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Agricultural Experiment Station

College of Agriculture, West Virginia University

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Morgantown

Chemical Analyses and Fertility of West Virginia Soils

(Technical)

BY

O. C. BRYAN and E. P. DEATRICK

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Chemical Analyses and Fertility of West Virginia Soils¹

In 1914 the Department of Soils of the West Virginia Agricultural Experiment Station began a chemical and field study of the important agricultural soils in the State². Experiment Station Bulletins 161 and 168, dealing with this investigation, have already been published. The present report is a continuation of these investigations and includes the results of the analyses of 485 soil samples representing the important soils in the State. The data given in the two previous bulletins have been revised, and a number of corrections have been made. The revised data are included in this report.

Of all the nutrients required by plants from the soil, nitrogen, phosphorus, and potassium are the ones most liable to be deficient. This deficiency may be due to insufficient amounts of these elements in the original soil material; to the removal of these elements through the sale of farm products; or to losses due to the processes of leaching and erosion. In this investigation, the content of nitrogen, phosphorus, potassium, and carbon, as well as the requirement of lime, was determined. The results thus found have been compared with the fertility. The organic carbon was determined in order to ascertain whether or not a correlation existed between either the carbon and the nitrogen, or the carbon and the fertility, of the soils. Calcium as a nutritive element in the soil is seldom deficient as such, but many crops are often limited because of the lack of calcium carbonate to neutralize the acidity. For this reason, the lime requirement was determined.

The availability of the different plant nutrients varies with the crops grown, and the treatment of the soil; hence, no attempt was made in this investigation to determine the immediate availability of the plant nutrients. With soils of similar conditions and treatments it seems that the nutrients would become available in proportion to their amounts present in the soil. However, there are exceptions to this which have not been satisfactorily explained.

¹O. C. Bryan, the senior author resigned as assistant Soil Technologist, West Virginia Agricultural Experiment Station, August, 1923.

²This investigation was started by Professors Firman E. Bear and R. M. Salter who are now on the faculty of Ohio State University. The authors wish to express their appreciation to them; to Messrs. M. F. Morgan, H. J. Barnett, C. F. Wells, E. B. Wells, R. E. Stephenson and to others who assisted in the progress of this work.

The methods used in collecting the soil samples and in analyzing about two-thirds of the soils are described in West Virginia Agricultural Experiment Station Bulletin 159. For the remaining one-third, the same analytical procedures were followed in determining the nitrogen and carbon, but a modification of Hillebrand's methods¹ for phosphorus and potassium proved to be shorter and was, therefore, used. The lime requirement was determined by the Veitch method. Field records were kept of the soil treatment, the crops grown, and the general fertility of the areas from which the samples were taken. In some cases, however, the field men were unable to secure all of this information.

The classification of the soils into provinces and series is essentially that described by the United States Bureau of Soils². Some of the counties in the state have not been surveyed and for this reason a few soils may not be classified correctly. The field men could not always follow the classification used by the Bureau. According to the Bureau of Soils, West Virginia is divided into three provinces in each of which the soils have been produced by the same force or group of forces. Within each province there are several series which are groups of soils having a similar color, character of subsoil, relief, and origin. Soils of the same series may differ in texture. Soils of the same texture in a series form a soil type. Thus a clay loam in the Upshur series would be Upshur Clay Loam type.

The description of the provinces and important series in West Virginia has been abstracted from Bulletin 96 of the United States Bureau of Soils as follows:

LIMESTONE VALLEYS AND UPLANDS PROVINCE

The soils in this province were derived from the limestone formations in the eastern section of the State, including portions of the Eastern Panhandle and of counties along the Virginia border line. Soils of this province are also found, in small areas, in other sections of the State, particularly in the northern counties, including the Northern Panhandle. These soils vary from gently rolling lands to hills. They are well drained and are fertile.

Brooke Series

The soils in this series are grayish-brown to brown, with yellowish-brown to slightly reddish-brown subsoils. They were derived from pure limestone, with occasional admixtures of material from sandstone and shale. This series is typically developed on the crest of ridges and hills, and in plateau-like situations. They have good drainage, are easy to cultivate, and are fertile.

¹United States Department of Interior, Bulletin 700.

²United States Bureau of Soils, Bulletin 96.

Hagerstown Series

The surface soils in this series are prevailingly brown in color, with light-brown to reddish-brown subsoils. They were derived from the limestone formations located in the eastern section of the State. They have an undulating to gently rolling surface, and are well drained. These soils are very fertile and are admirably adapted to general farming.

APPALACHIAN MOUNTAINS AND PLATEAU PROVINCE

The soils in this province were derived from the disintegration of the sandstones and shales of the Appalachian mountains and plateaus. They have a rolling to mountainous surface which is well drained. They are not very fertile.

Dekalb Series

The surface soils of the Dekalb series are gray to brown, while the subsoils are some shade of yellow. They are derived from sandstones and shales. The surface consists of gently rolling lands, table-lands, hills, and mountains. They are well drained, but are not very fertile.

Meigs Series

This series is variable in character and particularly in color, ranging from Indian red to a pale gray. This series includes some Upshur and Dekalb soils and intermediate types. The soils were derived from red and gray sandstones and shales. They are prevailingly steeply rolling, or mountainous. Some of the smoother slopes are suitable for farming, but are not very fertile.

Upshur Series

Both the surface and subsoil of this series are Indian red. Some types have a grayish-red surface. They were derived from Indian red sandstones and shales, frequently of a calcareous nature. The surface is rolling to mountainous, well drained, and is generally more fertile than the corresponding members of the Dekalb series.

Westmoreland Series

The soils of this series consist of a grayish-brown to a yellowish-brown surface, and a yellowish-brown to yellow subsoil. The surface soils have a mellow structure and the subsoils have a friable structure. They were derived from sandstone and shale with interbedded limestone and calcareous shale. The topography ranges from gently rolling lands to steep hills. They are well drained and are fertile.

