield Dolomite (Sb) and greenish gray shaly dolomite of the Ordovician Drakes Formation (Od).

Geology Along the Bert T. Combs Mountain Parkway: Mile 9.9–26.3

Mile 10.2: Indian Old Fields was the site of Eskippakithiki ("blue lick place"), a Shawnee village that was one of the last, if not the last, Indian settlements in Kentucky



Mile 10.0: Landscape changes eastward from a region of narrow ridges and valleys underlain by shales and thin limestones to a gently rolling area underlain by predominantly shale and occasionally by dolomite. This marks the boundary of the Bluegrass Hills and Outer Bluegrass physiographic regions.

Mile 11.7: New Albany Shale (MDna)

Mile 11.8: New Albany Shale (MDna) over Boyle Dolomite (Db)

Mile 13.7–14.1: New Albany Shale (MDna)

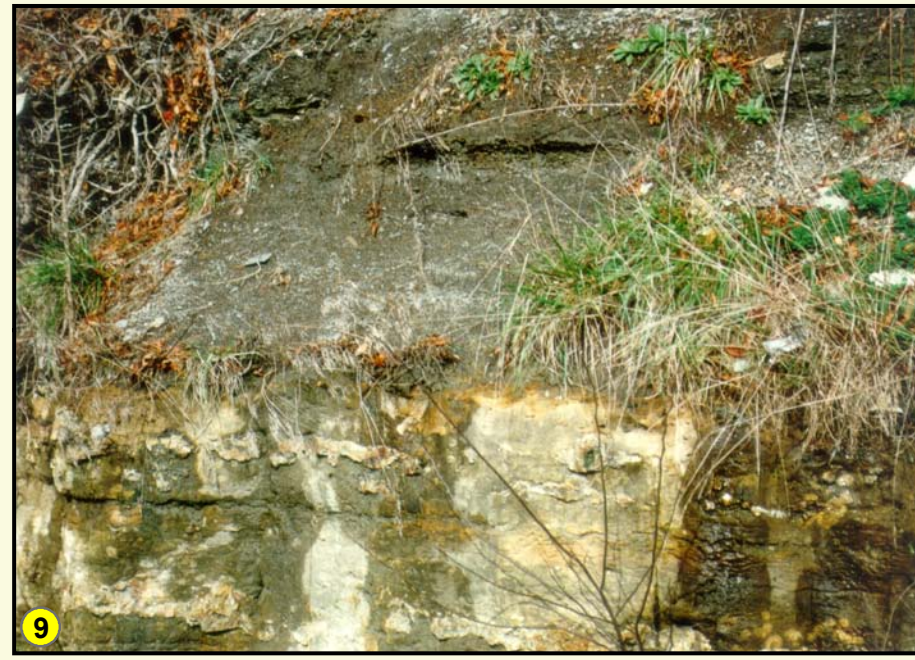
Mile 15.4, 15.7, 15.9: New Albany Shale (MDna) over Boyle Dolomite (Db)



Mile 12.4: The New Albany Shale (MDna) is one of Kentucky's valuable energy resources. Large quantities of natural gas have been produced from the Ohio Shale in the subsurface of eastern Kentucky. Surface and near-surface deposits are a potential source of oil that can be obtained by distilling kerogen in the shale. The Ohio Shale could also be a source of uranium.

Clark County

Powell County



Mile 10.9–16.1: Black carbonaceous New Albany Shale (MDna) over cherty Boyle Dolomite (Db).

Geologic Map Index

K45	K46	K45 Hedges
L46	L47	K46 Levee
		L46 Clay City
		L47 Stanton

Mile 18.5, 18.9: New Albany Shale (MDna)

Mile 19.0, 20.3, 20.5, 20.7, 21.0: Nancy Member, Borden Formation (Mbn)

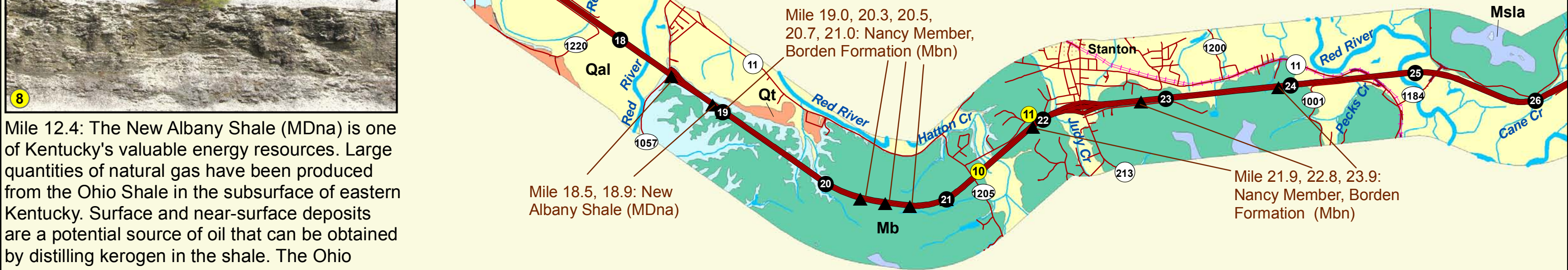
Mile 21.9, 22.8, 23.9: Nancy Member, Borden Formation (Mbn)



