BIG A MOUNTAIN

Titles and Headings

GEOLOGIC MAP OF THE BIG A MOUNTAIN QUADRANGLE,

BUCHANAN AND RUSSELL COUNTIES, VIRGINIA

By

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Mapped in 1970-1972

Text

Economic Geology

Coal

Coal is the only mineral resource that has been exploited in the Big A Mountain quadrangle. The coal is high volatile A bituminous rank occurring in at least 15 beds in the Norton Formation. Sixty-six analyses of the beds within and close to the quadrangle indicate that the coal contains ranges from ~~, on the average~~, .56 to 1.57 percent sulfur, 4 to 8.5 percent ash, 31 to 36 percent volatiles, and has a heating value of from 14,400 to 15,200 Btu's.

Only one commercial underground mine was in operation in 1971-72, but numerous medium and small underground mines have been active in the past. Two strip mines were also active in 1971-72, and several other ones have produced for short periods of time. In addition small "house ~~that~~ mines" have been opened up in many places, several of which were still active.

Most ~~Some~~ of the coal was transported by truck or rail to markets to be used for fuel in electric power plants or coking coal in steel mills.

The oldest coal mined in the quadrangle is the Tiller bed which has a maximum known thickness of 82 ~~78~~ inches (208 cm), but like most of the coals in the quadrangle is locally very thin or totally absent. The Tiller north of the Russell Fork fault is not as thick and contains more clay partings than south of the fault. It crops out low in hollows along the west side of the quadrangle, and along all but the upper (eastern) part of the Russell Fork River valley north of the Russell Fork fault. It is below drainage in the rest of the quadrangle except near ~~up to~~ the Buffalo Mountain fault, where it has been brought to the surface along steeply dipping beds. The Lambert Fork mine is in the Tiller coal bed at Indian Creek near the west edge of the quadrangle. It is the largest and only currently active commercial

underground mine in the quadrangle. It is serviced by a spur of the Norfolk and Western Railroad. The coal in the mine is about 55 inches (140 cm.) thick with some variation. The Tiller coal has been stripped and augered and mined underground in the Patton Branch and contains many old and abandoned smaller mines along other ~~exposures~~ belts of outcrop including along Alvy Creek, in the southwestern part of the quadrangle, where it is 78 inches (198 cm.) thick.

Sulfur content of the coal averages .56 percent and in 21 analyses was not more than .90 percent. The Council Sandstone, here designated a member of the Norton Formation, overlies the Tiller and ranges in thickness from 20 to 160 feet (6-49m) except where it pinches out along Patton Branch on the west edge of the quadrangle.

The Jawbone coal bed lies on or close above the Council Sandstone. Its distribution is similar to the Tiller coal except that it crops out a little higher and farther up the hollows and valleys. The Jawbone is about 27 inches (68 cm.) thick in Hurricane Creek and Indian Creek but in most places is only about 15 inches (38 cm.) thick. Most of the mines in the Jawbone coal were opened for local domestic ("house coal") use but are now abandoned. Average sulfur content is .73 percent.

The Jawbone-rider coal bed, found only south of the Russell Fork fault, lies 25 to 40 feet (8-12 m.) above the Jawbone. A few small house coal mines and prospects have been opened on it. Sulfur content averages .83 percent.

The Raven No. 1 coal bed is about 60 feet (18 m.) above the Jawbone bed north of the Russell Fork fault, but 135 to 180 feet (41-55 m.) above the Jawbone south of the fault. It is lenticular and in places consists of a zone of 2 or more closely spaced beds. North of the Russell Fork fault it occurs in lower Ball Creek and Dog Pen Branch tributaries to the Russell Fork River. It is not known in Hurricane Creek in the northwestern part of the quadrangle, and lies below drainage in the Stinson Ridge-Sandy Ridge area. South of the Russell Fork fault it occurs on the lower slopes of Indian Ridge and along Puncheon Camp Branch, Patton Branch, and Alvy Creek. The Raven No. 1 coal bed has been extensively mined in lower Ball Creek, but none of the mines are now active. Sulfur content of the coal averages .87 percent.

The Raven No. 2 coal lies from 25 to 75 feet (8-23 m.) above the Raven No. 1. It has been prospected in a number of places and has been mined in McFarlane Branch. The only analysis of the coal available showed 1.57 percent sulfur. This is the highest sulfur content of any of the analyzed coals in the quadrangle.

The Raven No. 3 (Red Ash) coal bed is from about 75 to 100 feet (23-30 m.) above the Raven No. 2. North of the Russell Fork fault it is poorly exposed and found only in a few places along the slopes of hollows. It is below drainage along the east side of the quadrangle in Russell County and is not known in the Hurricane Creek area of the northwestern part of the quadrangle. South of the Russell Fork fault the Raven No. 3 crops out on the south valley wall of the Russell Fork River and along its tributaries. It is also found at a few places in hollows near the west edge of the quadrangle. It is strip mined at the west end of Indian

Ridge where the coal is 28 to 30 inches (71-76 cm.) thick. Sulfur content averages .78 percent.

The Aily coal bed is 80 to 140 feet (24-43 m.) above the Raven No. 3. It is very thin in most places, but does have significant thicknesses locally. It has been prospected in Hale Hollow and McFarlane Branch, but apparently no mining was done. No analyses of the coal are available.

The Kennedy coal, or Widow Kennedy according to the old name, is 100 to 150 feet (30-46 m.) above the Aily. North of the Russell Fork fault it is exposed midway up the sides of most hollows except in the Drill area along the east edge of the quadrangle where it is near the valley floor. The coal was not found in the western part of the Hurricane Creek area. South of the Russell Fork fault the Kennedy coal crops out midway up the south slopes of the Russell Fork River valley and slopes of lower Indian Creek. It is found high up on ridges along the west edge of the quadrangle south of Indian Creek and dips eastward under Sandy Ridge. The Kennedy lies on or close above the top of the McClure Sandstone, an important marker unit in the quadrangle because of its abundant exposures in ledges and cliffs. South of the Russell Fork fault there are a number of prospects but very few adits on the Kennedy coal, probably because it is too thin to be of interest. North of the fault, however, especially in the northeastern part of the quadrangle, it contains many underground mines. It has also been strip mined in parts of Nance White Branch, Ball Creek, and Barton Fork, where it is about 34 inches (86 cm.) thick. The Kennedy coal has also been mined in the Drill area along the northeast edge of the quadrangle, but all of the mines are now abandoned. Sulfur content averages .82 percent.

The Kennedy-rider coal bed lies 15 to 40 feet (5-12 m) above the Kennedy coal and has practically the same distribution. It has been prospected in a number of places but it is not consistently thick enough to be an important coal in the quadrangle. The Kennedy-rider coal averages 1.09 percent sulfur.

A previously unnamed coal is here named the Puncheon Camp coal, from its exposures along the valley of that name. It is found only south of the Russell Fork fault where it is about 33 inches (84 cm) thick. The Puncheon Camp coal is 165 to 185 feet (50-56 m) above the Kennedy-rider and crops out around all but the south side of Combs Ridge, and the north and west sides of Sandy Ridge north of the Buffalo Mountain fault. A few house coal mines and prospects have been opened on it. Six analyses of the coal showed an average of 1.38 percent sulfur, which is higher than most of the Norton Formation coal beds.

The Lower Banner coal is about 170 feet (51 m) above the Puncheon Camp coal south of the Russell Fork fault and ~~practically~~ about the same interval above the Kennedy-rider coal north of the fault. Thus, the interval between the Lower Banner and the Kennedy-rider is about twice as great south of the fault as it is to the north. However, the identification of the Lower and Upper Banner coals south of the Russell Fork fault is probable but ~~un~~not certain, ~~and~~ usage here adopted does not conform with ~~local~~ previous usage. The Lower Banner is an important coal in the Sandy Ridge-Drill area along the northeast side of the quadrangle where it was being strip mined in 1971-72. It is thin or absent elsewhere north of the Russell Fork fault.