RIVER FLOOD PLAINS PROVINCE

These soils are variable in color, drainage, and fertility. They consist of washed material from limestone, sandstone, and shale soils, and form strips of varying widths along rivers and streams.

Elk Series

The soils of this series have a light-brown to brown surface, and a pale-yellow to yellow subsoil. They are above the overflow but are entirely alluvial. These soils were derived from limestone, sandstone, and shale soils. Gravel is generally found in the substratum. The soils are level to slightly rolling, and have poor drainage in wet seasons. When properly managed and well drained, these soils are fairly fertile.

Holston Series

These soils have a yellowish-brown to brown surface, and a yellow subsoil. They are entirely alluvial, consisting of material washed from sandstone and shale soils. They are above the overflow and are fairly well drained. In general, they are less fertile than the members of the Elk series.

Tyler Series

The surface soils are grayish-brown, while the subsoils are yellowish to mottled gray. Some of these soils have a slightly plastic structure. They consist of material washed from sandstone and shale soils. They are fairly level, and poorly drained in many cases. These soils are best suited to grazing and hay. They have a fertility about equal to the Holston series.

Wheeling Series

The soils of this series are brown to yellowish-brown with a slight difference between the surface and subsoil. They are underlain with gravel, usually within three feet of the surface. These soils are alluvial, consisting of material washed from the glaciated area along the Ohio and other rivers. These soils have good drainage and are fertile.

Huntington Series

These soils are light-brown to brown. The subsoils are yellow to light brown. They consist of material washed from limestone, sandstone, and shale soils. They represent the best drained soils of the first bottom and are very fertile.

Moshannon Series

These soils comprise the reddish-brown to Indian red first bottom alluvial soils. They were derived largely from material washed from the Dekalb soils, but they sometimes contain washed material from limestone soils. They are fairly well drained and are fertile.

The greater portion of the soils in the State are composed of the Dekalb, Meigs, and Upshur series as will be seen in Table 1, which gives the area of the different series that had been surveyed in West Virginia up to 1921.

Table I.—Area of the Different Soil Series Surveyed in West Virginia.¹

	Number of Acres Surveyed to 1921
Brooke	46,594
Colbert	960
Decatur	4,992
Frankstown	43,392
Frederick	16,384
Hagerstown	123,136

¹The samples from Berkley, Jefferson, and Morgan counties were collected before the survey was completed in these counties and it is possible that some of the soils classified as Dekalb series in this report belong to the Berks series. The Frankstown and Frederick series are of limestone origin and somewhat similar to the soils in the Hagerstown series. Very likely some of the soils classed as Hagerstown series belong to the Frankstown, or Frederick series. The Berks, Frankstown, and Frederick series have been noted in this state only in the Eastern Panhandle.

Berks	41,856
Dekalb	5,028,224
Meigs	2,896,512
Rough stony land	947,136
Steep broken land	53,696
Lickdale	1,216
Upshur	581,120
Westmoreland	183,488
Atkins	11,712
Elk	35,840
Holly	28,928
Holston	140,352
Huntington	385,280
Moshannon	129,280
Pope	62,280
Tyler	60,672
Riverwash	2,432
Wheeling	40,768
TOTAL	10,866,250

This table was furnished through the courtesy of the U. S. Bureau of Soils.

RESULTS

The nitrogen, phosphorus, potassium, and carbon are given as percentages in this report rather than as pounds per acre, as was the case in the two previous bulletins. On the basis of 2,000,000 pounds of soil per 6 2-3 acre inches, 1 per cent equals 20,000 pounds and .1 per cent equals 2,000 pounds. The analyses do not include the mineral, rock, and organic particles which would not pass a 2mm. sieve.

The chemical analyses and field data of the various soils are given in Table II. The most important information in this table is the total store of the plant nutrients (nitrogen, phosphorus, and potassium) and the lime requirement. These are an index to the potential fertility of the soils. In general, the higher the content of nitrogen and phosphorus and the lower the lime requirement, the greater the fertility, provided the drainage and other factors are favorable. The crop yields observed by the owner of the land and by members of the Soils Department are used as a basis to determine the fertility which is compared with the chemical analyses. There seems to be a fairly definite correlation between the amounts of plant nutrients present and the crop yields on those soils which have like conditions and treatments. This is particularly true with the soils in the same province. A similar correlation with soils in other provinces has been noted by previous investigators.¹ The

¹U. S. Bureau of Soils, Bulletin 54, and annual reports of field operations from 1903 to 1907.

data indicate a low fertility when the phosphorus is less than .04 per cent, and the nitrogen less than .12 percent.

Table II shows that the average soils in the Dekalb, Meigs, Upshur, Tyler, and Holston series are relatively low in nitrogen and phosphorus. The Tyler and Holston series belong to the River Flood Plains Province, but compare favorably in fertility with the sandstone and shale soils. The Upshur series frequently has calcareous formations and is a little more fertile than the strictly sandstone and shale soils. The Elk and Pope series also belong to the River Flood Plains Province, and sometimes contain material washed from limestone formations. They are more fertile than the Tyler and Holston series. About 50 per cent of the Dekalb and Meigs series, 33 per cent of Holston, Tyler, and Upshur series, and about 30 per cent of the miscellaneous soils have less than .04 per cent phosphorus. More than 45 per cent of the soils in the Dekalb, Meigs, Holston, and Upshur series contain less than .12 per cent of nitrogen. More than 90 per cent of all the sandstone and shale soils are acid, and require an average of 3000 pounds of lime per acre to neutralize the acidity. Practically all of the soils in the above series are of low fertility.

