

GEOLOGY OF THE VIRGINIA PORTION OF THE PATTERSON, BRADSHAW, AND WAR QUADRANGLES

William W. Whitlock
1989

EXPLANATION

- ALUMINUM**
- Wise Formation**
- Norton Formation**
- McClure Sandstone Member**
- Bluestone Formation**
- Prochehan Formation**
- Bluestone Formation**
- KEY**
- CONTACTS**
- ATTITUDE OF ROCKS**
- COAL MINES**
- TEST WELLS FOR OIL AND GAS**
- REPOSITORY NUMBERS**
- QUARRIES**
- MODIFIED LAND**

INTRODUCTION

The Patterson, Bradshaw, and War quadrangles are located in northeastern Buchanan County, Virginia and southwestern McDowell County, West Virginia. The area described in this report includes the Virginia portion of these quadrangles, approximately 69 square miles. This area is in the Appalachian Plateau physiographic province and is characterized by steeply sloping and narrow valleys. The maximum elevation is 3020 feet in the southeastern corner of the Bradshaw quadrangle and the minimum elevation is 1120 feet in the northwestern corner of the Patterson quadrangle. Geologic mapping was conducted between April 1988 and January 1989.

STRATIGRAPHY

Rocks exposed in the Patterson, Bradshaw, and War quadrangles include approximately 1430 feet of siltsstone, sandstone, shale, coal, and limestone. These rocks, labeled in the interval from 50 feet below the Tiller coal bed to approximately 160 feet above the Clinwood coal bed, are divided into the Norton and Wise Formations. A thin layer of Quarternary(?) deposits locally overlies the bedrock (see Stratigraphic Column).

For this report several revisions were made to the stratigraphic nomenclature previously used by Hink, 1918; Nohle and Mitchell, 1984; England, 1981; and Morrison and Miller, 1981. The boundary of the Lower and Middle Pennsylvanian is placed at or near the base of the Raven No. 1 coal bed. This corresponds to usage by Nohle (1989) in the Keen Mountain quadrangle.

The Prochehan, Lee, Norton, and Wise Formation names are used for the Pennsylvania age rock units in this report. Where a quarternary member of the Lee Formation is present, these formation names are used instead of the Kanawha and New River Formation names established in West Virginia and used in the deeper portion of the Prochehan basin in Tennessee and Russell counties, Virginia. It was determined from drill hole data that the lower quarternary of the Middle Member of the Lee Formation represents the surface westward from the middle of Bradshaw quadrangle.

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STRUCTURE

Structure in the mapped area is relatively simple with a regional dip of about 1° to the northeast. Locally, dip of up to 10° is present. The regional dip is interrupted by local folds such as the small ones in the southeast corner of Patterson quadrangle, north of Spivey Fork Creek. The same has about 100 feet of closure and covers an area of approximately 1 square mile.

McLaughlin (1981) indicated the possibility that a "spur" of the Bishop-Bradshaw Creek (Canebranch) fault extends into Virginia. He noted there was no direct evidence of faulting along the "spur". Field mapping, mine maps, and drill hole data provide no evidence for the continuation of the Bishop-Bradshaw Creek fault into Virginia.

ECONOMIC GEOLOGY

COAL

Coal is the primary mineral or energy resource in the mapped area. Coal is extracted by contour, hill-top removal, auger, and underground mining methods. Mines now produced from the Prochehan No. 3, Jawbone, Raven, Kennedy, Big Fork, Lower Banner, Upper Banner, Splish Dam, Hay, Norton, Decherster, Lyons, and Clinwood coals.

Six coal samples have been taken in the mapped area; however, analysis has not yet been completed. Analysis of six samples previously collected in surrounding quadrangles (Henderson and others, 1981) indicate the coals are generally high volatile A bituminous to medium-volatile bituminous. Results of analysis are on an as-received basis: 61.6 to 65.5 percent sulfur, 15.6 to 28.3 volatile matter, and 2.4 to 14.9 percent ash. As-received

SHALE, SILTSTONE, AND CLAY

The Norton and Wise Formations have abundant shale and siltstone beds. A report by Johnson and others (1966) included analyses of two samples collected southwest of Grundy. The samples were taken from the Wise Formation and had a potential use in the manufacture of lightweight aggregate. A third sample taken from a Kentucky clay deposit, south of Grundy, had potential use in the manufacture of brick, tile, and drain tile.