South of the fault the Lower Banner is exposed on the north and west sides of Sandy and Combs Ridges near the crest and dips below drainage southward towards the Buffalo Mountain fault. It has a number of prospects and small mines in this area have produced from the Lower Banner for local domestic fuel. Sulfur content averages .85 percent.

The Upper Banner coal bed is 50 to 100 feet (15-30 m.) above the Lower Banner and is not an important coal in the quadrangle. North of the Russell Fork fault it is a thin seam found in the Sandy Ridge area which apparently pinches out westward and seems to be absent in the Hurricane Creek area. South of the Russell Fork fault it is exposed at or near the crest of the Combs and Sandy Ridges but dips below drainage southward. It has a scattering of house coal mines. The average of two analyses of the coal showed .64 percent sulfur. In most places a prominent sandstone bed is found on top of the Upper Banner coal and has been mapped where practical. ~~possible, to help define the tops of ridges~~. The sandstone is light gray, fine to coarse grained, and crossbedded, and weathers light yellowish brown and crumbly. It contains notable amounts of feldspar, mica flakes, and dark minerals typical of the Norton Formation sandstones and ranges in thickness from 40 to 100 feet (12-30 m.).

The Splash Dam coal is about 80 to 100 feet (24-30 m.) above the Upper Banner coal bed and lies just above the top of the sandstone bed that caps the Upper Banner. The Splash Dam is very thin north of the Russell Fork fault and found only at a few prospects high on Fletcher Ridge and at the northeast end of Big A Mountain. South of the fault it has been ~~slightly~~ there are a few prospected bits high up on Combs and Sandy Ridges, but it dips ~~rapidly~~ below drainage southward towards the Buffalo Mountain fault. In the only analysis available, it contained .71 percent sulfur.

The Hagy coal bed is 50 to 120 feet (15-37 m.) above the Splash Dam coal north of the Russell Fork fault. It is limited in extent to the highest part of Fletcher Ridge near the northern border of the quadrangle. Several small adits have been driven on the Hagy coal, which is here about 37 inches (94 cm.) thick, but contains as much shale as coal in the basal 16 inches (41 cm.). The Hagy is also exposed at the northeast end of Big A Mountain near the Buchanan-Russell County line. South of the Russell Fork fault the Hagy is about 150 feet (46 m.) above the Splash Dam coal and is limited to the highest parts of Combs and Sandy Ridges just north of the Buffalo Mountain fault. Close above the Hagy coal bed is a crest-forming sandstone which has been mapped, where practical, north of the Russell Fork fault. However, south of the fault several thick sandstone units occupy this interval near the ridge tops so that the position of the equivalent sandstone bed could not be determined.

The highest coal mapped, but unnamed, lies just below the Gladeville Sandstone(?) and above the cap rock of the Hagy coal bed. It is exposed just below the crest of "The Knob" on Fletcher Ridge and at the northeast end of Big A Mountain. It contains at least one abandoned small mine and several prospects at "The Knob". It was not found at the surface south of the Russell Fork fault.

Oil and Gas

No drilling has been done for oil or gas in the quadrangle. A few wells nearby to the west, north and northeast have penetrated nearly to the base of the Devonian. The Keen Mountain gas field lies 6 miles to the northeast and the Nora gas field is 12 miles to the west. The rocks penetrated by wells in these fields are very similar to the equivalent rocks of Devonian and Carboniferous age in the Big A Mountain Quadrangle. It is therefore quite possible that commercial gas accumulations are present in the northwestern half of this quadrangle, but the surface geology provides little guidance as to possibly favorable areas for drilling. The complexity of the faulting in the southeast half of the quadrangle discourages exploratory drilling, although deep targets such as the dolomitic formations of the Knox Group could contain gas or oil accumulations in a northeast-southwest belt between the Buffalo Mountain Fault and Fullers Corners Fault.

Stratigraphy

The sedimentary section present at the surface in the quadrangle totals almost 18,000 feet (5,500 m.) of beds. Because of the complex structure affecting the pre-Pennsylvanian formations and the paucity of good sections, even partial sections, the thickness figures and the lithologic descriptions for some of these formations have been derived from outside the quadrangle at localities where the exposures are better and more continuous. Changes in thickness of the formations between these localities and the same formations within the quadrangle are difficult to assess.

The Norton Formation is the formation at the surface over most of the northwestern two-thirds of the quadrangle. It differs materially in lithology and in thickness in the area northeast of the Russell Fork fault from its character southwest of the fault. For this reason two detailed lithologic columns of the mapped Norton Formation, the important coal bearing sequence of the quadrangle, are given. ~~are shown for the Norton.~~ The principal differences are a thicker and more sandy sequence especially above the Kennedy coal in the region southwest of the fault, and the presence southwest of the fault of an important coal, the Puncheon Camp coal, which is not present to the northeast.

In the area northeast of the fault it was possible to map numerous sandstone units, because they ~~were~~ are separated from each other by equal or greater thicknesses of non-resistant shale. Only the thickest and most extensive of these units are here shown. In contrast, in the area to the southwest, sandstone units are thicker and the shale units fewer, thinner, and less prominent, with the result that it was extremely difficult to recognize or trace individual sandstone units and hence impractical to map them. Hence, the apparent greater abundance of sandstone above the Kennedy coal northeast of the fault, as it appears on the map, is illusory. The reverse is the case.

Structure

The Big A Mountain quadrangle is divisible into three gross structural units which differ materially from each other. The area in the southeast part of the quadrangle, bounded on the northwest and northeast by the Buffalo Mountain and Russell Fork faults, consists of abundantly faulted rocks ranging in age from Lower Cambrian to the lower part of the Pennsylvanian. Within this area numerous faults thrust older rocks on the southeast over younger rocks on the northwest. These belts of rock at the surface are, with a few exceptions, progressively younger from southeast to northwest, culminating on the north flank of Big A Mountain where Silurian formations are thrust over Mississippian formations. The master faults in this complex from southeast to northwest are (1) the Honaker fault which is traceable for miles in both directions beyond the borders of the quadrangle (Butts, 1933), (2) the St. Paul fault which continues for many miles southwest of this quadrangle (Butts, 1933), (3) the No Name fault which is of major size in this quadrangle, but not previously recognized elsewhere (no named topographic or cultural feature lies near its surface trace), and (4) the Buffalo Mountain fault, a name in use on coal company maps; it takes its name from a prominent ridge just beyond the southwest corner of the quadrangle. The names Cross Creek fault, Weaver Creek fault, and Fullers Corners fault are taken from the small scale geologic map of Bates (1946) although the fault traces as here shown differ somewhat from his. The names Lockhart Chapel fault and No Name fault are new. The interrelations of all these faults and fault slices are shown in the cross section AA'. Although the gross relations of these geologic elements are probably approximately as depicted, there are undoubtedly lesser faults, particularly intraformational faults, that were not identified or were considered too small to map. These would make the true situation even more complex than shown.

