MINERAL RESOURCES OF BLAND COUNTY

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DIVISION OF MINERAL RESOURCES
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MINERAL RESOURCES OF BLAND COUNTY, SOUTHWESTERN VIRGINIA.

The range of mineral occurrence in the mountain county of Bland in Virginia, comprises within its scope Building Stones (granite, seyenite, gneiss, sandstone and limestone), Non-metallic Minerals (pyrite, pyrrhotite, arsenopyrite, fluorite, silica, ocher, manganese, feldspar, asbestos, talc and soapstone, fullers earth, barite and gypsum). Cement Materials, Clays, Copper, Zinc and Lead (sphalerite, calamine and galenite), Iron Ores (oriskany, hematite, magnetite and limonite) and Coal of the highest steam and cooking grade.

Iron ore occurs in deposits of remarkable richness, the beds of ore being from 20 to 100 feet in thickness. The lead and zinc deposits of Wythe County, adjoining Bland County have been worked for more than 125 years, and furnished lead to both the Continental and Confederate Armies. Copper deposits are extensive in Southwestern Virginia and numerous noted deposits have long been the seat of an important industry. The sandstones of the Mountains, the limestones and slates of the Valleys, and the granites and cement materials which are widely distributed afford an abundant supply of building materials. Limestones, dolomites and pyrite, are the predominating deposits. The limestones have been quarried extensively at numerous places, but have been used to only a very limited extent for building purposes, most of the output being utilized for making lime and as a flux in the reduction of ores. The bulk of the extensive pyrite deposits, has gone into the manufacture of sulphuric acid, the demand for which commodity having increased materially of late, as a result of its extended use in the manufacture of superphosphates form phosphate rock, in which latter process a chemically pure sulphuric acid is not essential and that made from pyrite serves the purpose equally as well as that made from sulphur. Siliceous crystalline rocks and slate cover a large

area in Southwestern Virginia. The occurrence of slate in deposits of commercial importance is distributed over a considerable area in Bland County and Southwestern Virginia, excellent deposits having been found and developed in the Great Valley and Appalachian districts. For many years the States of Virginia and Georgia have contributed the bulk of the output of manganese in the United States, nearly all of the yield being exported to England. The known occurrences of manganese ore in Virginia are widely distributed, being practically co-extensive with its area. Beginning with the pocket occurrences in the Tidewater district, the ore has been found and mined in the Midland, Piedmont, Blue Ridge, Valley, Appalachian and trans-Appalachian divisions, westward to the West Virginia line. The most remarkable and valuable occurrence of bituminous coal to be found in the United States in association with vast deposits of metalliferous ores is that forming the Southeastern portion of the Kanawha basin, comprising Tazewell, Russell, Scott, Buchanan, Wise and Lee Counties and extending into Bland County. The foregoing and other minerals occurring in Bland County, including Timber Estimates, are set forth in detail with the requisite assays, estimates and exploitation notes.

BUILDING STONES

An abundance of excellent building and decorative stones occur throughout Bland County. These include granite and gneiss; trappean rocks; slate; sandstone and limestone.

Granite -- Crystalline, granular, massive rocks consisting essentially of quartz, orthoclase, and mica or hornblende, occur in Little Walker Mountain and in the neighboring Mountain districts, in the vicinity of No Business Creek there are outcrops of a light gray biotite granite which appears to have been extensively altered by pressure.

Syenite. -- An exposure of hornblende syenite, strikingly similar to the syenite of Madison and Greene Counties may be traced for more than a mile on the

eastern slope of Wolf Creek Mountain. It is indicative of a large area of coarse-grained dark greenish aggregate of feldspar and black pyroxene.

Gneiss. --Excellent exposures of gneiss are found along New River and some of its tributaries above Pearisburg. South of New River and extending into Bland County towards Rich Mountain are several belts of granite-gneiss of uniform color and texture, in which quartz, feldspar and mica are the predominating minerals.

Mica Schist. --Rocks composed essentially of quartz and mica, with pronounced schistose structure, similar in grade to mica schist quarried in Franklin County and well adapted for flagging and other purposes, outcrop along Hunting Camp Creek, and are traceable in the direction of the source of No Business Creek in western Giles County. The rock is thinly foliated, and composed essentially of mica and quartz.

Trappean Rocks.--Numerous basic eruptive rocks of finer crystallization than granite, but well suited for general building and ornamental work, occur widely distributed over parts of Bland and adjacent Counties. An outcropping between Kimberling and No Business Creeks, resembles in many respects a granitoid igneous rock found in the northwestern part of Floyd County.

Slate. --Argillaceous rocks are exposed in several sections of Bland County, in contact with granites and gneisses. Numerous outcroppings show a black slate of moderately fine texture and little lustre, which is carbonaceous, and does not effervesce with cold dilate hydrocheoric acid.