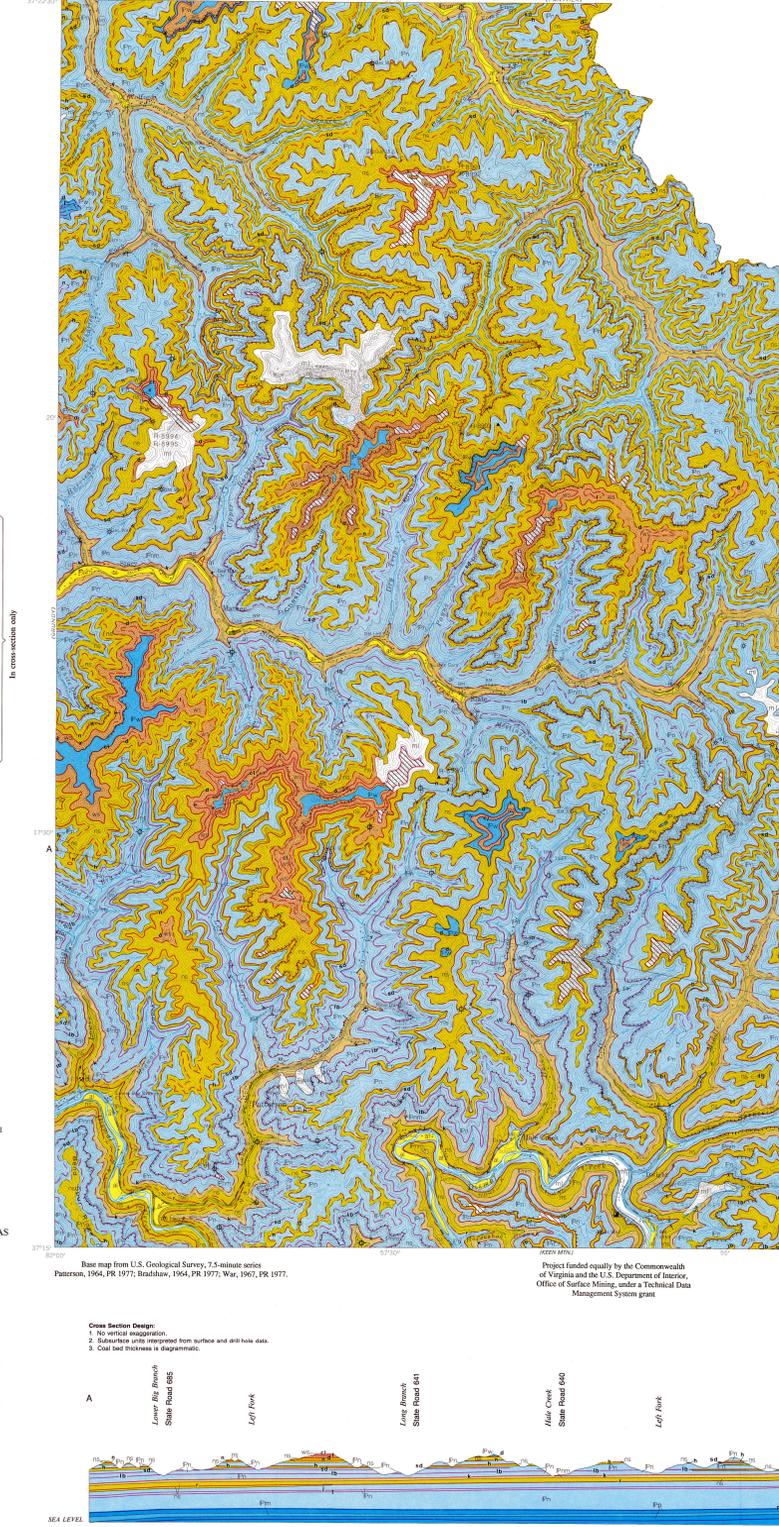
SANDSTONE

An abandoned sandstone quarry is located at the junction of State Roads 638 and 685 north of Dismal Creek. The quarry is in a massive sandstone below the Raven coal bed. The sandstone is fine to medium grained and contains grains of feldspar and dark minerals. No production or historical data could be found for this quarry; however, the sandstone was probably used as aggregate for local concrete.