The second and third structural units of the quadrangle encompass the west and north parts of the quadrangle. This area, which is blanketed by a coal-bearing sequence of rocks of Pennsylvanian age, is bisected by the Russell Fork right lateral transverse or tear fault (Section BB'). Along this fault the rocks southwest of the fault, which are part of the Cumberland Overthrust Block (Wentworth, 1921) have moved approximately 4 miles (6.4 km) to the northwest (Englund and DeLaney, 1966) along a concealed fault, the Pine Mountain overthrust. This major Appalachian fault has been shown by deep drilling in nearby areas to be a very prominant shear zone within the lower part of the Chattanooga Shale of Mississippian and Devonian age. The fault is so located in cross section AA', but it is believed to plunge from this stratigraphic position to a deeper horizon near the base of the Lower Cambrian Rome Formation beneath and beyond the southeastern part of the quadrangle. On the basis of deep drilling outside this quadrangle, Young has shown that a shear zone, evidencing some fault movement, is present near the base of the Chattanooga Shale northeast of but close to the Russell Fork Fault. Within a mile or two away from the fault, however, all evidence of this shear zone has vanished. Thus movement along the Pine Mountain Fault began before the Russell Fork tear fault developed.

Because the rocks of Pennsylvanian age on opposite sides of the Russell Fork Fault are approximately 4 miles (6.4 km) displaced with respect to each other, the coal-bearing sequences across the fault do not match. ~~This is especially apparent in the interval from the Kennedy coal to the~~ within the Norton Formation have been described. Differences involving ~~Copper Banner coal~~. Differences in lithology and thickness of older formations on opposite sides of the fault are also to be expected, but subsurface evidence to document these changes is lacking within the quadrangle.

A sole fault, shown near the bottom of cross section AA', is believed from indirect evidence to be a very extensive feature in the southeast part of the Cumberland Plateau and adjacent Valley and Ridge Province. Displacement to the northwest along this fault is probably less than a mile in this quadrangle, but may well exceed 10 miles (16.1 Km.) to the southeast of the quadrangle where the Pine Mountain, No Name, and St. Paul faults have joined it.

The position of basement shown hypothetically in section AA' is based on the above interpretations and on thickness measurements derived from surface and subsurface measurements largely outside the quadrangle. Cumulative errors due to inexact thicknesses of the formations and especially those below the Pine Mountain Fault may exceed 1,000 (305 m.) feet but probably are not in excess of 2,000 (610 m.) feet.

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Big A Mountain GQ

Lithologic Descriptions

Quaternary

Silt, sand, gravel, and boulders

Wise Formation(?)

Siltstone, shale, and sandstone. Siltstone and shale, gray. Sandstone, fine-grained, impure. Formation may contain coal but none observed. Overlies the Gladeville Sandstone(?) in small areas.

Gladeville Sandstone(?)

Sandstone, medium- and fine-grained, feldspathic, moderately quartzose. Identity with type Gladeville Sandstone not certain because of isolated position of the small areas in this quadrangle and distance from the type region.

Norton Formation

Sandstone, siltstone, shale, and coal. Sandstone, gray, very fine, fine-, and medium-grained, impure, locally feldspathic and micaceous. Siltstone and shale, medium- and dark-gray. Numerous coal beds including mined and prospected coals. Lowest 825 feet (250 m.), present at surface but poorly exposed in southwest corner of quadrangle, are equivalent to the upper part of the Lee Formation to the southwest where higher "Lee-type" resistant quartzose sandstone tongues are present, and to part of the New River Formation to the northeast where all "Lee-type" sandstone units have lenaed out. (Englund and DeLaney, 1966.)

Lee Formation

Sandstone, conglomerate, ailtstone, shale, and coal. Sandstone, fine-, medium-, and coarse-grained, quartzose; locally conglomeratic. Some speckled with dark minerals, elsewhere clean. Forms resistant

Lee Formation--continued

gray, and impure fine-grained sandstone comprise poorly exposed middle part of formation. Thin coal beds probably included but none exposed.

Pocahontas Formation

Siltstone, shale, sandstone, and coal. Siltstone and shale, gray, poorly exposed. Sandstone, fine- to coarse-grained, medium-gray, moderately quartzose to impure ("dirty"). A resistant, fine-grained sandstone marks the base of the Pocahontas. Some sandstones incorporate carbonaceous seams and plant trash. Probably includes thin coal beds, but none exposed.

Bluestone Formation

Upper red member

Siltstone, shale, and sandstone. Siltstone, grayish-red, medium-gray, and greenish-gray. Shale, grayish-red, medium-gray, and brownish-gray. Sandstone, very fine, impure ("dirty"); abundantly speckled.

Lower member

Siltstone, shale, and sandstone. Siltstone, gray. Shale, gray and greenish-gray. Sandstone gray, and a little grayish red, very fine grained, moderately quartzose, slightly speckled, and impure ("dirty"), abundantly speckled. A dark-gray to grayish black shale unit, the Pride Shale of other areas, is probably present at base but is not exposed.

Princeton Sandstone

Sandstone, white, fine-grained, quartzose, friable. Poorly developed, lenticular, and absent in many places.

Hinton Formation

Poorly exposed on mountain northwest of Weaver Creek and perhaps interrupted by faults in addition to those identified and mapped. Continuity of members as shown is uncertain in many places.

Little Stone Gap Member

Shale, calcareous, very fossiliferous, weathers yellowish brown and crumbly. Probably present approximately as mapped but seen at only a few localities.

Red Member

Siltstone, shale, and sandstone. Siltstone, grayish-red, and medium- and dark-gray. Shale, dark-gray. Sandstone, greenish-gray, fine-grained and very fine-grained, quartzose and moderately quartzose, speckled. One or more thin sandstone units in lower part of member resemble sandstone of the Stony Gap Member.

Stony Gap Sandstone Member

Sandstone, white, fine-grained and very fine-grained, quartzose, hard, forms ledges, in lower and upper parts of member. Shale or siltstone in middle is almost everywhere covered. Upper sandstone unit intertongues with lower part of red member.

Bluefield Formation

Shale, limestone, siltstone, and sandstone. Shale, medium- and medium-dark-gray, calcareous in lower part of formation. Limestone, medium-gray and brownish-gray, interbedded with shale in lower part of formation, including one limestone unit 20 to 40 feet (6-12 m.) thick. Siltstone and very fine-grained sandstone sparingly present in upper part of formation. Very poorly exposed. Known principally from deep wells near Big A Mountain quadrangle.

Greenbrier Limestone

Limestone, olive-gray and brownish-gray in upper third, very light olive gray (tan) in lower two-thirds, cryptocrystalline and very fine crystalline in even beds 6 inches to 2 feet (15-61 cm.) thick. Many beds of oolitic limestone in upper part and near base. Digitate nodules of grayish-black chert near base. A few beds of dolomitic limestone in lower part.

Maccrady Shale

Shale, grayish-red. Thin and poorly exposed.

Price Siltstone

Siltstone, sandstone, and shale. Siltstone, light-olive-gray in beds up to 2 feet (61 cm.) thick, and also thin bedded to shaly. Sandstone, light-olive-gray, very fine grained in one massive unit 6 feet (1.8 m.) thick in lower part. Shale, medium-dark-gray, in one unit in lower part. Shale, medium-gray, interbedded with siltstone in lowest 20 feet (6 m.).

Chattanooga Shale

Thick shale sequence, but thickness and sequence of lithologies indeterminate in this quadrangle. Predominantly medium-gray and light-olive-gray shale. Dark-gray shale unit along southeast wall of Weaver Creek may be equivalent to the Sunbury Shale of the Elkhorn City, Ky. area. Berea Sandstone not found. Probably not deposited but may be faulted out or present beneath alluvium of Weaver Creek.

Wildcat Valley Sandstone

Sandstone, chert, limestone, and ironstone. Sandstone, white or iron-stained, medium-grained, porous, and fine-grained. Chert, in beds averaging 1 foot thick, in thinner bands interlayered with sandstone, and in oval nodules up to 1-1 1/2 feet (46 cm.) in longest dimension. Limestone, light-brownish-gray, medium-crystalline. Most of original limestone has been replaced by chert. Ironstone, dark-reddish-brown replacing sandstone. Abundant fossils, predominantly brachiopods, in some beds of chert, limestone, and sandstone.