Sandstone.--Cambrian, Silurian, Devonian and Carboniferous sandstones, in association with quartzites are well exposed in Bland and Pulaski Counties and show a variable thickness of sandstone, shale and conglomerate. They have been quarried in Pulaski County and used for building material in the Town of Pulaski and elsewhere. Exposed groups of these rocks comprise alternating beds of shales and conglomeratic sandstones, with beds of coal.

for the purpose of utilizing pyrrhotite for the making of both acid and iron.

Arsenopyrite.--This double sulphide of arsenic and iron is found in association with pyrite in veins which outcrop in places along the slopes of Flat Top and Wolf Creek Mountain. Numerous lenses have been uncovered which widen as depth is attained, and which are similar in all essentials to the Floyd County arsenopyrite deposits which have been exploited with profit and satisfaction, one drift extending to an 8-foot veins or lense of arsenopyrite, of 25 per cent arsenic.

Fluorite.--Fluorspar (fluoride of calcium) the commercial designation of fluorite is sparingly found in the Cambro-Ordovician limestone of Bland County, in association with the ores of zinc and lead. Various occurrences have been noted on the slopes of Flat Top, Sugar Run, Wolf Creek and Brushy Mountains, The close association of the veins with dykes of igneous rocks makes it reasonable certain that the ores are related to the igneous intrusions.

Silica.--Quartz chert and diatomaceous earth are distributed over Bland County. Quartz, the most common in massive-granular form, occurs as veins in the older crystalline rocks. Chert, frequently known as hornstone, a chalcedonic variety of silica is distributed in the form of irregular nodular masses. Diatomaceous earth, resembling chalk and kaolin in its physical properties, has a predominant siliceous character. A sample from an opening north of Laurel Creek, shows by analysis 73.18 per cent silica, 3.12 per cent alumina and 14.01 percent water and organic matter.

Ocher.--The earthy and pulverulent forms of hematite and limonite (anhydrous and hydrous oxides of iron) have wide variation in mode of occurrence and are rendered more or less impure through the presence of other metallic oxides and argillaceous matter. That prospected along the North Fork of Kimberling Creek, is unusally fine and free from impurities, the colors ranging from yellow to gray. The analysis of a sample from near the western base of Flat Top Mountain, gave:

Ferric Oxide	49.17	per cent
Manganese Oxide	1.94	" "
Clay and Sand	41.11	" "
Water	4.78	" "

Manganese.--In Bland County the manganese ores are, generally speaking, embedded in the residual clays which overlie the rocks, from which the clays have been derived by the usual processes of decay, the underlying rock being either the consolidated sediment, sandstone, shale, or limestone; or, a metamorphic crystalline type. Closely associated with the manganese deposits and co-extensive with them are deposits of limonite, which generally line cavities in the manganese ore, and in such places are doubtless later depositions. On the western slope of Flat Top Mountain, overlooking No Business Creek, there is a deposit very similar in appearance and occurrence to the manganese ore in Cave Spring district at Reynolds Mountain in Floyd County, Georgia. The ore is a bluish psilomelane, with granular pyrolusite, cementing fragments in chert breccia, exposed in dark-red clay. An analysis of this ore shows the following composition:

Metallic Manganese	50.71	per cent
Metallic Iron	8.43	" "
Phosphorus	.09	" "
Silica	11.31	" "

Several theories have been advanced regarding the origin of these Appalachian manganese ores, appearing in Bland County and nearby territory; but, doubtless the Cambrian and Ordovician sediments were obtained from the disintegration and decomposition of the crystalline and metamorphic rocks. These rocks contained manganese-bearing silicates, such as micas, pyroxenes, amphiboles, and garnets which were either deposited undecomposed in the shales and to a small extent in the quartzites, or were decomposed and had their manganese content carried in solution and deposited as oxide or carbonate in the shales or limestones.

Feldspar.--Pegmatitic dikes of frequent occurrence in Bland County contain feldspar of the potash varieties, orthoclase and microcline. Occasionally the soda variety, albite, occurs. The feldspar is associated with quartz and mica as coarse crystallizations. Orthoclase, the most ordinary variety, from Pearis Mountain, near the head of No Business Creek, gave the following typical analysis: Silica, 63.18; alumina, 20.33; alkalies, 15.17; and water 0.69.

Asbestos.--Amphibole asbestos is found sparingly in the granite or schistose rocks of Bland County in pockets and occasionally in well-defined veins as occurs in the vicinity of Kimberling and Laurel Creeks. Chrysolite or serpentine asbestos occurs sparingly associated with the outcrops of basic magnesian rocks. Amphibole asbestos, occurring in ancient crystalline rocks that have been crushed and sheared under great pressure in the process of mountain building, appears in several forms.