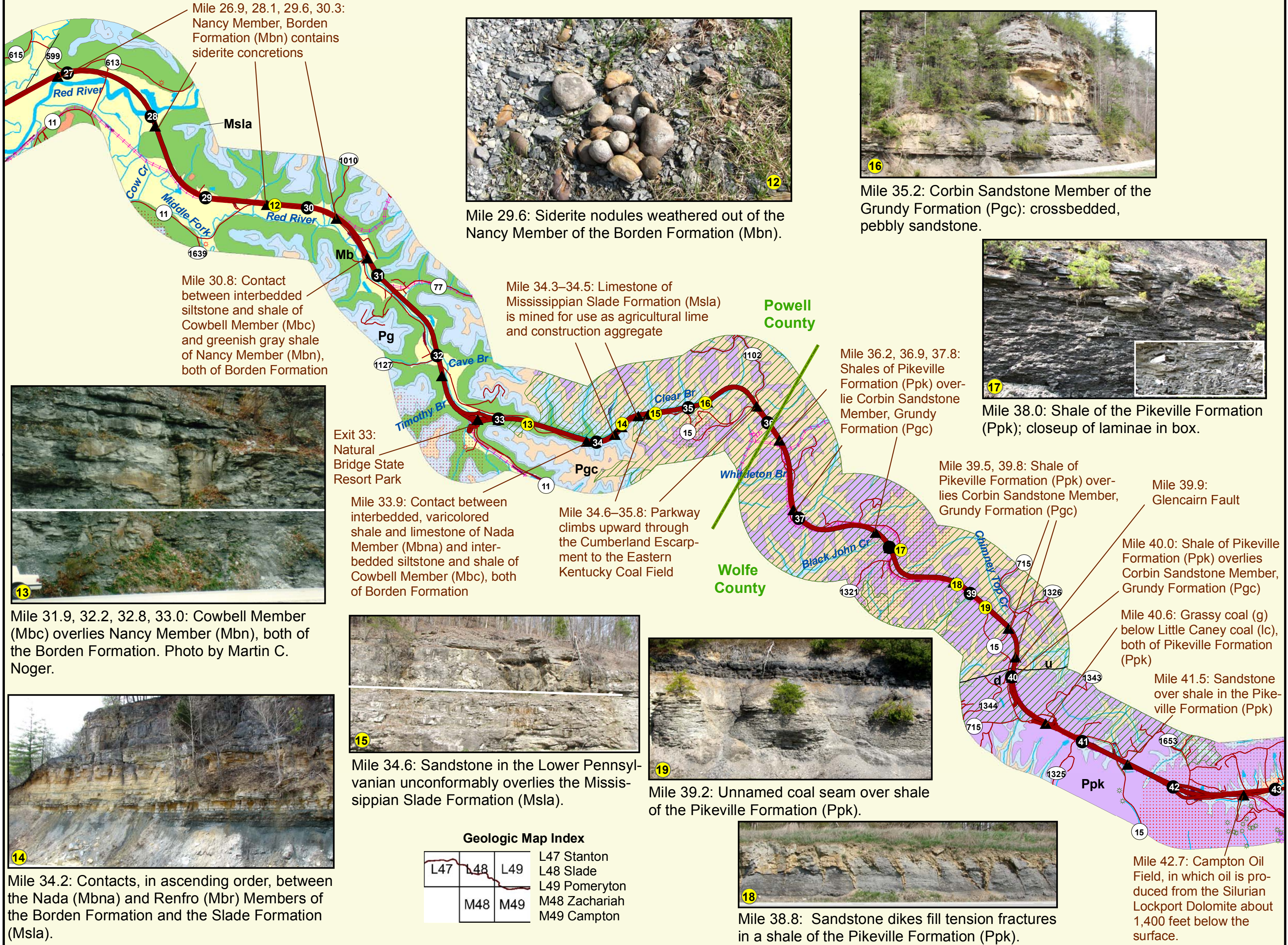
Mile 19.0–26.3: Nancy Member of the Mississippian Borden Formation (Mbn): greenish gray shale containing concretions. Nancy shale readily weathers to plastic clay, which is particularly susceptible to slumping when moist.



Landscape changes eastward from a gently rolling area underlain by shale and dolomite to a belt of ridges and cone-shaped hills composed of resistant siltstones and sandstones separated by broad shale-floored valleys. This is the boundary between the Outer Bluegrass and the Knobs physiographic regions.



Geology Along the Bert T. Combs Mountain Parkway: Mile 26.3–43.1



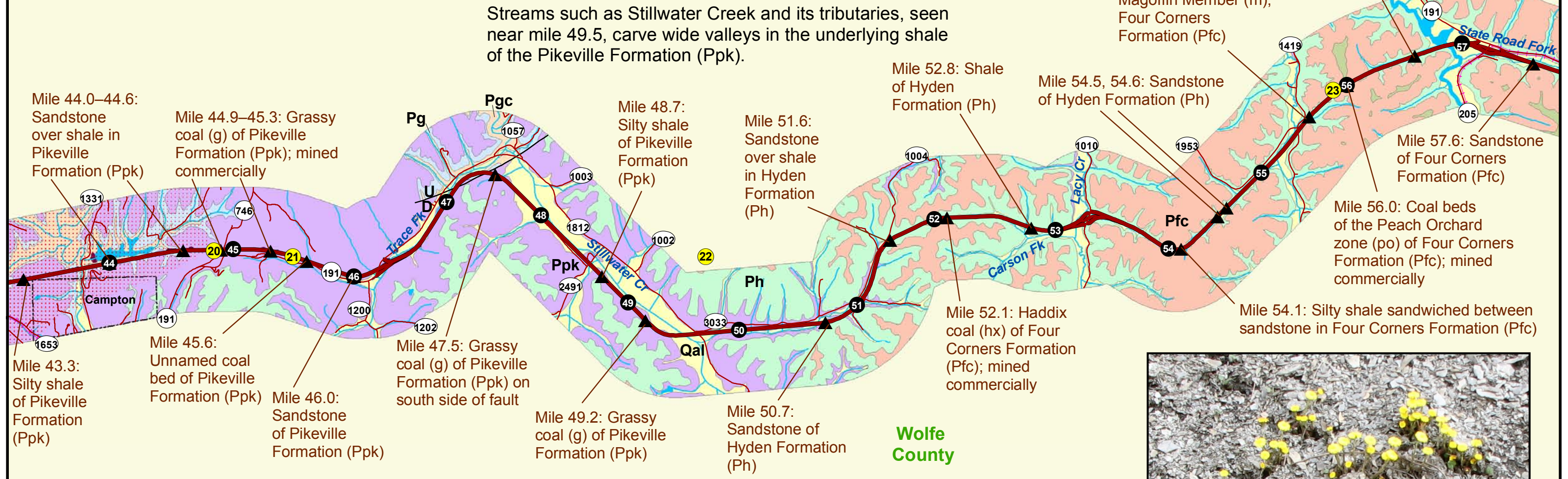
Geology Along the Bert T. Combs Mountain Parkway: Mile 43.1–57.8