The data in Table II indicate that most of the well drained soils that are low in nitrogen and phosphorus will respond favorably to acid phosphate and nitrogenous fertilizers. Most of the acid soils will not grow clover without lime and, in many instances, without phosphates. Field experiments in West Virginia¹ and in Pennsylvania² show that the Dekalb soil responds favorably to phosphates, and nitrogen, and in a lesser degree to potassium and lime. Very likely all of the well drained soils which have as low phosphorus and nitrogen content and as high a lime requirement as the average of the Dekalb series will respond favorably to fertilizers containing phosphorus, nitrogen, and potassium. Poor drainage conditions, no doubt, limit the productivity of the Tyler and Holston soils in many cases. Most of the soils studied are fairly high in potassium. A few of them are low in this nutrient, and will probably respond to potash fertilizers. All of the soils which are low in organic matter will likely respond to potash fertilizers.

The organic matter seems to be a good index to the nitrogen content and is no doubt an important factor in determining the fertility. The percentage content of organic matter may be calculated by multiplying the carbon content by 1.724.

¹ West Virginia Agricultural Experiment Station, Bulletin 155.

² Pennsylvania Agricultural Experiment Station, Bulletin 166.

The content of nitrogen varies from 8 to 10 per cent of that of the organic carbon in practically all the soils studied. Some of the sandstone and shale soils have a high content of nitrogen, phosphorus, potassium; and a low lime requirement, yet produce poor crops. This is possibly due to poor management, or to unfavorable drainage conditions.

The Brooke, Hagerstown, Westmoreland, Huntington, Moshannon, and Wheeling soils are much more fertile than those of sandstone and shale origin. They have a higher content of nitrogen and phosphorus and are in general, less acid. All of these, except the Wheeling series, have wholly or partly a limestone or calcareous origin. The last three named soils belong to the River Flood Plains Province, but compare well in fertility with those of strictly limestone origin. The phosphorus in all these soils averages .06 per cent, or more and the nitrogen about .15 per cent. The high content of phosphorus in the limestone soils is probably due to a more rapid leaching of the carbonates than of the phosphates. The correlation between the high content of phosphorus, nitrogen, and lime carbonate, and the fertility has been noted by McHarague and Peter¹ and others. Some of the limestone soils, however, will respond to nitrogen and phosphate fertilizers as is indicated in Table II.

The organic carbon in the Hagerstown soils averages less than that in any of the other series. This is perhaps due to a very rapid decomposition of the organic matter, brought about by the presence of calcium carbonate. The content of nitrogen averages about .12 per cent of that of the organic carbon in the Hagerstown soils, and from 8 to 10 per cent of that of the average soils in the other series. Most of the limestone soils have a good supply of potassium. Indeed, some of them are very high in this nutrient. However, those which are low in organic matter will probably respond to potash fertilizers.

The average content of nitrogen, phosphorus, potassium, and carbon, and the lime requirement of the important soil series in West Virginia are given in Table III (page 21). The general fertility of the series is also indicated in this table.

¹Kentucky Agricultural Experiment Station Bulletin 236.

TABLE II.—Chemical Analyses and Field Data of West Virginia Soils Arranged According to Series.
LIMESTONE VALLEYS AND UPLANDS PROVINCE
BROOKE SERIES

Soil No.	Percentage of Elements				Reg'd CaCO ₃ Per A.	Kinds and Amounts of Fertilizers Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C				
42	.182	.068	2.40	1.65	0	Some M	Corn, wheat, hay	R. Patterson, Wellsburg, Brooke
64	.150	.077	2.01	1.50	0	None	Corn, wheat, clover	G. A. F. Bonar, Belleville, Wood
114	.153	.056	1.56	1.54	2800	Some M, AP, L	Corn, oats, timothy	F. W. Brady, Collier, Brooke
172	.214	.076	0.85	2.01	3000	Med amts AP, L	Alfalfa	G. A. R. Jacobs, Short Creek, Ohio
360	.191	.064	1.92	1.96	3800	None	Oats, clover	De Garmo Bros., Wellsburg, Brooke
361	.191	.043	1.85	1.99	0	None	Pasture for 10 years	E. C. Bowers, Wellsburg, Brooke
365	.152	.065	1.41	1.46	3200	Med amts L, heavy M, AP	Truck crops	Ohio Co. Home Farm, Roney's Point, Ohio
Ave.	.176	.064	1.71	1.87	1800			

HAGERSTOWN SERIES

5	.120	.061	2.55	1.35	0	Some M, AP	Corn, rye, pasture	F. C. D. Wyson, Shepherdstown, Jefferson
24?	.117	.081	2.03	0.98	1000	Med amts 4-8-4 yearly	Orchard, grass	G. J. Miller, Martinsburg, Berkeley
28	.104	.101	2.69	0.77	800	Med amts 4-8-4 yearly	Orchard, grass	G. J. Miller, Martinsburg, Berkeley
29	.111	.054	2.45	1.15	0	4-10-8 occasionally	Orchard, clover	G. Mrs. Lupton, Martinsburg, Berkeley
32	.107	.064	2.48	1.08	0	400 lbs 2-10-8 yearly	Orchard, clover	G. J. W. Stewart, Tablers, Berkeley
33	.114	.045	5.44	1.19	1000	Some M & 4-10-8	Orchard, clover	G. D. G. Miller, Inwood Station, Berkeley
36?	.141	.052	2.75	1.58	2200	Some M & comp fert	Orchard, clover	G. H. L. Smith, Martinsburg, Berkeley
37?	.124	.066	2.75	1.36	2200	Some M & comp fert	Clover, orchard	G. Gr't. Golden Or. Co., Martinsburg, Berkeley
38	.154	.055	2.63	1.52	0	Heavy amts comp fert	Bluegrass pasture	G. Gray Silver, Martinsburg, Berkeley
47	.144	.064	1.37	1.32	1200	Some M	Bluegrass pasture	G. H. G. Murrill, Lewisburg, Greenbrier
121	.275	.078	1.38	3.14	200	Some M, AP	Corn, wheat, clover, timothy	G. W. G. Cochran, Onoto, Pocahontas
127	.132	.041	0.47	1.59	100	Some M, AP	Corn, grain, clover	G. J. D. Humphry, Ronceverte, Greenbrier
135	.154	.076	0.66	1.66	1100	None	Not cropped	G. Baxter Nell, Gap Mills, Monroe
436	.203	.068	0.74	2.13	400	None	Bluegrass and clover pasture	G. R. C. Scott, Shaks Grove, Monroe
138	.100	.053	0.94	1.32	1900	None	Corn, grain, clover	G. C. A. Kadel, Union, Monroe
192	.191	.052	2.37	1.01	0	M every 3-4 years	Corn, wheat, clover, timothy	G. J. Harman, Franklin, Pendleton

The crops listed are the most recent ones grown:

G—Good yield (more than 50 bus. corn per acre).
F—Fair yield (30 to 50 bus. corn per acre).