Talc and Soapstone.--The pure form of talc (hydrous silicate of magnesia) rarely occurs in commerical quantity; but, soapstone (steatite, an impure form of talc) has a wide distribution among the older crystalline rocks, in some cases being derived from altered eruptive rocks. An outcropping of soapstone of good quality is found near Wolf Pen Branch. Exposure of the rock shows a thinly foliated hornblendic schist in close association with the soapstone.

Fullers Earth.-- Among the clays of Bland County are found a variety of clay like substances, which have strong absorbent properties, and which result from the decomposition of the hornblendes and augites rather than the feldspars. Outcroppings, on the slopes, around the edge of low places at and near No Business Creek, are indicative of large areas of fullers earth. Heretofore but little fullers earth has been located in or near this territory and the simplest methods have been used in preparing the material. When these areas are topographically surveyed and the deposits mapped, they will doubtless compare favorably with the Florida and Georgia beds.

Barite.--The sulphate of barium, commercially known as barytes, is found widely distributed, occasionally occurring in well-defined veins, but more often found in a series of pockets or lenses of varying dimensions. Where the barite occurs in the limestone it is generally found as superficially loose lumps and nodules of irregular shapes and sizes. In the Bland-Tazewell-Russell area the usual associates are calcite and limonite, with some fluorite and small cherty masses. In the vicinity of Cluxi, barite occurs in a series of lenticular pockets which at times are distinct from each other, and then again connected by thin seams of barite.

Gypsum.--In Southwest Virginia the principal gypsum producing locality is confined to a portion of the valley of the North Fork of Holston River, where the deposits of Plasterco and Saltville furnish the principal output. The deposits are associated with grayish clays in shales and limestones of Lower Carboniferous age. Indications of gypsum of excellent quality have been noted near Kimberling Springs and along Kimberling Creek, where more extended underground examinations will undoubtedly demonstrate the occurrence of deposits of commercial importance.

CEMENT MATERIALS

Valuable and important cement materials are found in pure and argillaceous limestone of Cambrian and Ordovician age, and in the calcareous and argillaceous phases of the Ordovician shales. Bland County and in fact the entire Valley of Virginia is underlain by these limestones, the shales outcropping all along the bases of the bounding mountains. The area between Flat Top and Wolf Creek Mountains, and especially in the vicinity of Cluxi, is prominent as a region containing the raw materials for the making of cement; but, comparatively little has heretofore been noted or published upon its detailed stratigraphy.

CLAYS

Both residual and sedimentary clays are distributed throughout Bland County, in deposits of variable thickness. The following is an analysis of a deposit

near Burton's Branch of No Business Creek, after washing:

Silica	43.92	per cent
Alumina	41.17	" "
Ferric Oxide	1.71	" "
Lime	1.11	" "
Magnesia	0.64	" "
Alkalies	2.16	" "
Water	8.84	" "

The mountain province of Virginia contains clay resources of very great value. Associated with the coals are beds of shale which after investigation and development will become a valuable source of revenue.

SAND AND MARL

Glass, moulding and building sands occur in commercial quantities throughout Southwest Virginia. Bland County has a wide distribution of deposits in considerable quantities along its stream courses. Between Kimberling and No Business Creeks there are large beds of glass sand, comparatively free from organic compounds, which show by analysis as follows:

Silica	99.573	per cent
Alumina	.194	" "
Oxide of Iron	.012	" "
Limestone and Magnesia	.036	" "
Volatile Matter	.185	" "

Both calcareous and greensand types of marl are developed throughout the Valley region of Virginia, west of the Blue Ridge. These marls are mixtures of calcium carbonate and clay, occurring naturally with more or less siliceous sand.

COPPER

The geologic conditions are quite unlike in the different copper areas of Virginia. In Southwest Virginia, the "Gossan Lead" of the Floyd-Carroll-Grayson plateau, is indicative of the character and mode of occurrence of deposits in neighboring localities. As a rule the rocks are mostly altered sediments, and faulting of the overthrust type predominates. Several small outcrops on the Eastern slope of Wolf Creek Mountain, Bland County, consist essentially of pyrrhotite with stringers of chalcopyrite. The pyrrhotite is more or less admixed

with micaceous material, and in places interleaved with talc. Numerous good specimens of bornite, chalcopyrite and malachite, have been obtained from openings in schists, not far removed from porphory contacts in Buckhorn, Rich, Brusky, Flat Top and Little Walker Mountains.

LEAD AND ZINC

The ores of lead and zinc in Bland County and adjoining territory range from lower Cambrian to Carboniferous in age, and are of sedimentary origin. Geologically, these ores are confined to a single formation, magnesian limestone of Cambro-Ordovician age, known as the Shenandoah limestone in Virginia, and the Knox dolomite in Tennessee. The Shenandoah limestone is correlated with the Knox dolomite, and includes, in addition, at least, 1,500 feet of Cambrian strata beneath the Knox dolomite.