Geologic Map Index

L49	L50	L51	L49 Pomeroyton
			L50 Hazel Green
			L51 Cannel City
M49	M50	M51	M49 Campton
			M50 Landsaw
			M51 Lee City



Streams such as Stillwater Creek and its tributaries, seen near mile 49.5, carve wide valleys in the underlying shale of the Pikeville Formation (Ppk).



Mile 44.0–44.6: Sandstone over shale in Pikeville Formation (Ppk)

Mile 43.3: Silty shale of Pikeville Formation (Ppk)

Mile 44.9–45.3: Grassy coal (g) of Pikeville Formation (Ppk); mined commercially

Mile 45.6: Unnamed coal bed of Pikeville Formation (Ppk)

Mile 46.0: Sandstone of Pikeville Formation (Ppk)

Mile 47.5: Grassy coal (g) of Pikeville Formation (Ppk) on south side of fault

Mile 49.2: Grassy coal (g) of Pikeville Formation (Ppk)

Mile 48.7: Silty shale of Pikeville Formation (Ppk)

Mile 50.7: Sandstone of Hyden Formation (Ph)

Mile 51.6: Sandstone over shale in Hyden Formation (Ph)

Mile 52.1: Haddix coal (hx) of Four Corners Formation (Pfc); mined commercially

Mile 52.8: Shale of Hyden Formation (Ph)

Mile 54.1: Silty shale sandwiched between sandstone in Four Corners Formation (Pfc)

Mile 54.5, 54.6: Sandstone of Hyden Formation (Ph)

Mile 55.6: Clay shale with limestone concretions and fossil fragments of brachiopods and crinoid stems in Magoffin Member (m), Four Corners Formation (Pfc)

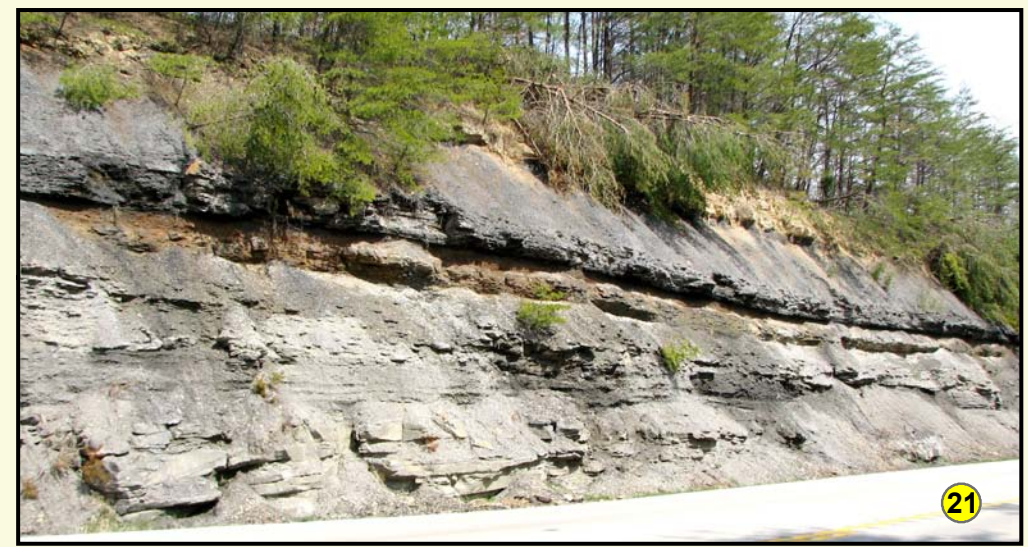
Mile 56.0: Coal beds of the Peach Orchard zone (po) of Four Corners Formation (Pfc); mined commercially

Mile 56.6: Fire Clay coal (fc) of Hyden Formation (Ph)

Mile 57.6: Sandstone of Four Corners Formation (Pfc)



Mile 44.8: Sandstone over shale in the Pikeville Formation (Ppk).



Mile 45.5: Unnamed coal bed in the Pikeville Formation (Ppk) northeast of Campton.



Mile 56.0: Coals in the Peach Orchard zone (po) of the Four Corners Formation (Pfc), seen here below dandelions in overlying shale, are mined commercially.