Tonoloway Limestone

Limestone, light-olive-gray, medium-gray, and light-brownish-gray, cryptocrystalline, argillaceous, beds smooth and platy, and ribbon-bedded, or undulatory. Laminae prominent on weathered surfaces. Some beds with abundant ostracodes (Leperditia).

Clinton Formation

Shale, and sandstone. Shale, very poorly exposed, greenish-gray, and possibly other colors. Sandstone, medium- to light-gray, very fine grained, quartzitic, hard, in thin platy beds. Shale-sandstone ratio about 10 to 1.

Clinch Formation

Upper red member

Sandstone and conglomerate. Sandstone, grayish-red, ferruginous, fine-, medium-, and coarse-grained; a few beds contain pebbles up to 1/4-inch (6 cm.), and others contain clay galls; interbedded with white sandstone near contact with lower member. Resistant.

Clinch Formation--continued

Lower white member

Sandstone and conglomerate. Sandstone, white, medium-grained and fine-grained, quartzose; and conglomerate, white, with quartz pebbles, most less than 1/4-inch. Lower beds massive and crossbedded, and some are quartzitic. Higher beds thinner and more even bedded, nonquartzitic. Very resistant.

Juniata Formation

Siltstone, grayish-red. Produces deep red soil.

Reedsville Shale

Shale, limestone, and siltstone. Shale, gray, predominant. Limestone, medium-dark gray, fossiliferous, interbedded in lower part. Siltstone, calcareous, sparingly present. The Reedsville Shale and Trenton Limestone combined are equivalent to the Martinsburg Formation of other reports.

Trenton Limestone

Limestone, medium-gray, medium-light-gray, and light-brownish-gray, fine- and medium-crystalline. Abundant medium-dark-gray shale partings produce a very even bedded appearance characteristic of the Trenton. Abundant fossils in some beds; brachiopods predominant in lower part, bryozoa in upper part. A few beds contain small nodules of dark-gray chert.

Eggleston Limestone

Believed present between Moccasin and Trenton Limestones, but no outcrops of the formation were found. Elsewhere consists of gray or greenish-gray, calcareous mudstone with interbedded fossiliferous limestone, and one or more bentonites.

Moccasin Limestone

Limestone, light-olive-gray and grayish-red, argillaceous.

Lower Middle Ordovician formations below the Moccasin Limestone

Limestone, predominantly light-olive-gray and brownish-gray, cryptocrystalline (calcilutite) in lower part, in even beds up to 3 feet (0.9 m.) thick, intercalated with thinner bedded slightly argillaceous brownish-gray limestone units. Predominantly olive-gray and brownish-gray thin-bedded limestone, much of which is nodular in middle and upper parts. Fossiliferous in some zones. Present at the surface in a small area and few outcrops within the area. Includes beds equivalent to the formations from Dot Limestone to Ben Hur Limestone of Miller and Brosgé (1954), and from Blackford Formation to Witten Limestone of Cooper (1944).

Beekmantown Dolomite

Dolomite, very light gray to medium-light-gray, in even beds up to 3 feet (1 m.) thick. Numerous beds of white-weathering non-oolitic chert, which is conspicuous as float. No sandy beds. Erosional unconformity at top.

Copper Ridge Dolomite and Chances Branch Dolomite Member of Maynardville Limestone

Dolomite, predominantly light-gray and medium-light-gray, very fine crystalline, but contains units of medium-gray and medium-dark-gray dolomite especially near middle of formation. Contains lenses, nodules and intergrowths of white-weathering chert in several zones. Some of chert is oolitic. Also contains a few thin zones of sandy dolomite, which weathers to porous sandstone in the soil. Lowest 150 feet (46 m.) is medium-gray, very fine crystalline, laminated dolomite. These beds are the same as the Chances Branch Member of the Maynardville Limestone of other areas. This member grades upward into the overlying Beekmantown Dolomite and was not mapped separately from it.

Maynardville Limestone

Low Hollow Limestone Member

Limestone, medium-dark-gray, cryptocrystalline, ribboned. Pure limestone layers and slightly argillaceous limestone layers parallel and nearly coequal in quantity. Beds average 1 to 2 inches 2 1/2-5 cm.) thick.

Nolichucky Formation

Upper member:

Shale, greenish-gray and yellowish-gray, with a persistent unit of medium-gray cryptocrystalline and medium-crystalline limestone in lower part. Medium-crystalline limestone contains glauconite pellets and trilobite fragments. Thin beds of limestone also interbedded with shale at base and top of member.

Nolichucky Formation--continued

Middle member:

Limestone, medium-dark-gray, medium- and fine-crystalline and cryptocrystalline. Some coarser beds contain glauconite pellets and trilobite fragments.

Lower member:

Shale, olive-gray; and siltstone, olive-gray, shaly. Very poorly exposed.

Honaker Limestone

Limestone, light-gray, cryptocrystalline, and dolomite, medium-light and light-gray, cryptocrystalline and very fine crystalline, and medium-dark-gray and massive bedded. Much of limestone is ribbon limestone consisting of limestone layers 1-2 inches (2 1/2-5 cm.) thick separated by thin argillaceous limestone layers; includes lenses of gray shale locally. In places thin units of limestone and dolomite are interbedded; elsewhere thick units are almost entirely limestone and others almost entirely dolomite. Lowest and highest units of formation are limestone.

Rome Formation

Shale, siltstone, sandstone, dolomite, and limestone. Shale and siltstone, greenish-gray (70± percent) and grayish-red (5± percent). Sandstone, very fine grained, gray (1± percent). Dolomite, very light gray, light-gray, and dark-gray, cryptocrystalline (12± percent). Limestone, very light gray, and medium-gray, cryptocrystalline and very fine crystalline (12± percent). Much of limestone is ribbon limestone. Dolomite is both thick and thin bedded. Some limestone units change to dolomite along strike. Other carbonate units are limestone in

lower part and dolomite in the upper part. One limestone unit near the top of the formation is persistent across the quadrangle. All other carbonate units are lenticular; a few are trsceable for distances up to a mile. Unidentified faults probably repeat parts of the section across the belt of outcrop.

South of Russell Fork fault

1. Coal, clean, but identified only in one locality.
2. Coal, clean, with no shale partings.
3. Coal, contains clay partings one to several inches thick.
4. Coal, contains shale beds. Maximum 66 inches (168 cm.), but including 23 inches (58 cm.) of clay and shale.
5. Coal, contains 1 to 8 inch (2 1/2-20 cm.) clay split in middle at many places.
6. Coal, up to 33 inches (84 cm.) of clean coal near Puncheon Camp Branch; elsewhere contains bony coal splits.
7. Coal, badly split into 2 or 3 thin beds.
8. Coal, in places 29 inches (74 cm.) thick or more, but mostly less than 22 inches (56 cm.).
9. Sandstone, light-gray, fine- to coarse-grained, thick-bedded, cross-bedded; contains notable mica and dark minerals. Forms cliff or bench.
10. Coal, in McFarlane Branch, up to 39 inches (99 cm.) thick including 7 inches (18 cm.) of shale, but in most places less than 18 inches (46 cm.) thick.
11. Coal, clean, 20 inches (51 cm.) to 30 inches (76 cm.) thick in most places.
12. Coal, up to 34 inches (86 cm.) thick in west-central part, but only about 10 inches (25 cm.) thick in the southwest.
13. Coal, lenticular, ranges from 0 to 27 inches (68 cm.) or more of clean coal. Up to 51-1/2 inches (130 cm.) including 12-1/2 inches (32 cm.) of shale in west-central part of quadrangle. A zone of 2 or 3 or more beds in many places.
14. Coal, up to 32 inches (81 cm.) thick including 6 inches (15 cm.) of shale.
15. Coal, up to 26 inches (66 cm.) thick in Indian Creek, but 18 inches (46 cm.) or less at Patton Branch. In most places about 15 inches (38 cm.).