NATURAL HAZARDS

The mapped area is dominated by steep ridge slopes and narrow stream valleys. This topography makes the area highly susceptible to mass movement of the rock and soil deposits on the slopes. There are several areas of active or recent landslides and many of the slopes are covered with ancient landslide debris or thick colluvial deposits and sandstone talus.

It is important to be aware of these unconsolidated deposits. A combination of excavation in the base of a landslide or other unconsolidated slope deposit or the occurrence of heavy rains, or both, may result in reactivation of the landslide or mass movement of the deposits. Outdrifted (1984) and Thomas and Conard (1984, 1984a) identified landslides and related features in the mapped area.



Coal names in the stratigraphic interval between the coal locally identified as the Glenamog and the Clinwood coal horizon in the lower Wise and upper Norton Formations have been largely assigned. It was determined that the distinctive quarternary Gladville Sandstone pinches out west of the Patterson quadrangle, approximately 69 square miles. This area is in the Appalachian Plateau physiographic province and is characterized by steeply sloping and narrow valleys. The maximum elevation is 3020 feet in the southeastern corner of the Bradshaw quadrangle and the minimum elevation is 1120 feet in the northwestern corner of the Patterson quadrangle. Geologic mapping was conducted between April 1988 and January 1989.

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SYSTEM AND SERIES	FORMATION, MEMBER, AND BED	LITHOLOGY	COAL THICKNESS IN INCHES	UNIT THICKNESS IN FEET	DESCRIPTION	
PENNSYLVANIAN	Wise Fm.	Alluvium		0-20	Deposits of clay, silt, sand, pebbles, and some cobbles and boulders; accumulated along the larger stream valleys.	
		Colluvium		0-20	Deposits of blocky sandstone boulders and cobbles in a matrix of gravel and sandy soil; accumulated on hillside (not mapped).	
	Norton Formation	Clinwood coal		0-60	200-260	Siltstone, shale, sandstone, and coal. Siltstone, dark-yellowish-brown, weathers medium-yellowish-brown, with irregular laminations and thin beds. Shale, olive-black, weathers medium-dark-gray, with irregular laminations and plant fossils. Sandstone, grayish-orange, weathers moderate-yellowish-brown, fine to medium-grained, very-shale-bedded to massive, with sparse cross-bed and lenticular sandstone bodies.
		Decherster coal		0-50	4-50	Siltstone, shale, sandstone, and coal. Siltstone, pale-yellowish-brown, weathers same, with irregular laminations. Shale, medium-dark-gray, weathers medium-light gray, with irregular laminations, invertebrate fossils(?). Sandstone, very-light-gray to dark-yellowish-orange, weathers yellowish-gray to light-olive-gray, very-fine to fine-grained, medium- to very-thick bedded, sparse planar and rough cross-bed. The sandstone between the Norton and Decherster coals is micaceous and foliolite. This is unlike the quarternary Gladville Sandstone. Because of this difference and evidence that the Gladville Sandstone is discontinuous east of Wise County, the name Gladville Sandstone is not used in this area. The top of the Norton Formation is placed at the base of the Decherster coal bed in this area.
		Norton coal		0-36	260-330	Siltstone, shale, sandstone, and coal. Siltstone, pale-yellowish-brown, weathers same, with irregular laminations. Shale, medium-dark-gray, weathers medium-light gray, with irregular laminations, invertebrate fossils(?). Sandstone, very-light-gray to dark-yellowish-orange, weathers yellowish-gray to light-olive-gray, very-fine to fine-grained, medium- to very-thick bedded, sparse planar and rough cross-bed. The sandstone between the Norton and Decherster coals is micaceous and foliolite. This is unlike the quarternary Gladville Sandstone. Because of this difference and evidence that the Gladville Sandstone is discontinuous east of Wise County, the name Gladville Sandstone is not used in this area. The top of the Norton Formation is placed at the base of the Decherster coal bed in this area.