Geology Along the Bert T. Combs Mountain Parkway: Mile 57.8–71.9

Geologic Map Index

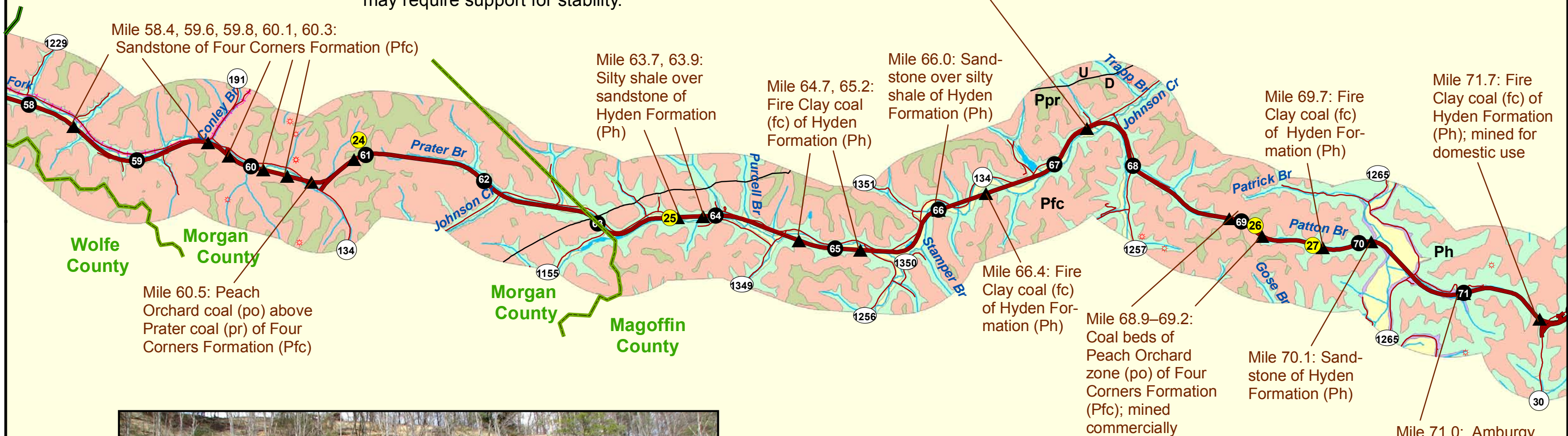
L51	L52	L53	L51 Cannel City
			L52 White Oak
			L53 Salyersville North
M51	M52	M53	M51 Lee City
			M52 Seitz
			M53 Salyersville South



Mile 63.6: Roadcuts into shale of the Hyden Formation (Ph) may require support for stability.



Mile 69.1: Different types of sandstones in the Four Corners Formation (Pfc) reflect different depositional environments.



Mile 60.0: Massive sandstone caps shales of the Four Corners Formation (Pfc) and the Peach Orchard coal bed (po).



Mile 69.7: Sandstone over the Fire Clay coal bed (fc) in the Hyden Formation (Ph).

Geology Along the Bert T. Combs Mountain Parkway: Mile 71.9–75.7; U.S. 460/Ky. 114: Mile 0.0 (Magoffin County)–Mile 5.1 (Floyd County)

Mile 72.0: Fire Clay coal (fc) of Hyden Formation (Ph); mined for domestic use

Mile 73.5: Coals of Prater coal zone (pr) of Four Corners Formation (Pfc)

End of Mountain Parkway; strip map continues on U.S. 460 and Ky. 114

Mile 72.7: Amburgy coal (a) of Hyden Formation (Ph)

Mile 75.2: Fire Clay coal (fc) above Whitesburg coal (w) of Hyden Formation (Ph)

Mile 13.0, 14.0: Amburgy coal (a) and Kendrick Shale Member (k) of Hyden Formation (Ph)

Mile 1.7: Fire Clay coal (fc) above Whitesburg coal (w) of Hyden Formation (Ph)

Mile 2.0: Whitesburg coal (w) of Hyden Formation (Ph)

Salyersville oil and gas field produces oil at 1,100 feet from Mississippian Weir sandstone and gas at 1,300 feet from Devonian Ohio Shale, at 1,800 feet from Salina Dolomite, and at 2,100 feet from Silurian Big Six sandstone



Mile 73.3: Sandstone, siltstone, shale, Whitesburg coal (w), underclay, shale, and sandstone of the Hyden Formation (Ph).

Begin Ky. 114

Mile 2.4–2.7: From bottom, Amburgy coal (a), Kendrick Shale Member (k), Whitesburg coal (w), and Fire Clay coal (fc) of Hyden Formation (Ph); Amburgy mined commercially

Mile 3.4–3.7: Little Caney coal (lc) above Grassy coal (g) of Pikeville Formation (Ppk)

Mile 4.1, 4.3: Grassy coal (g) of Pikeville Formation (Ppk)

Geologic Map Index

M53	M54	M53 Salyersville South
		M54 Ivyton

Ivyton oil and gas field produces oil at 1,200 feet from Mississippian Weir sandstone and gas at 500 feet from Pennsylvanian sandstone and at 2,400 feet from Silurian Big Six sandstone



Mile 1.8: Fire Clay coal (fc) above an unnamed coal bed in the Hyden Formation (Ph).

Mile 0.6: Grassy coal (g) of Pikeville Formation (Ppk)

Mile 1.3: Lower Elkhorn coal (le) of Pikeville Formation (Ppk)

Mile 2.4: Little Caney coal (lc) of Pikeville Formation (Ppk)

Mile 2.6, 2.9, 3.4, 3.9, 4.1: Grassy coal (g) of Pikeville Formation (Ppk)



Mile 75.0: Limestone concretions formed in clay that became the shale of the Hyden Formation (Ph). The originally spheroid concretions were compressed into ellipsoids by subsequent overlying deposits.