P—Poor yield (less than 30 bus. corn per acre).

*—Soil drainage is not good.

?—Soil possibly belongs to another series.

Known complete fertilizer formulas given as 4-8-4, N, P₂O₅, K₂O

APPALACHIAN MOUNTAINS AND PLATEAU PROVINCE

DEKALB SERIES

199	.131	.050	1.551	0	None	AP, L, M	Corn, corn, bluegrass	G J. Callahan, Martinsburg, Berkeley
200	.143	.082	1.37	0	Some	AP, L, M	Corn, wheat, clover, bluegrass	G J. W. Small, Bedington, Berkeley
201?	.179	.051	1.44	0	Some	AP, L	Corn, wheat, clover	G I. W. Small, Bedington, Berkeley
202	.118	.044	2.41	0	Some	AP, M, L	Corn, wheat, clover	G A. R. Tabler, Martinsburg, Berkeley
203?	.083	.030	2.85	900	Some	M, AP	Corn, grain, clover	F A. R. Tabler, Martinsburg, Berkeley
205	.128	.060	5.06	0	AP for	wheat	Corn, wheat, clover	G Flo. Ramsburg, Martinsburg, Berkeley
207?	.123	.032	1.71	0	Med amts	M & 8-10-0	Corn, grain (Good)	G Downey & Thompson, Jones Springs, Berkly
209	.111	.054	4.01	0	None		Virgin soil (Good)	G Wm. Hider, Hallsboro, Jefferson
211	.179	.151	3.45	0	Heavy amts	M, AP	Potatoes, rye	G N. T. Snyder, Shenandoah Jct., Jefferson
212	.103	.046	4.84	200	Some	M, AP, L	Corn, wheat, clover	G Ed. Jarrett, Shepherdstown, Jefferson
214?	.113	.099	1.91	0	None		Virgin soil (Good)	G N. T. Snyder, Shepherdstown, Jefferson
216	.132	.054	5.54	1000	Some	M, AP	Corn, wheat, clover, timothy	F R. Garhardt, Bakerton Ridge, Jefferson
217	.118	.045	2.92	0	Some	M	Corn, wheat, clover	G H. McDonald, Summit Point, Jefferson
218	.204	.055	1.92	0	Some	M	Corn, wheat, clover, grass	G I. S. Carr, Middleway, Jefferson
Ave.	.138	.062	2.48	500				

2	.111	.035	1.42	3000	None		Timothy, grass	P W. Va. U. Farm, Morgantown, Monongalia
9	.083	.034	1.31	1200	Med amts	M	Grain, clover	F J. A. Creel, Davisville, Wood
10	.113	.044	0.90	1.46	2400	Some L, M	Corn, wheat, clover, timothy	F Mr. Henry, Stotlers, Cross Roads, Morgan
16	.103	.036	1.30	1.15	3000	None	Corn, wheat, clover	P W. Va. U. Farm, Morgantown, Monongalia
17	.111	.039	1.51	1.90	4000	None	Weeds, orchard	F Somers Orchard, Cherry Run, Morgan
19	.117	.046	1.48	1.57	1200	None	Orchard, clover	F Somers Orchard, Cherry Run, Morgan
26	.022	.027	1.19	1.40	2400	Some AP, 4-10-7, L	Corn, buckwheat, clover	F Black Cr. Or. Co., Hedgesville, Berkeley
39	.060	.021	0.53	1.26	2200	Heavy amts comp fert	Pasture	F B. H. Fiesman, Fayetteville, Fayette
52	.103	.061	1.33	1.01	2000	None	Sedge, clover	G R. Pickens, Ravenswood, Jackson
58	.156	.037	0.92	1.59	4600	None	Sedge, grass	F L. V. Showyer, Corliss, Fayette
61	.104	.043	0.80	1.52	2400	None	Corn, grain, hay	P Jones's Estate, Oak Hill, Fayette
65	.130	.033	0.56	1.22	2200	Some comp fert	Corn, wheat, pastures	F L. P. Willis, Mt. Cove, Fayette
66	.168	.034	1.00	2.36	1400	Heavy amts M, AP, L	Corn, oats, potatoes, hay	G A. F. McMillen, Masontown, Preston
67	.216	.199	1.30	2.36	1600	Med amts AP, M, L	Grain, buckwheat, potatoes	G S. Watson, Masontown, Preston
70	.193	.060	1.35	2.07	400	Med amts AP, L, M	Potatoes, oats, buckwheat	F Preston Co. Farm, Kingwood, Preston
72	.207	.056	1.17	2.48	2600	Med amts AP, M, L	Corn, wheat, clover	F J. A. Hodge, Terra Alta, Preston
74	.076	.018	0.86	1.06	1000	Some M	Corn, wheat, bluegrass	P Perry Lawson, Milton, Cabell
87	.137	.035	1.10	1.60	3200	None	Pasture	P A. Sheeds, Lost Creek, Harrison
91	.245	.061	1.11	2.63	1800	None	Bluegrass pasture	F A. H. Davidson, Lost Creek, Harrison
92	.157	.045	1.29	1.60	1600	None	Corn, wheat, timothy	F A. H. Davidson, Lost Creek, Harrison
93	.095	.029	1.11	1.09	1000	Some L	Timothy, grasses	F S. F. Romine, Washington, Wood
97	.106	.024	1.37	1.14	2200	Med amts AP	Meadow, corn, wheat	F C. C. Hardman, Spencer, Harrison
104	.152	.039	1.13	1.46	2200	None	Oats, corn, wheat, timothy	F S. S. Fans, Bridgeport, Harrison
105	.115	.035	1.11	1.18	0	Some M	Fruits, vegetables	P W. S. Metz, Ravenswood, Jackson
107	.130	.033	1.29	1.43	2000	Some AP	Orchard, clover	F L. Millam, Charleston Kanawha
108	.111	.022	0.83	1.52	1600	None	Corn, grain, timothy	F W. H. Lawson, Charleston, Kanawha
109	.169	.033	1.01	1.97	2800	Some AP	Corn, wheat, clover, timothy	F J. B. Kesler, Clifty, Fayette
120	.198	.066	0.56	2.66	5200	Med amts AP, M	Corn, wheat, clover, timothy	P W. G. Cochran, Onoto, Pocahontas