16. Sandstone, light-gray, medium- to coarse-grained, conglomeratic, thick-bedded, cross-bedded. Contains mostly quartz with mica flakes and dark minerals. Pinches out in Patton Branch.

17. Coal, thickness increases from 55 inches (140 cm.) at Lambert Fork mine southward to 78 inches (200 cm.) in Alvy Creek. In places contains shale split in middle of bed.

South of Russell Fork Fault

1" = 200'

FORMATION, MEMBER, AND BED		LITHOLOGY	COAL IN INCHES (cm in parens)	THICKNESS IN FEET (Meters in parens)
Gladeville Sandstone (?)				5 0 + (15)
unnamed coal bed	1		0-14 (36)	
High coal bed	2		14+ (36)	
Splash Dam coal bed	3		19-26 (48-66)	
Upper Banner coal bed	4		4-43 (109)	
Lower Banner coal bed	5		9-48 (122)	
(Unnamed coal bed)				
Puncheon Camp coal bed	6		0-33 (84)	1355 (413)
Kennedy-rider coal bed	7		0-23 (58)	
Kennedy coal bed	8		0-29+	
McClure sandstone	9			40-80 (12-24)
Aily coal bed	10		0-32 (81)	
Raven No. 3 (Red Ash) coal bed	11		8-40 (20-101)	
Raven No. 2 coal bed	12		0-34 (86)	
Raven No. 1 coal bed	13		0-27+ (68)	
Jawbone-rider coal bed	14		0-21+ (53)	
Jawbone coal bed	15		0-26 (66)	
Council sandstone	16			0-12 (30)
Tiller coal bed	17		0-82+ (208)	

Norton Formation

North of Russell Fork fault

1. Coal, locally contains up to 12 inches (29 cm.) of bony coal.
2. Coal, clean with no shale partings.
3. Coal, locally contains shale partings an inch or so thick.
4. Coal, clean, but limited extent.
5. Coal, locally contains shale near top and middle of bed.
6. Coal, locally present only.
7. Coal, maximum of 34 inches (83 cm.) of clean coal, but up to 54 inches (137 cm.) including clay splits.
8. Sandstone, light-gray, fine- to coarse-grained, thick-bedded, cross-bedded; contains notable feldspar, mica flakes, and dark minerals. Forms cliff or prominent ledges in most places.
9. Coal, very thin at most places, but in Hale Hollow occurs in a 12-foot (3.7 m.) zone containing 5 beds of coal ranging in thickness from 7 to 31 inches (18 to 79 cm.).
10. Coal, individual beds up to 27 inches (68 cm.) in zone up to 25 feet (8 m.) thick containing coal and shale interbedded.
11. Coal, thickness unknown. Prospects buried.
12. Coal, exposures poor but coal apparently clean.
13. Coal, contains thin clay splits locally.
14. Sandstone, light-gray, medium- to coarse-grained, conglomeratic, thick-bedded, cross-bedded. Contains mostly quartz with sparse feldspar, mica, and dark minerals.
15. Coal, up to 35 inches (89 cm.) of clean coal, but in most places contains clay and shale splits up to nearly half of the bed.

May 1 73

North of Russell Fork Fault

1" = 200' (cm. in parens) (meters in parens)

FORMATION, MEMBER, AND BED		LITHOLOGY	THICKNESS COAL IN INCHES	THICKNESS IN FEET
Gladeville(?) Sandstone.				50
Norton Formation: Unnamed coal bed	1		0-14 (36)	
Hagy coal bed	2		0-21 (53)	
Splash Dam coal bed	3		0-12 (30)	
Upper Banner coal bed	4		0-15 (38)	
Lower Banner coal bed	5		0-48 (122)	
Kennedy-rider coal bed	6		0-22 (56)	1145 (349)
Kennedy coal bed	7		0-34+ (86)	
McClure sandstone	8			40-80 (12-24)
Aily coal bed	9		0-for [illegible]	
Raven No. 3 (Red Ash) coal bed	10		0-27+ (69)	
Raven No. 2 coal bed	11		?	
Raven No. 1 coal bed	12		0-31 (79)	
Jawbone coal bed	13		0-27 (69)	
Council sandstone	14			60-160 (18-49) 14
Tiller coal bed	15		0-35 (89)	16

South of Russell Fork fault

1. Coal, clean, but identified only in one locality.
2. Coal, clean, with no shale partings.
3. Coal, contains clay partings one to several inches thick.
4. Coal, contains shale beds. Maximum 66 inches (168 cm.), but including 23 inches (58 cm.) of clay and shale.
5. Coal, contains 1 to 8 inch (2 1/2-20 cm.) clay split in middle at many places.
6. Coal, up to 33 inches (84 cm.) of clean coal near Puncheon Camp Branch; elsewhere contains bony coal splits.
7. Coal, badly split into 2 or 3 thin beds.
8. Coal, in places 29 inches (74 cm.) thick or more, but mostly less than 22 inches (56 cm.).
9. Sandstone, light-gray, fine- to coarse-grained, thick-bedded, cross-bedded; contains notable mica and dark minerals. Forms cliff or bench.
10. Coal, in McFarlane Branch, up to 39 inches (99 cm.) thick including 7 inches (18 cm.) of shale, but in most places less than 18 inches (46 cm.) thick.
11. Coal, clean, 20 inches (51 cm.) to 30 inches (76 cm.) thick in most places.
12. Coal, up to 34 inches (86 cm.) thick in west-central part, but only about 10 inches (25 cm.) thick in the southwest.
13. Coal, lenticular, ranges from 0 to 27 inches (68 cm.) or more of clean coal. Up to 51-1/2 inches (130 cm.) including 12-1/2 inches (32 cm.) of shale in west-central part of quadrangle. A zone of 2 or 3 or more beds in many places.
14. Coal, up to 32 inches (81 cm.) thick including 6 inches (15 cm.) of shale.
15. Coal, up to 26 inches (66 cm.) thick in Indian Creek, but 18 inches (46 cm.) or less at Patton Branch. In most places about 15 inches (38 cm.).

16. Sandstone, light-gray, medium- to coarse-grained, conglomeratic, thick-bedded, cross-bedded. Contains mostly quartz with mica flakes and dark minerals. Pinches out in Patton Branch.

17. Coal, thickness increases from 55 inches (140 cm.) at Lambert Fork mine southward to 78 inches (200 cm.) in Alvy Creek. In places contains shale split in middle of bed.