Mile 2.2: Little Caney coal (lc) and Elkins Fork Shale (ef) of the Pikeville Formation (Ppk).

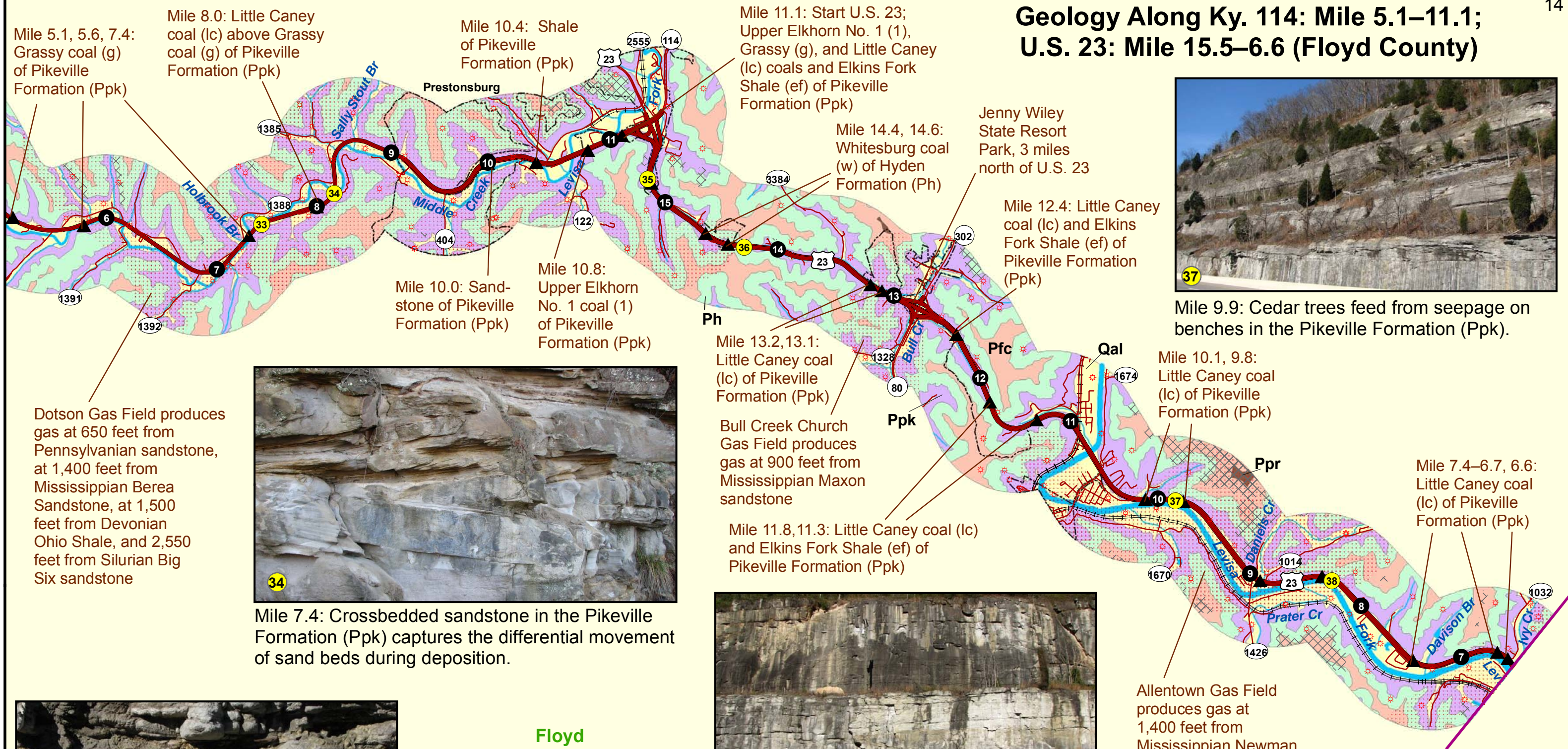


Mile 4.8: Sandstone above the top of the Kendrick Shale Member (k) of the Hyden Formation (Ph).

Big Sandy Gas Field produces gas at 1,400 feet from Devonian Ohio Shale



Geology Along Ky. 114: Mile 5.1–11.1; U.S. 23: Mile 15.5–6.6 (Floyd County)



Mile 5.1, 5.6, 7.4: Grassy coal (g) of Pikeville Formation (Ppk)

Mile 8.0: Little Caney coal (lc) above Grassy coal (g) of Pikeville Formation (Ppk)

Mile 10.4: Shale of Pikeville Formation (Ppk)

Mile 11.1: Start U.S. 23; Upper Elkhorn No. 1 (1), Grassy (g), and Little Caney (lc) coals and Elkins Fork Shale (ef) of Pikeville Formation (Ppk)

Jenny Wiley State Resort Park, 3 miles north of U.S. 23

Mile 14.4, 14.6: Whitesburg coal (w) of Hyden Formation (Ph)

Mile 12.4: Little Caney coal (lc) and Elkins Fork Shale (ef) of Pikeville Formation (Ppk)

Mile 10.0: Sandstone of Pikeville Formation (Ppk)

Mile 10.8: Upper Elkhorn No. 1 coal (1) of Pikeville Formation (Ppk)

Mile 13.2, 13.1: Little Caney coal (lc) of Pikeville Formation (Ppk)

Bull Creek Church Gas Field produces gas at 900 feet from Mississippian Maxon sandstone