		Hay coal		6-34		Siltstone, shale, sandstone, and coal. Siltstone, pale-yellowish-brown, weathers same, with irregular laminations. Shale, medium-dark-gray, weathers medium-light gray, with irregular laminations, invertebrate fossils(?). Sandstone, very-light-gray to dark-yellowish-orange, weathers yellowish-gray to light-olive-gray, very-fine to fine-grained, medium- to very-thick bedded, sparse planar and rough cross-bed. The sandstone between the Norton and Decherster coals is micaceous and foliolite. This is unlike the quarternary Gladville Sandstone. Because of this difference and evidence that the Gladville Sandstone is discontinuous east of Wise County, the name Gladville Sandstone is not used in this area. The top of the Norton Formation is placed at the base of the Decherster coal bed in this area.
		Splish Dam coal zone		0-30	270-	Sandstone, siltstone, shale, and coal. Sandstone, light-gray to grayish-orange, weathers light-gray to moderate-yellowish-brown, very-fine to medium-grained, thick bedded to massive, sparse planar cross-bed. Sandstone above and below the Splish Dam coal zone forms ledges. Siltstone, dark gray to moderate-gray, weathers medium-gray to grayish-orange, thinly laminated to laminated, fissile, minor interbedded sandstone, may contain siltstone nodules and lenses. Shale, moderate-yellowish-brown, yellowish-gray, laminated, abundant plant fossils in some horizons. The Splish Dam coal of this report and that of England (1981), contains with the Upper Banner coal of the Jewell Ridge quadrangle (Whitlock, 1981). England mapped a coal below the sandstone which appears to correlate with the Upper Banner of this and the Buchanan County reports.
		Upper Banner coal		0-28	300	Sandstone, siltstone, shale, and coal. Sandstone, light-gray to grayish-orange, weathers light-gray to moderate-yellowish-brown, very-fine to medium-grained, thick bedded to massive, sparse planar cross-bed. Sandstone above and below the Splish Dam coal zone forms ledges. Siltstone, dark gray to moderate-gray, weathers medium-gray to grayish-orange, thinly laminated to laminated, fissile, minor interbedded sandstone, may contain siltstone nodules and lenses. Shale, moderate-yellowish-brown, yellowish-gray, laminated, abundant plant fossils in some horizons. The Splish Dam coal of this report and that of England (1981), contains with the Upper Banner coal of the Jewell Ridge quadrangle (Whitlock, 1981). England mapped a coal below the sandstone which appears to correlate with the Upper Banner of this and the Buchanan County reports.
		Lower Banner coal		0-45+	100-1260	Siltstone, shale, sandstone, limestone, and coal. Siltstone, medium-gray, weathers medium-gray, laminated to thin-bedded. Shale, dark-gray, weathers pale-brown to dark-gray, very-thin to medium-bedded. Sandstone, very-pale-orange to grayish-orange, weathers very-pale-orange, fine to coarse-grained, thin bedded to massive, sparse coal stringers, some lenticular sandstone bodies. The ledge-forming sandstone below the Lower Banner coal in the Bearwallers Sandstone Member of England (1981). Limestone, medium-gray, dense, micritic, occurs as lenses (up to 4 feet wide and 1 foot thick) ten to twenty feet above the Kennedy coal.
		Big Fork coal		0-21	170-	Siltstone, shale, sandstone, limestone, and coal. Siltstone, medium-gray, weathers medium-gray, laminated to thin-bedded. Shale, dark-gray, weathers pale-brown to dark-gray, very-thin to medium-bedded. Sandstone, very-pale-orange to grayish-orange, weathers very-pale-orange, fine to coarse-grained, thin bedded to massive, sparse coal stringers, some lenticular sandstone bodies. The ledge-forming sandstone below the Lower Banner coal in the Bearwallers Sandstone Member of England (1981). Limestone, medium-gray, dense, micritic, occurs as lenses (up to 4 feet wide and 1 foot thick) ten to twenty feet above the Kennedy coal.