DEKALB SERIES (Continued)

Soil No.	Percentage of Elements				Requ't in lbs. CaCO ₃ per A.	Kinds and Amounts of Fertilizers Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C				
131	.091	.027	0.45	1.32	2000	Some AP, L, M.	Corn, wheat, clover, timothy	F. E. W. Woodson, Cashmere, Monroe
132	.187	.023	0.59	1.33	2100	Some AP, M	Corn, wheat, clover, timothy	F. W. H. Spangler, Hallard, Monroe
133	.078	.014	0.28	1.21	2600	Comp fert yearly	Corn, wheat, clover	P. O. L. McNeil, Alderson, Monroe
137	.082	.019	0.21	1.07	2200	Some AP, M	Corn, grain, clover	P. C. E. Saunders, Forest Hill, Summers
141	.062	.018	0.57	0.62	1500	Med ants AP, M	Corn, grain, clover	P. C. E. Saunders, Forest Hill, Summers
143	.084	.019	0.32	1.47	2200	Med ants AP	Wheat oats, truck crops	P. W. C. Anderson, Jumping Branch, Summers
144	.050	.019	0.32	1.47	2200	Med ants AP	Buckwheat, wheat	P. L. E. McCommas, Jumping Branch, Summers
145	.082	.024	0.39	1.31	3500	AP on wheat	Buckwheat, clover, corn	F. A. H. Mann, Jumping Branch, Summers
146	.103	.020	0.35	1.84	1600	Some AP, L, M	Corn, soybeans, wheat, clover	F. O. A. Odell, Nettie, Nicholas
147	.252	.060	1.23	3.63	4100	Med ants AP	Bluegrass, broomsedge	P. R. W. Sawyers, Canas, Nicholas
148	.134	.028	0.92	1.93	3300	None	Buckwheat, grass	P. A. Dasey, Mt. Lookout, Nicholas
150	.137	.025	0.67	2.11	2000	Some AP, M	Corn, grain, hay	F. A. Bryant, Summersville, Nicholas
151	.166	.046	1.23	2.06	3200	Some AP, M	Wire grass, red top	F. D. T. Callahan, Craigsaville, Nicholas
153	.155	.042	1.71	2.21	4200	None	Soybeans, meadow, oats	F. T. Smith, Frew, Tyler
156	.154	.040	1.29	1.51	2700	Some AP, M	Corn, soybeans, clover, wheat	F. E. Archer, Middlebourne, Tyler
157	.112	.034	1.33	1.11	2000	Some AP, M	Corn, weeds	P. Reynolds Memo, Hosp., Glendale, Marshall
163	.105	.071	1.24	1.11	2100	None	Corn, wheat, clover, grass	F. E. W. Dorsey, Moundsville, Marshall
166	.144	.084	0.84	1.44	3700	Some M	Grass, weeds	F. E. S. Supler, Triadelphia, Ohio
169	.116	.076	0.83	1.14	2300	Some M	Bluegrass pasture	F. Clark Leap, New Martinsville, Wetzel
178	.131	.044	1.06	1.51	2300	Heavy amounts	Corn, clover, grain	G. J. P. Harmon, St. Marys, Pleasants
185	.096	.023	1.08	1.03	3200	Some AP, M	Corn, wheat, grass	P. G. F. Mitchell, Franklin, Pendleton
195	.084	.024	0.76	0.67	3800	Some AP, M	Corn, wheat, grass	P. G. F. Trumbo, Franklin, Pendleton
196	.104	.035	1.41	0.48	2800	Some AP, M	Corn, mostly	P. Chat. Dally, Harpers' Ferry, Jefferson
215	.103	.024	2.36	0.65	3000	None	Corn, truck crops	P. E. Vanrenslaer, Berkeley Springs, Morgan
219	.133	.024	1.93	0.70	0	Some M & comp fert	Truck crops	P. H. Henry, Berkeley Springs, Morgan
220	.101	.043	1.31	0.76	0	Some M & comp fert	Peach orchard	P. Mrs. G. Allen, Berkeley Springs, Morgan
222	.157	.034	1.38	1.38	1900	None	Wheat, orchard, grass, clover	P. J. W. Grove, Berkeley Springs, Morgan
224	.095	.034	1.69	0.54	0	None	Rye, weeds, grass	P. Wm. Grove, Berkeley Springs, Morgan
225	.107	.026	1.46	0.60	0	Some L	Rye, corn	P. Cherry Run, Morgan
228	.145	.051	1.79	1.02	1900	None	Corn, wheat, clover	G. Mathias, Mathias, Hardy
232	.133	.041	1.58	0.71	1400	Some AP, M	Pasture	F. A. Mason, Greenwood, Doddridge
242	.128	.041	1.28	1.63	0	None	Corn, grain, grass	Dr. F. Lloyd, Harrisville, Ritchie
248	.120	.034	1.28	1.28	4000	Some AP every 2 years	Orchard, clover	P. J. D. Cunningham, Smithville, Ritchie
249	.135	.039	1.15	1.43	3200	Med ants AP	Corn, soybeans, grain	P. Hurricane, Putnam
262	.089	.044	2.51	0.72	2800	None	Timberland, stony	P. Mrs. W. S. Edwards, Millikin, Kanawha
269	.101	.028	1.38	1.60	5800	None	Pasture	G. A. B. Huffman, Palestine, Wirt
271	.210	.068	1.22	2.05	3000	None	Bluegrass, vetch	P. Near Black Hill Church, Wirt
273	.070	.015	1.40	1.14	5800	None	Corn, grain	F. J. F. Lanon, Blueville, Taylor
276	.117	.071	1.45	2.13	6000	None	Corn, grain	