Mile 10.1, 9.8: Little Caney coal (lc) of Pikeville Formation (Ppk)

Mile 7.4–6.7, 6.6: Little Caney coal (lc) of Pikeville Formation (Ppk)

Mile 11.8, 11.3: Little Caney coal (lc) and Elkins Fork Shale (ef) of Pikeville Formation (Ppk)

Allentown Gas Field produces gas at 1,400 feet from Mississippian Newman Limestone of Slade Formation, and at 1,800 feet from Devonian Ohio Shale

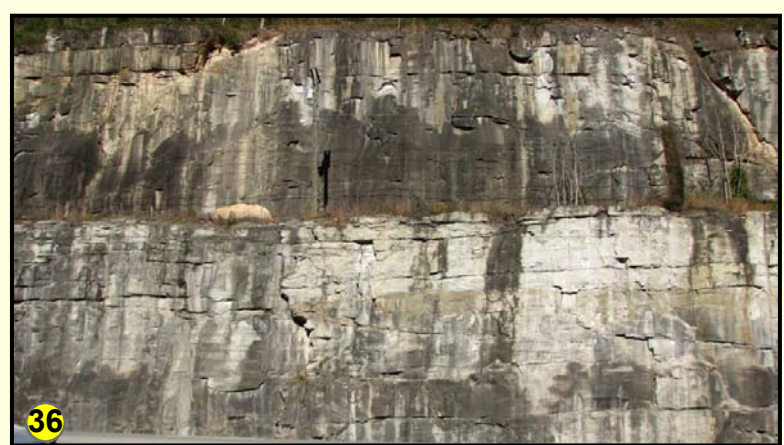
Dotson Gas Field produces gas at 650 feet from Pennsylvanian sandstone, at 1,400 feet from Mississippian Berea Sandstone, at 1,500 feet from Devonian Ohio Shale, and 2,550 feet from Silurian Big Six sandstone



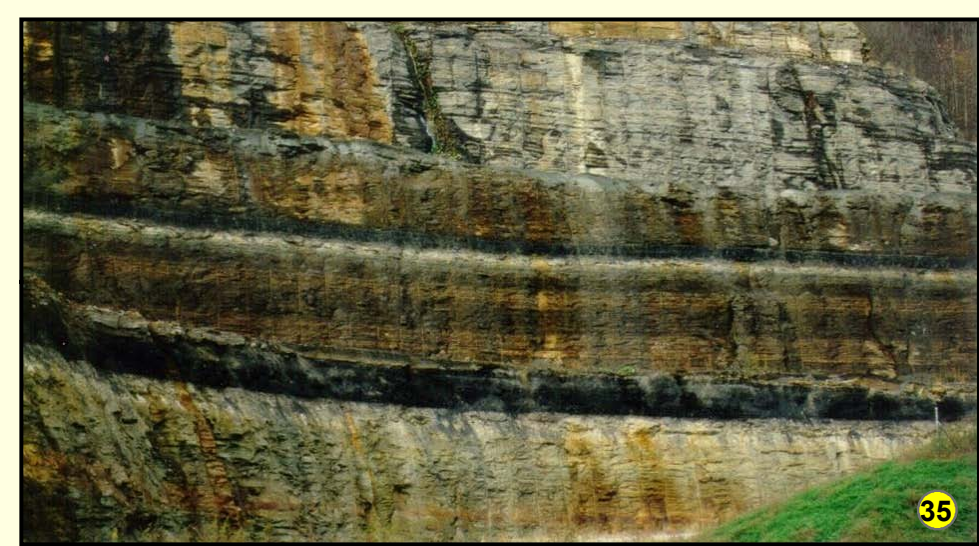
Mile 7.4: Crossbedded sandstone in the Pikeville Formation (Ppk) captures the differential movement of sand beds during deposition.



Mile 8.2: Nodular sandstone in the Pikeville Formation (Ppk) is the result of weathering. Water seeped through many tiny cracks and eroding the sand.



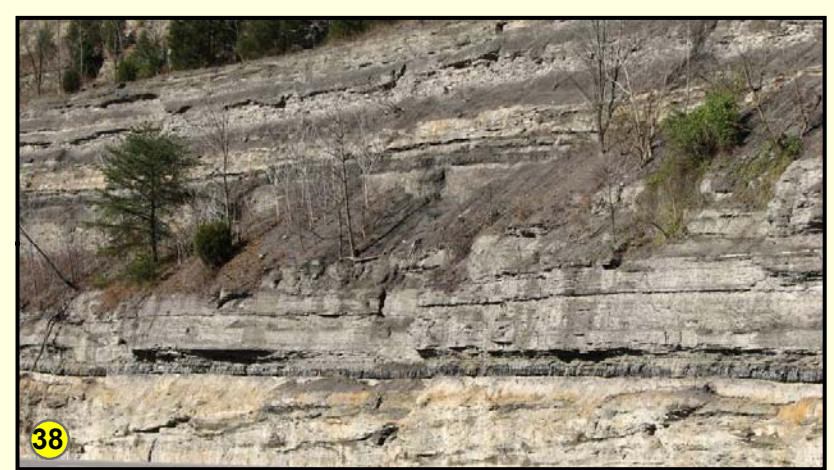
Mile 14.3: Massive sandstone in the Hyden Formation (Ph).



Mile 15.2: Williamson coal (wm) over Little Caney coal (lc) of the Pikeville Formation (Ppk). Photo by Martin C. Noger.



Mile 9.9: Cedar trees feed from seepage on benches in the Pikeville Formation (Ppk).