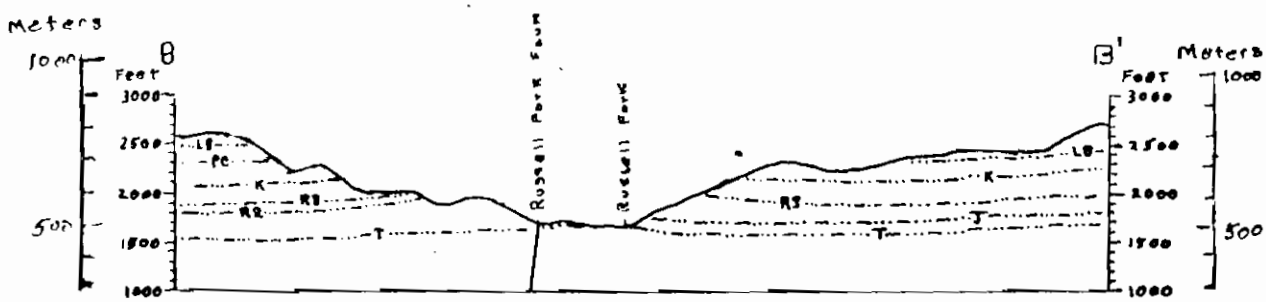
South of Russell Fork Fault

MAY 1975

1" = 200' (cm in parens) (Meters in parens)

FORMATION, MEMBER, AND BED		LITHOLOGY	COAL IN INCHES	THICKNESS IN FEET
Gladeville Sandstone (?)				5[illegible]+(15)
Unnamed coal bed	1		0-14 (36)	
Hagy coal bed	2		14+ (36)	
Splash Dam coal bed	3		19-26 (48-66)	
Upper Bannor coal bed	4		4-43 (109)	
Lower Banner coal bed	5		9-48 (122)	
(Unnamed coal bed)				
Puncheon Camp coal bed	6		0-33 (84)	1355 (413)
Kennedy-rider coal bed	7		0-23 (58)	
Kennedy coal bed	8		0-29+	
McClure sandstone	9			40-80 (12-24)
Aily coal bed	10		0-32 (81)	
Raven No. 3 (Red Ash) coal bed	11		8-40 (20-101)	
Raven No. 2 coal bed	12		0-34 (86)	
Raven No. 1 coal bed	13		0-27+ (68)	
Jawbone-rider coal bed	14		0-21+ (53)	
Jawbone coal bed	15		0-26 (66)	
Council sandstone	16			0-[illegible] (30)
Tiller coal bed	17		0-82" (208)	

Norton Formation


Meters
1000
500
B
Feet
3000
2500
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1500
1000
LB
Pe
K
R3
R2
T
Russell Park Fault
Russell Park
B'
Feet
3000
2500
2000
1500
1000
Meters
1000
500
LB
K
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T
J

Contact; dotted where concealed by mapped Quaternary deposits, queried where in doubt

Coal bed; solid where approximately located; dotted where projected long distances without control. Where a coal lies close above (or below) a mapped sandstone unit, the line representing the coal also represents the top (or base) of the sandstone unit.

Mapped coals in Norton Formation with corresponding symbols.

u, unnamed coals at various horizons
h, Hagy coal
sd, Splash Dam coal
ub, Upper Banner coal[1]
lb, Lower Banner coal[1]
pc, Puncheon Camp coal[2]
kr, Kennedy Rider coal
k, Widow Kennedy coal
a, Aily coal
r3, Raven No. 3 (Red Ash) coal
r2, Raven No. 2 coal
r1, Raven No. 1 coal
jr, Jawbone Rider coal
j, Jawbone coal
t, Tiller coal

(1) Identification of Upper and Lower Banner coals southwest of the Russell Fork fault is uncertain. Usage here adopted does not conform with local usage.

(2) New name. Named for Puncheon Camp Branch of Indian Creek.

Fault; queried where probable; dotted where concealed beneath mapped Quaternary deposits; T, upper plate of thrust fault; u upthrown side; D, downthrown side.

Tear fault, showing relative horizontal movement

Anticline, showing crestline; dashed where approximately located

Syncline, showing troughline; dashed where approximately located

25 4R 70

Measured Calculated Overturned Vertical Horizontal

Strike and dip of beds

Structure contours Drawn on base of Widow Kennedy coal bed; dashed where contoured horizon is above the land surface. Contour interval 40 feet

Coal mine adit

Strip mine and(or) augered coal bed

Coal prospect or good showing

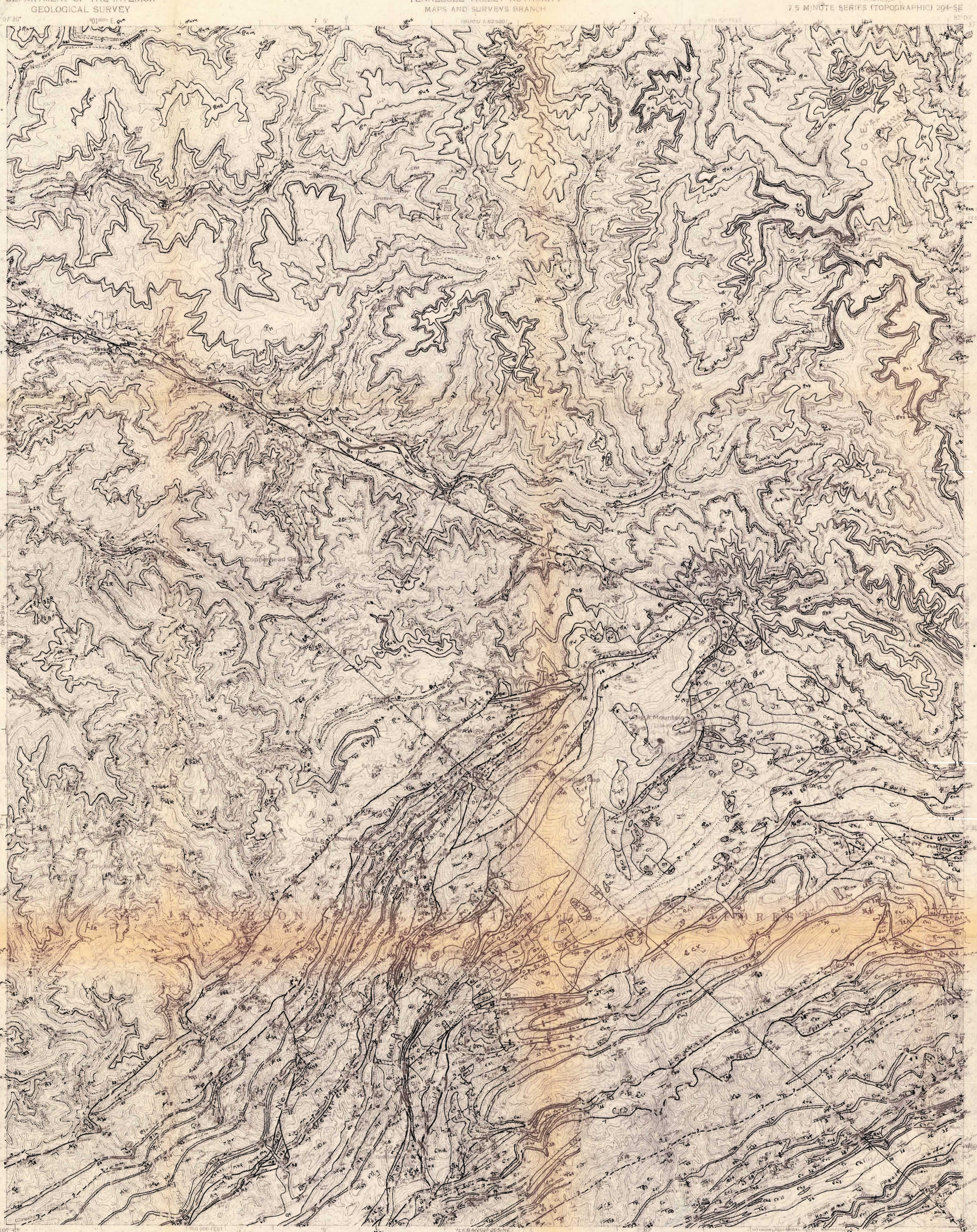
Diamond-drill hole

June 1933

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
TENNESSEE VALLEY AUTHORITY
MAPS AND SURVEYS BRANCH

BIG A MOUNTAIN QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC) 204-SE



Mapped and edited by Tennessee Valley Authority
Published by the Geological Survey