The sulphide ores, including zinc blende, galena and pyrite, all closely associated, uncovered in the vicinity of No Business Creek and Kimberling Creek, show a predominance of zinc blende of remarkable purity, the pyrite being distributed through the limestone in quantity insufficient to be harmful. The following analysis of a specimen of the blende from No Business Creek, above Holly Brook, indicates the general character of the ore:

Zinc	63.07 per cent
Sulphur	32.16 " "
Silica	.21 " "
Lime	.12 " "
Iron	4.44 " "

Limonite is the principal iron ore in association with the zinc ores, while hematite and black oxide of manganese are less frequent associates.

IRON

Red hematite (70 per cent of metallic iron), brown hematite (60 per cent of metallic iron), magnetite (72 per cent of metallic iron) and carbonate (48 per cent of metallic iron) iron ores, corresponding roughly to the minerals hematite,

limonite, magnetite and siderite, have a more or less general occurrence throughout Bland County, which has the Oriskany and Clinton horizons on the slopes of the mountains. It is along the lower flanks of the mountains and on the slopes of the intervening ridges that the most important features of the district are found. Here the formation is made up of coarse gray and brown sandstones, and everywhere throughout their locality in this section they carry with them heavy persistent and valuable strata of brown iron ores. Their outcrops so frequently and extensively displayed along the base of every mountain and on the slopes of every intermediate ridge, point out the existence of a series of continuous beds of ore that are of great thickness and which extend for many miles. A selected sample of this ore taken from Laurel Creek, analyzed as follows:

Sesquioxide of iron----------	79.17 per cent
Silica ----------	2.16 " "
Sulphur ----------	.366 " "
Phosphorous ----------	1.127 " "

Extensive outcrops of the ore appear on the slopes of Flat Top Mountain, above No Business Creek.

COAL

The Virginia portion of the Appalachian coal field, which includes the extreme soutwest counties and to which the State owes its high rank as a coal producer, is Upper Carboniferous in age. The Southwest Virginia coal field forms the southwestern part of the Kanawha basin and comprises Buchanan, Dickenson, Lee, Russell, Scott, Wise and Tazewell counties, extending into Bland County. Of these Wise and Tazewell counties are at this time large producers, which the remainder of the territory contains large reserves of coal awaiting further development and transportation facilities. The Bland-Wythe counties coal field has promising seams appearing in the Price sandstone near Bland Courthouse, Sharon Springs and in the western part of Bland County; and to the south of Little Walker Mountain. Geological conditions point unerringly to the conclusion

that coal-bearing beds, the extensions of the beds beneath the Pocahontas or Flat Top, the Big Stone Gap, the Montgomery-Pulaski counties and the Bland-Wythe counties fields, are to be found at varying depths but of continuous habit, throughout the entire territory bounded by the aforementioned fields. None of the formation can be traced through the entire field or territory, and in general the formations consist of overlapping lens-shaped beds, which explains the gradual thickening and thinning. On account of this variation it is difficult to correlate different beds throughout the entire region, or even in the restricted portion of Bland County. The last word in the correlation problem cannot be said until the large undeveloped areas intervening between the developed regions have been thoroughly explored.

TIMBER

New River, tributary to the Ohio, drains the eastern portion of the Appalachian Plateau. The sources of the tributaries in Bland County are at elevations of from 2,000 to 3,000 feet. The topographic features are deep, narrow valleys and ravines, with irregular intervening hills and mountains, and occasional narrow flats along the larger streams. Many of the old hill fields have been exhausted by close pasturage, and the soil is being rapidly removed by erosion. About 55 per cent of the territory is wooded. The forests of large area are limited to the higher altitudes, and the propositions of the various species composing the forests are as follows:

Oaks	45 per cent
Chestnut	20 " "
White pine	2 " "
Hemlock	4 " "
Spruce	1 " "
Poplar	2 " "
Ash	2 " "
Buckeye	2 " "
Linn	3 " "
Black gum	1 " "
Beech	1 " "
Birch	3 " "
Maple	3 " "
Hickory	1 " "
Locust	1 " "
Black pine	1 " "
Other species	8 " "

The outlying isolated wood lots, surrounded by cleared land, are noticeably in better condition than the larger wild areas in the mountains. About 2,500,000 feet of timber at Cluxi, red oak and chestnut oak predominating, and averaging about 6,000 feet B.M. to the acre, with an excellent bark for tanning purposes, may be taken as an indication of value. The following species on this property have been cruised, and conform to the foregoing table of percentages: White Pine (Pinus strobus), Black Spruce (Picea mariana), Hemlock (Tsuga canadensis), White Oak (Quereus alba), Chestnut Oak (Quercus primus), Black Oak (Quercus velutina), Cucumber tree (Magnolia acuminato) and Yellow poplar (Liriodendron tulipifera).

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