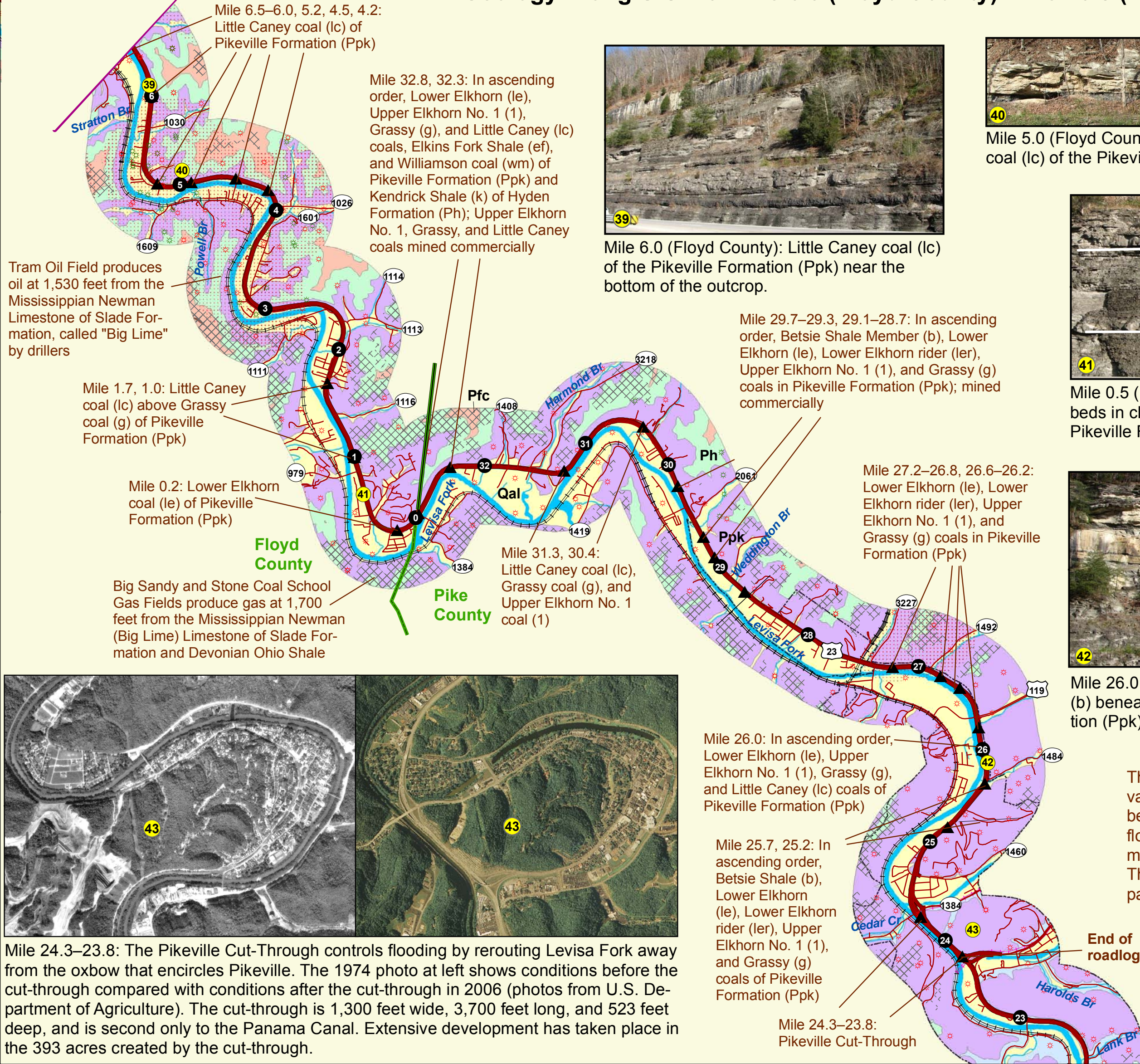


Mile 8.9, 8.4: Little Caney coal (lc) above Grassy coal (g) of the Pikeville Formation (Ppk).

Geologic Map Index

M54	M55	M56	M54 Ivyton
N54	N55	N56	M55 Prestonsburg
			M56 Lancer
			N54 David
			N55 Martin
			N56 Harold

Geology Along U.S. 23: Mile 6.5 (Floyd County)–Mile 23.8 (Pike County)



Mile 6.5–6.0, 5.2, 4.5, 4.2: Little Caney coal (lc) of Pikeville Formation (Ppk)

Mile 32.8, 32.3: In ascending order, Lower Elkhorn (le), Upper Elkhorn No. 1 (1), Grassy (g), and Little Caney (lc) coals, Elkins Fork Shale (ef), and Williamson coal (wm) of Pikeville Formation (Ppk) and Kendrick Shale (k) of Hyden Formation (Ph); Upper Elkhorn No. 1, Grassy, and Little Caney coals mined commercially

Tram Oil Field produces oil at 1,530 feet from the Mississippian Newman Limestone of Slade Formation, called "Big Lime" by drillers

Mile 1.7, 1.0: Little Caney coal (lc) above Grassy coal (g) of Pikeville Formation (Ppk)

Mile 0.2: Lower Elkhorn coal (le) of Pikeville Formation (Ppk)

Big Sandy and Stone Coal School Gas Fields produce gas at 1,700 feet from the Mississippian Newman (Big Lime) Limestone of Slade Formation and Devonian Ohio Shale

Mile 29.7–29.3, 29.1–28.7: In ascending order, Betsie Shale Member (b), Lower Elkhorn (le), Lower Elkhorn rider (ler), Upper Elkhorn No. 1 (1), and Grassy (g) coals in Pikeville Formation (Ppk); mined commercially