Control by USC&GS, USGS, and TVA

Topography by multiplex methods from aerial photographs taken 1933 and 1934. Field examination by TVA, 1958

Polyconic projection. 1927 North American datum
10,000-foot grid based on Virginia (South) rectangular coordinate system

1000 meter Universal Transverse Mercator Grid ticks, Zone 17, shown in blue

Fine red dashed lines indicate selected fence and field lines visible on aerial photographs. This information is unchecked

APPROXIMATE MEAN DECLINATION, 1960

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

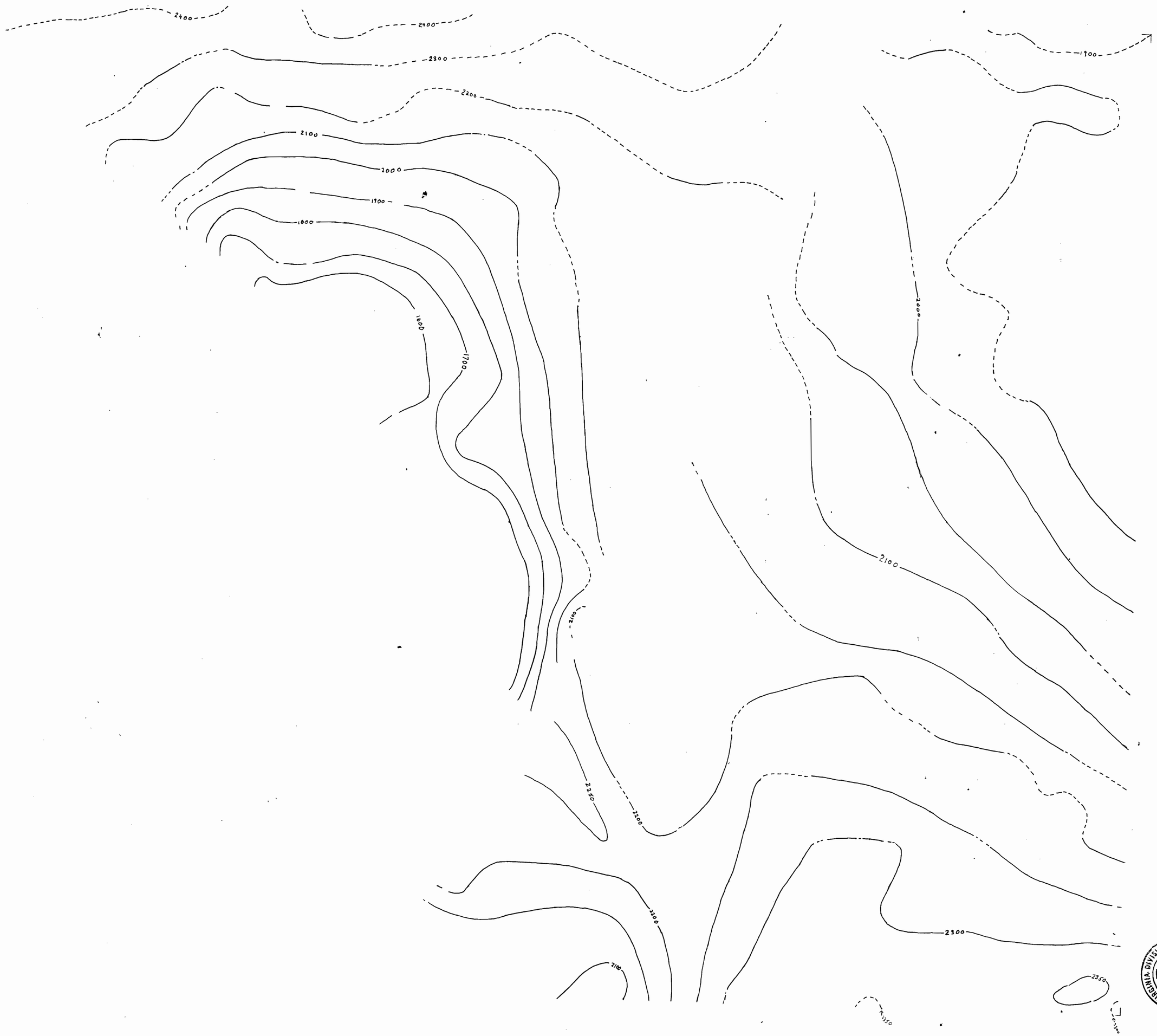
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON 25, D. C.
AND BY U. S. TENNESSEE VALLEY AUTHORITY, CHATTANOOGA OR KNOXVILLE, TENN.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

KENTUCKY
TENNESSEE
MISS. ALA. GA. S.C. N.C. VA. MO. ILL.
QUADRANGLE LOCATION

ROAD CLASSIFICATION
Heavy-duty — Poor motor road
Medium-duty — Wagon and jeep track
Light-duty — Foot trail
U. S. Route — State Route

BIG A MOUNTAIN, VA.
N3700—W8250/7.5
1958

(24)



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BIG A MOUNTAIN QUADRANGLE
JUNE 1973

BIG A MOUNTAIN QUADRANGLE
JUNE 1973

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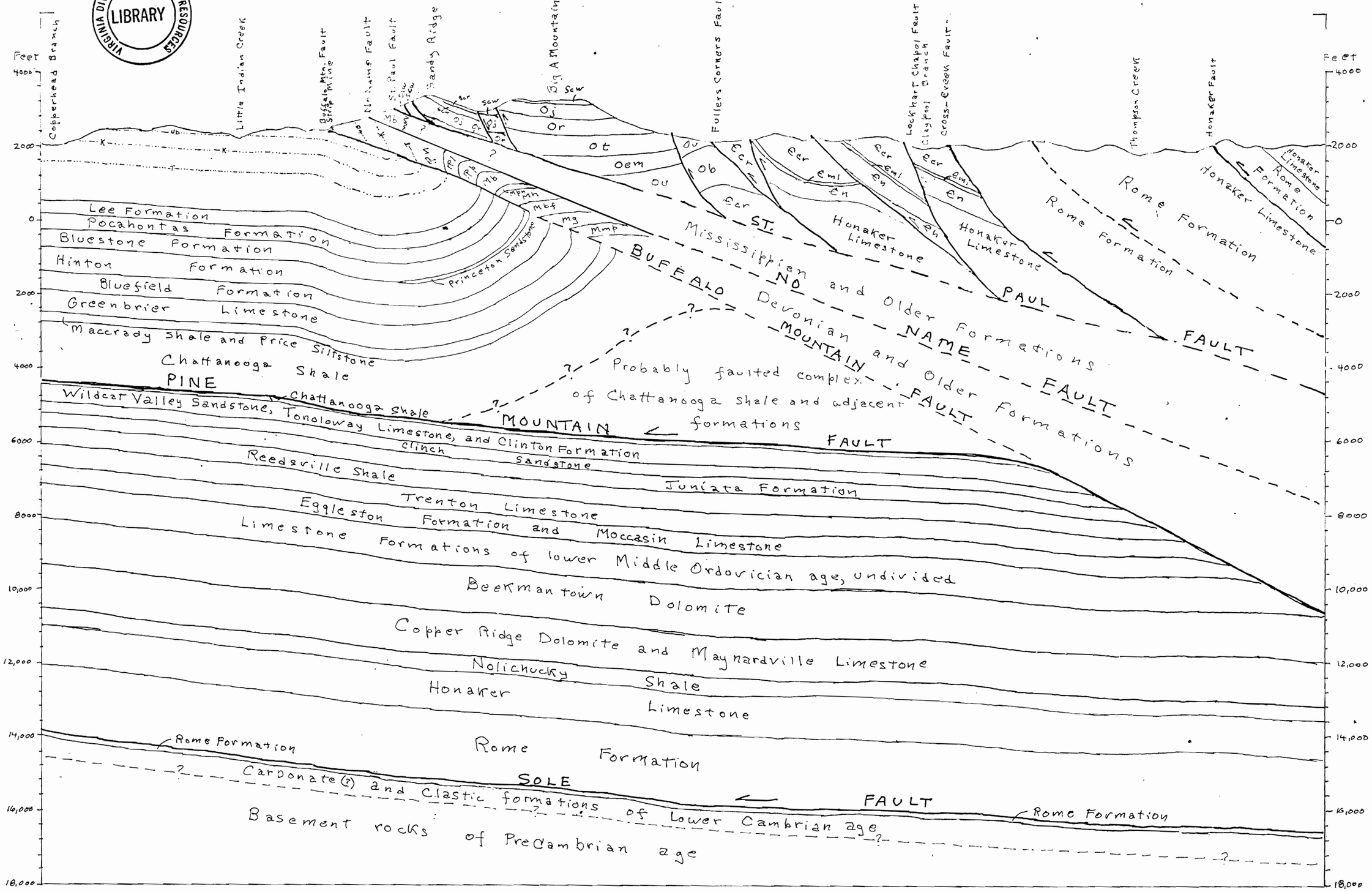