277	.169	.068	1.52	2.04	1000	None	Corn, grain	F. J. F. Lanon, Blueville, Taylor
278	.256	.081	1.52	2.71	4000	None	Pasture	P. Mrs. E. F. Fleming, Grafton, Taylor
279	.181	.072	1.43	2.49	4600	Heavy amts M	Truck crops	F. J. A. Thomas, Grafton, Taylor
280	.161	.061	1.30	1.97	1000	Heavy AP, M, & med L	Truck crops	F. S. R. Jenkins, Grafton, Taylor
281	.151	.055	1.37	1.52	400	Med amts AP, L	Alfalfa, grass	F. S. R. Jenkins, Grafton, Taylor
282	.173	.075	1.55	1.70	5600	Med amts AP, L, M	Corn, grain, grass	F. I. M. Rinker, Grafton, Taylor
284	.116	.036	1.31	1.19	7800	Med amts AP, L, M	Corn, soybeans	F. A. M. Allender, Grafton, Taylor
287	.224	.088	1.69	2.09	5200	Some AP	Corn, pasture, meadow	P. Jake Zinn, Philippi, Barbour
289	.159	.084	1.12	1.98	3200	AP every 3 years	Pasture	P. G. W. Gaul, Philippi, Barbour
290	.217	.061	1.35	2.62	8400	None	Corn, wheat, clover	F. E. R. Dyer, Philippi, Barbour
293	.099	.038	1.26	1.39	8000	Some AP	Corn, oats, weeds, grass	F. E. R. Dyer, Philippi, Barbour
295	.148	.052	1.74	1.63	4800	None	Corn, wheat, clover	F. J. G. Vanscoy, Kerns, Randolph
295a	.160	.050	1.53	1.97	4200	None	Corn, wheat, clover	F. J. G. Vanscoy, Kerns, Randolph
297	.082	.032	1.47	1.04	8200	None	Weeds, grass	P. Kirk Wees, Elkins, Randolph
297a	.134	.037	1.20	2.13	8200	None	Weeds, grass	P. Kirk Wees, Elkins, Randolph
298	.214	.045	1.36	2.07	4600	None	Weeds, grass	P. D. O. Harper, Elkins, Randolph
298a	.128	.038	1.30	1.61	4600	None	Weeds, grass	F. I. J. Ireland, Buckhannon, Upshur
307	.132	.063	1.74	1.67	7800	Med amts AP, L, M	Corn, wheat, clover	F. I. J. Ireland, Buckhannon, Upshur
308	.122	.049	1.22	1.48	4000	None	Pasture, some clover	F. S. E. Marple, Buckhannon, Upshur
311	.178	.046	1.20	1.81	8800	Med amts AP, L, M	Corn, wheat, clover	F. P. G. Groves, Buckhannon, Upshur
315	.153	.043	1.15	2.57	5800	Heavy amts M, AP	Corn, wheat, clover	F. P. G. Groves, Buckhannon, Upshur
320	.143	.047	1.32	1.62	8000	Some AP, L	Corn, grain	P. A. Starcher, Berlin, Lewis
326	.129	.067	0.67	1.79	2800	Some AP	Corn, grain, soybeans	P. J. B. McLaughlin, Strange Creek, Braxton
327	.075	.023	1.47	1.46	5400	Some AP	Corn, grain, soybeans	P. J. B. McLaughlin, Strange Creek, Braxton
332	.122	.029	1.04	1.71	3400	None	Corn, wheat, clover	P. Adonis Bros., Flatwoods, Braxton
332a	.056	.016	0.67	1.06	2400	None	Weeds, grass	P. L. D. Smith, Cowen, Webster
335	.146	.046	1.38	2.20	4800	Some AP, L, M	Corn, hay, wheat	P. L. D. Smith, Cowen, Webster
335a	.116	.030	1.38	2.30	4800	None	Briers, sedge	P. L. B. Bobbitt, Cowen, Webster
337	.184	.038	1.71	3.02	4800	None	Briers, sedge	P. Floyd Miller, Cowen, Webster
339	.174	.046	0.65	2.77	5400	AP every 2 yrs	Corn, oats, grass	P. W. H. Cunningham, Webster Spgs, Webster
342	.193	.055	1.34	2.41	4200	None	Corn, clover, bluegrass	P. W. H. Cunningham, Webster Spgs, Webster
343	.159	.042	0.45	2.49	3600	None	Bluegrass, and clover pasture	P. H. Conrad, Orlando, Braxton
346	.131	.050	1.31	1.44	800	None	Japan clover meadow	P. N. F. Snowden, Chester, Hancock
349	.125	.052	0.77	1.23	0	Med amts AP, M, L	Corn, grain, clover	F. Geo. Pepin, Chester, Hancock
350	.093	.060	0.90	0.84	2800	Some AP, M	Corn, oats, wheat	F. S. Stephens, Chester, Hancock
351	.108	.051	0.99	0.91	3000	Some AP, L, M	Corn, oats, wheat	F. S. Stephens, Chester, Hancock
352	.092	.063	0.77	0.91	2600	None	Meadow for several years	F. I. Kristinger, New Cumberland, Hancock
355	.092	.051	1.09	0.96	3600	M, L once	Corn, oats, hay	P. M. Headley, New Cumberland, Hancock
356	.121	.059	0.90	1.28	4800	Some AP	Not cultivated	Welton Steel Co., Weirton, Hancock
357	.117	.072	1.15	1.19	4800	None	Alfalfa for five years	F. I. F. Hindman, Hollidays Cove, Hancock
358	.141	.060	1.22	1.27	2200	Some M, L	Corn, grain, meadow	F. E. M. Smith, Wellsburg, Brooke
359	.128	.060	1.42	1.26	3600	Some M, L	Bluegrass pasture for years	G. W. L. McCleary, Warwood, Ohio
362	.231	.067	0.70	2.36	200	M & L once	Millet, pasture	F. W. L. McCleary, Warwood, Ohio
363	.227	.081	0.45	2.36	200	None	Bluegrass pasture for years	G. W. L. McCleary, Warwood, Ohio
364	.136	.050	1.02	1.29	4800	Some M	Meadow for several years	F. Ohio County Farm, Roney's Point, Ohio
365	.183	.047	0.77	1.70	2400	None	Corn, wheat, hay	P. D. A. Holsade, Spencer, Roane
372	.145	.038	2.12	1.91	2600	None	Few weeds and sedge	P. D. A. Holsade, Spencer, Roane
374	.185	.048	0.20	3.13	6	None	Corn, wheat, clover	G. Russell farm, Keyser, Mineral
375	.113	.042	0.70	1.17	2600	None	Corn, wheat, clover	G. Russell farm, Keyser, Mineral
379	.096	.018	0.77	1.30	3200	None	Clover, grass pasture	P. H. Boggs, Ivydale, Clay
385	.195	.037	1.28	2.33	2800	Med amts AP, L	Rye, vetch, soybeans	P. I. N. Combs, Romney, Hampshire