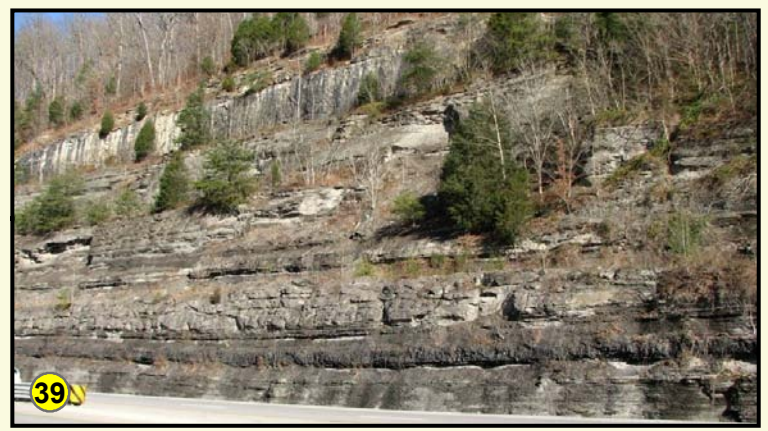
Mile 27.2–26.8, 26.6–26.2: Lower Elkhorn (le), Lower Elkhorn rider (ler), Upper Elkhorn No. 1 (1), and Grassy (g) coals in Pikeville Formation (Ppk)

Mile 31.3, 30.4: Little Caney coal (lc), Grassy coal (g), and Upper Elkhorn No. 1 coal (1)

Mile 26.0: In ascending order, Lower Elkhorn (le), Upper Elkhorn No. 1 (1), Grassy (g), and Little Caney (lc) coals of Pikeville Formation (Ppk)

Mile 25.7, 25.2: In ascending order, Betsie Shale (b), Lower Elkhorn (le), Lower Elkhorn rider (ler), Upper Elkhorn No. 1 (1), and Grassy (g) coals of Pikeville Formation (Ppk)

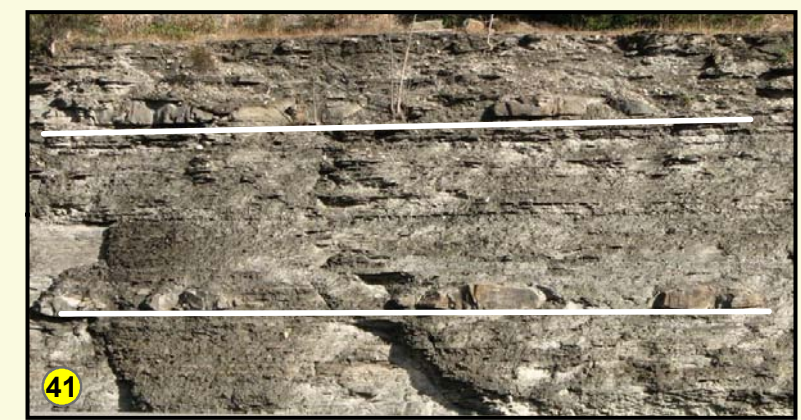
Mile 24.3–23.8: Pikeville Cut-Through



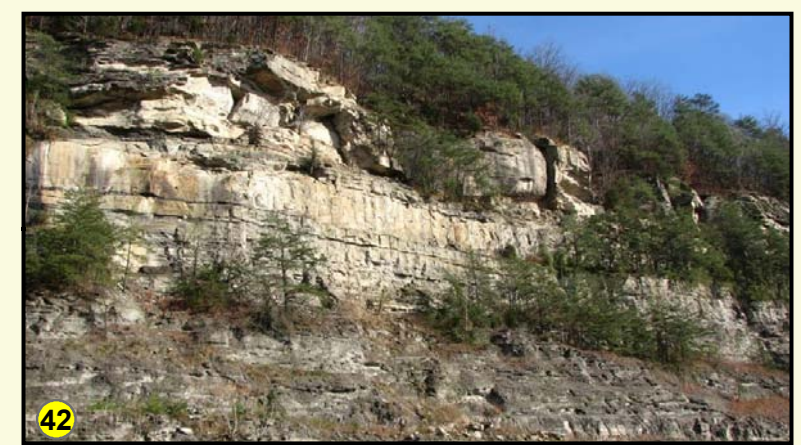
Mile 6.0 (Floyd County): Little Caney coal (lc) of the Pikeville Formation (Ppk) near the bottom of the outcrop.



Mile 5.0 (Floyd County): Excavations into the Little Caney coal (lc) of the Pikeville Formation (Ppk).



Mile 0.5 (Floyd County): Siderite nodules and beds in claystone and mudstone of the Pikeville Formation (Ppk).



Mile 26.0 (Pike County): Betsie Shale Member (b) beneath sandstone of the Pikeville Formation (Ppk).



Mile 24.3–23.8: The Pikeville Cut-Through controls flooding by rerouting Levisa Fork away from the oxbow that encircles Pikeville. The 1974 photo at left shows conditions before the cut-through compared with conditions after the cut-through in 2006 (photos from U.S. Department of Agriculture). The cut-through is 1,300 feet wide, 3,700 feet long, and 523 feet deep, and is second only to the Panama Canal. Extensive development has taken place in the 393 acres created by the cut-through.

The city of Pikeville was built in the valley of an entrenched meander bend of Levisa Fork, and frequently flooded before the series of cuts that make up the Pikeville Cut-Through. The cuts shortened U.S. 23 and parallel tracks by 2 miles.