BIG A MOUNTAIN
JUNE 1973

Big A Mt. Quad., Va.

EXPLANATION

JUNE 1973

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Qal
Alluvium

Qc
Colluvium

Qf
Fan Deposits

Qt
Terrace Deposits

Pw
Pws
Pw
Pws
Pw

Wise Formation
Pw Sandstone, siltstone, shale; may contain coal but none observed.
Pws, unnamed resistant, prominent sandstone units.

Pg
Gladeville Sandstone(?)

Pn
Pns
Pn
Pnm
Pn
Pns
Pn
Pnc
Pn
Pns
Pn

Norton Formation
Pn, sandstone, siltstone, shale, and coal
Pns, unnamed resistant prominent sandstone units
Pnm, McClure Sandstone Member
Pnc, Council Sandstone Member

Plu
Plm
Pll

Lee Formation
Plu, upper sandstone member
Plm, middle shale, and siltstone member
Pll, lower sandstone member
Pl, formation undivided in cross-section only

Pp
Ppb

Pocahontas Formation
Pp, siltstone, sandstone, shale, and coal
Ppb, basal conglomeratic sandstone

Mb | Mbr
Mbl

Bluestone Formation
Mb, Bluestone Formation, undivided
Mbr, red member
Mbl, lower member

Mpn
Princeton Sandstone

Mhl
Mhr
Mhs2
Mhs0
Mhs1

Hinton Formation
Mhl, Little Stone Gap Member
Mhr, lower red member (Wilpolt + Marden, 1959)
Mhs, Stony Gap Sandstone Member; where more than one prominent sandstone unit of Stony Gap is present, labelled Mhs_1, and Mhs_2, with intervening weak beds Mhs_0. Mh, formation undivided in cross-section only.

Mbf
Bluefield Formation

Mg
Greenbrier Limestone

Mm
Maccrady Shale

Mmp
Maccrady Shale and Price Siltstone undivided in cross-section only

Mp
Price Siltstone

MDc
Chattanooga Shale*

Dwv
Wildcat Valley Sandstone

DSu
Wildcat Valley Sandstone and Tonolaway Limestone undivided in cross-section only

St
Tonolaway Limestone

Sct
Clinton Formation

Sc | Scr
Scw

Clinch Sandstone
Sc, Clinch Ss, undivided; Scr, upper red ss. mem.; Scw, lower white ss. mem.

Oj
Juniata Formation

Or
Reedsville Shale

Ot
Trenton Limestone

Oem
Eggleston Formation and Moccasion Limestone, undivided

Ou
Limestone Formations of lower-Middle Ordovician age, undivided

Ob
Beekmantown Dolomite

Ꞓcr
Copper Ridge Dolomite, includes Chances Branch Dolomite Member of Maynardville Limestone at base.

Ꞓml
Maynardville Limestone
Ꞓml, Low Hollow Limestone Member

Ꞓnu
Ꞓnm
Ꞓnl

Nolichucky Shale
Ꞓnu, upper shale member
Ꞓnm, middle limestone member
Ꞓnl, lower shale and siltstone member

Ꞓhl
Ꞓhd
Ꞓhl ~~Ꞓhs~~

Honaker Limestone
Ꞓhl, thick carbonate units, predominantly limestone
Ꞓhd, thick carbonate units, predominantly dolomite
Ꞓhs, thin shale unit
Ꞓh, Honaker Limestone in cross-section only

~~Ꞓrl~~ Ꞓr
Ꞓr ~~Ꞓrd~~

Rome Formation
Ꞓrl, thick carbonate units, predominantly limestone
Ꞓrd, thick carbonate units, predominantly dolomite

Big A Mt. Quad, Va.

Scale 1" = 500'

COMPOSITE

June 1973
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SYSTEM	SERIES	GROUP, FORMATION, MEMBER, AND BED	LITHOLOGY	THICKNESS OF COAL IN INCHES	THICKNESS IN FEET
Qu. Al.		Alluvium, Colluvium, Fan, Terrace Deposits			0-20 each
CARBONIFEROUS	PENNSYLVANIAN	Wise Formation			600
		Gladeville Formation			20
		Norton Formation: Unnamed coal bed		0-14	2430
		Hagy coal bed		0-21	
		Splash Dam coal bed		0-26	
		Upper Banner coal bed		0-43	
		Lower Banner coal bed		0-48	
		Puncheon Camp coal bed (South of Russell Fork fault only)		0-33	
		Kennedy-rider coal bed		0-33	
		Kennedy coal bed		0-38	40-80
		McClure sandstone			
		Aily coal bed		0-18	
		Raven No. 3 coal bed		0-40	
		Raven No. 2 coal bed		0-34	
		Raven No. 1 coal bed		0-31	
		Jawbone-rider coal bed (South of R.F. fault)		0-36	
		Jawbone coal bed		0-36	
		Council sandstone			
		Pilgrim coal bed		0-32	0-160
		Lee Formation			375
		Pocohontas Formation			400
	MISSISSIPPIAN	Pennington Group: Bluestone Formation			500
		Princeton Sandstone			0-130
		Little Stone Gap Member		50	
		Hinton Formation: Red Member		350	650
		Stony Gap Member		250	
		Bluefield Formation			550
		Greenbrier Formation			600
		Maccrady Formation			30
		Price Formation			200
DEVONIAN	Upper Devonian	Chattanooga Shale			1700
	Dev.	Wildcat Valley Sandstone			40
SILURIAN	Up. Sil.	Tonoloway Limestone			100
	Middle Silurian	Clinton Formation			350
	Lower Silurian	Clinch Sandstone: Red Member		150	300
		White Member		150	
ORDOVICIAN	Upper Ordovician	Juniata Formation			400
		Reedsville Shale			450
	Middle Ordovician	Trenton Limestone			550
		Eggleston and Moccasin Limestone			500
		Lower Middle Ordovician Formations			900
	Lower Ordovician	Knox Group: Beekmantown Dolomite			1250
CAMBRIAN	Upper Cambrian	Copper Ridge Dolomite			1100
		Chances Branch Dolomite Member of Maynardville Limestone			
		Low Hollow Limestone Member of Maynardville Limestone			75
		Nolichucky Shale: Upper Shale Member		190	450
		Middle Limestone Member		165	
		Lower Shale Member		100	
	Middle Cambrian	Honaker Limestone			1100
	Lower Cambrian	Rome Formation			200