SOIL MAP OF

COMPILED FROM THE U. S. BUREAU

T VIRGINIA

L SURVEYS OF WEST VIRGINIA

COUNTIES

- 1—Hancock
- 2—Brooke
- 3—Ohio
- 4—Marshall
- 5—Wetzel
- 6—Marion
- 7—Monongalia
- 8—Preston
- 9—Pleasants
- 10—Tyler
- 11—Doddridge
- 12—Harrison
- 13—Taylor
- 14—Barbour
- 15—Tucker
- 16—Grant
- 17—Mineral
- 18—Hardy
- 19—Hampshire
- 20—Morgan
- 21—Berkeley
- 22—Jefferson
- 23—Wood
- 24—Ritchie
- 25—Jackson
- 26—Wirt
- 27—Calhoun
- 28—Gilmer
- 29—Lewis
- 30—Upshur
- 31—Randolph
- 32—Pendleton
- 33—Mason
- 34—Roane
- 35—Braxton
- 36—Cabell
- 37—Putnam
- 38—Kanawha
- 39—Clay
- 40—Webster
- 41—Wayne
- 42—Lincoln
- 43—Boone
- 44—Raleigh
- 45—Fayette
- 46—Nicholas
- 47—Greenbrier
- 48—Pocahontas
- 49—Mingo
- 50—Logan
- 51—Wyoming
- 52—McDowell
- 53—Mercer
- 54—Summers
- 55—Monroe

NOTE: No attempt has been made to show the extent of the River Flood Plain Soils. Reports have not yet been published for the unshaded counties. Reports for Tucker (15) and Grant (16), however, are on the press at this time. Field work has been completed for Mineral (17), and is being completed for Mercer (53), Summers (54), and Monroe (55). A preliminary geological survey has been made for Hardy (18) and Hampshire (19). The work on the four remaining counties is to be done shortly.

DEKALB SERIES (Concluded)

Soil No.	Percentage of				Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C			
386	.693	.032	0.64	1.24	2600	Corn, wheat	P. J. C. Hott, Romney, Hampshire
387	.119	.039	1.60	1.12	1000	Not cultivated	N. Augusta, Romney, Hampshire
390	.057	.022	0.77	0.40	4800	Not cultivated	W. F. Black, Myria, Lincoln
397	.123	.030	1.15	1.35	3000	Fair woodland	W. F. Black, Myria, Lincoln
409	.085	.033	1.74	1.34	3000	Not cultivated	W. F. Black, Myria, Lincoln
413	.158	.060	1.60	1.36	2400	Pasture	W. F. Black, Myria, Lincoln
417	.172	.053	1.67	1.74	1600	Corn for several years	F. May Everette, Griffithsville, Lincoln
420	.095	.043	1.51	1.43	2600	Japan clover, pasture	F. Tom Bias, Danesville, Boone
421	.166	.061	0.26	1.64	1400	Japan clover, pasture	F. Tom Bias, Danesville, Boone
434	.139	.033	0.83	1.95	2400	Pasture	F. R. F. Armentrout, Parsons, Tucker
437	.294	.069	0.57	4.06	5200	Bluegrass pasture	P. Sugar Land Farm, Ben Bush, Tucker
438	.301	.041	0.85	4.77	5200	Fair cut-over land	Davis Coal Co., Thomas, Tucker
439	.135	.019	0.57	2.65	4400	Oats, buckwheat, clover	D. Aarhalt, Mt. Storm, Grant
441	.163	.053	0.64	2.50	2400	Hay, meadow	P. Parker Bros., Mt. Storm, Grant
442	.185	.048	1.02	2.27	3600	Grass	P. J. W. & L. M. Lee, Gorman, Grant
443	.243	.070	1.22	2.57	5400	Wheat, corn, soybeans	P. C. Wade, Mt. Morris, Pa. Monongalia
449	.156	.047	1.41	1.75	2800	Wheat, grass	P. C. A. Reed, Glenville, Gilmer
450	.163	.040	0.90	1.81	2400	Corn, wheat, clover, timothy	F. C. L. Reed, Glenville, Gilmer
455	.134	.034	1.02	1.49	1800	Corn, soybeans, wheat	P. R. E. Davis, Dekalb, Gilmer
456	.128	.044	1.22	1.30	3400	Clover, bluegrass	P. H. S. Knight, Big Ben, Calhoun
462	.123	.032	1.09	1.87	3200	Oats, corn, meadow	F. F. W. Pringle, Ripley, Jackson
466	.092	.025	0.83	1.31	2000	Wheat, corn, grass	P. J. M. Bailey, Mt. Hope, Raleigh
467	.038	.040	0.83	1.79	3800	Corn, meadow	P. J. M. Bailey, Prosperity, Raleigh
468	.107	.028	0.77	1.48	3000	Fallow land, barren	P. Raleigh Coal Co., Raleigh, Raleigh
469	.123	.032	0.90	1.71	3000	Corn, grass	P. D. R. Lilley, Ghent, Raleigh
470	.114	.032	.070	2.41	3800	Meadow, some clover & timothy	F. Raleigh Co. Farm, Daniels, Raleigh
472	.131	.034	0.77	1.75	3000	Corn, buckwheat	F. Lewis Heirs, Daniels, Raleigh
473	.128	.035	0.45	1.71	3200	Meadow	P. G. P. Daniels, Daniels, Raleigh
474	.140	.047	1.15	1.66	4000	Pasture, weeds	P. Pocahontas Fuel Co., Pineville, Wyoming
477	.079	.021	0.45	1.03	2200	Meadow, corn	P. O. F. Brooks, Rockview, Wyoming
478	.129	.036	1.09	1.81	2600	Pasture	P. H. S. Collins, Baileysville, Wyoming
480	.128	.047	1.15	1.66	2600	Corn, oats, meadow	P. H. C. Presley, Gary, Wyoming
483	.131	.041	1.28	1.71	3800	Timberland (Fair)	Forest Reserve, Crumpler, McDowell
485	.151	.040	1.09	1.71	3800		
Ave.	.136	.043	1.12	1.65	3300		