Kennedy coal		0-41	240	Sandstone, siltstone, and coal. The McClure Sandstone Member is grayish-orange to moderate-yellowish-brown, weathers dark-yellowish-brown to pale-orange, fine to medium-grained, conglomeratic near base, medium- to very-thick bedded, some lenticular sandstone bodies, planar cross-bed. The sandstone between the McClure Sandstone and the Raven coal bed in the Dismal Sandstone Member of England (1981). This sandstone is light-olive-gray, weathers same, very-fine to fine-grained, conglomeratic in base, thin to thick bedded, some lenticular sandstone bodies. The McClure and Dismal sandstone form prominent cliffs along Dismal Creek in southern Patterson quadrangle and to a lesser extent in Bradshaw quadrangle. Siltstone, moderate-brown, weathers medium-gray, laminated to thin-laminated.		
McClure Sandstone Member		0-6	205-	Sandstone, siltstone, and coal. The McClure Sandstone Member is grayish-orange to moderate-yellowish-brown, weathers dark-yellowish-brown to pale-orange, fine to medium-grained, conglomeratic near base, medium- to very-thick bedded, some lenticular sandstone bodies, planar cross-bed. The sandstone between the McClure Sandstone and the Raven coal bed in the Dismal Sandstone Member of England (1981). This sandstone is light-olive-gray, weathers same, very-fine to fine-grained, conglomeratic in base, thin to thick bedded, some lenticular sandstone bodies. The McClure and Dismal sandstone form prominent cliffs along Dismal Creek in southern Patterson quadrangle and to a lesser extent in Bradshaw quadrangle. Siltstone, moderate-brown, weathers medium-gray, laminated to thin-laminated.		
Aly coal		0-30	245-	Sandstone, siltstone, and coal. The McClure Sandstone Member is grayish-orange to moderate-yellowish-brown, weathers dark-yellowish-brown to pale-orange, fine to medium-grained, conglomeratic near base, medium- to very-thick bedded, some lenticular sandstone bodies, planar cross-bed. The sandstone between the McClure Sandstone and the Raven coal bed in the Dismal Sandstone Member of England (1981). This sandstone is light-olive-gray, weathers same, very-fine to fine-grained, conglomeratic in base, thin to thick bedded, some lenticular sandstone bodies. The McClure and Dismal sandstone form prominent cliffs along Dismal Creek in southern Patterson quadrangle and to a lesser extent in Bradshaw quadrangle. Siltstone, moderate-brown, weathers medium-gray, laminated to thin-laminated.		
Raven No. 2 coal		12-36	205-	Siltstone, shale, sandstone, and coal. Siltstone, moderate-brown, weathers medium-gray to dark-gray, laminated to thin-laminated. Shale, brownish-black, weathers dark-gray, thinly laminated, fissile. Sandstone, pale-orange to moderate-light-gray, weathers moderate-yellowish-brown to light-olive-gray, very-fine to medium-grained, medium bedded to massive, large-scale planar cross-bed, fine chills in southeast Patterson quadrangle.		
Jawbone rider coal		0-21	205-	Siltstone, shale, sandstone, and coal. Siltstone, moderate-brown, weathers medium-gray to dark-gray, laminated to thin-laminated. Shale, brownish-black, weathers dark-gray, thinly laminated, fissile. Sandstone, pale-orange to moderate-light-gray, weathers moderate-yellowish-brown to light-olive-gray, very-fine to medium-grained, medium bedded to massive, large-scale planar cross-bed, fine chills in southeast Patterson quadrangle.		
Jawbone coal		20-42	205-	Siltstone, shale, sandstone, and coal. Siltstone, moderate-brown, weathers medium-gray to dark-gray, laminated to thin-laminated. Shale, brownish-black, weathers dark-gray, thinly laminated, fissile. Sandstone, pale-orange to moderate-light-gray, weathers moderate-yellowish-brown to light-olive-gray, very-fine to medium-grained, medium bedded to massive, large-scale planar cross-bed, fine chills in southeast Patterson quadrangle.		
Tiller coal		26-40	205-	Siltstone, shale, sandstone, and coal. Siltstone, moderate-brown, weathers medium-gray to dark-gray, laminated to thin-laminated. Shale, brownish-black, weathers dark-gray, thinly laminated, fissile. Sandstone, pale-orange to moderate-light-gray, weathers moderate-yellowish-brown to light-olive-gray, very-fine to medium-grained, medium bedded to massive, large-scale planar cross-bed, fine chills in southeast Patterson quadrangle.		

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