MEIGS SERIES

4	.008	.029	1.34	0.96	4400	None	Med	amts M & 4-10-4	Corn, corn, grass	F Mr. Wilson, Ona, Cabell
115	.116	.035	0.75	1.08	3100	None		Corn, wheat, clover, timothy	F J. A. Young, Marlinton, Pocahontas	
118	.121	.032	1.63	1.39	3800	Some M		Corn, corn, corn	F J. W. Smith, Frew, Tyler	
121	.135	.049	0.86	1.20	2500	None		Corn, wheat, clover	F T. H. Cornett, Steelton, Wetzel	
175	.195	.052	0.56	1.89	2300	None		Bluegrass pasture	G G. K. Rutenecutter, St. Marys, Pleasants	
190	.130	.045	1.29	1.56	5200	None		Bluegrass pasture	F J. F. Hartly, Burat House, Ritchie	
146	.039	1.41	1.56	1.56	5200	None		Meadow	F Geo. Hardman, Fonzo, Ritchie	
251	.117	.041	1.58	1.19	2200	None		Bluegrass pasture	F D. H. Thomas, Red House, Putnam	
257	.145	.063	1.95	1.42	3000	None		Oats, clover, pasture	F A. B. Huffman, Palestine, Wirt	
272	.142	.048	1.38	1.51	4200	None		Bluegrass pasture	F R. D. Talbott, Philippi, Barbour	
286	.173	.057	1.20	2.21	4600	Some AP, L		Corn, soybeans, wheat	P M. Moore, Mingo, Randolph	
303	.165	.033	1.51	1.43	0	None		Woods, grass	F Jim Evans, Keeds Station, Lewis	
346	.136	.060	1.24	1.40	4400	None		Bluegrass and clover pasture	P Gardner, Mercer	
393	.071	.017	0.30	1.01	2000	None		Oats, grass	P Tom Bowling, Spanishburg, Mercer	
395	.130	.047	1.73	1.26	3000	AP occasionally		Corn, wheat, clover	F Wm. Ferguson, Kenova, Wayne	
402	.147	.062	0.64	1.50	1400	None		Wild grass pasture	F Wm. Purdue, Ceredo, Wayne	
403	.076	.046	0.77	0.60	1800	None		Wild grass pasture	P U. Rowe, Ceredo, Wayne	
424	.227	.048	2.26	1.88	3400	None		Pasture, sandy	F T. E. McQuinn, Kenova, Wayne	
405	.073	.023	1.09	0.68	2000	None		Pasture (sandy)	F W. A. Carroll, Hamlin, Lincoln	
407	.108	.034	1.51	0.86	5200	None		Japan clover pasture	F R. Shepherd, Spencer, Roane	
425	.117	.085	1.15	1.18	4200	Med amts M, AP, L		Corn, wheat, hay	F S. Tennant, Pentress, Monongalia	
445	.183	.071	1.47	1.88	9200	None		Poverty grass, hay	P S. Tennant, Pentress, Monongalia	
446	.126	.034	1.28	1.24	3800	None		Meadow, pasture	P Bush Heirs, Glenville, Gilmer	
454	.034	.027	0.90	1.42	4000	None		Meadow with some clover	F E. L. Ash, Latonia, Gilmer	
457	.095	.027	1.58	1.45	3200	None		Pasture (Japan clover only)	F E. H. Knight, Cherry Creek, Calhoun	
458	.144	.028	0.57	1.47	2800	M occasionally		Corn, wheat, oats, grass	P M. R. Low, Grantsville, Calhoun	
461	.122	.041	1.42	1.39	2400	None		Pasture	P R. R. Low, Grantsville, Calhoun	
462	.128	.043	1.25	1.36	3100	None		Pasture		

UPSHUR SERIES

8	.127	.047	1.88	1.29	5200	None	Orchard, clover	F. J. A. Greef, Davisville, Wood
18	.124	.061	2.49	1.08	0	None	Orchard, clover	F. M. E. Clark, Ona, Canell
56	.087	.027	1.04	1.05	2600	None	Pasture, briars, bluegrass	F. M. E. Morgan, Ravenswood, Jackson
59	.103	.031	1.82	0.92	6400	M & AP once	Grass, underbrush, clover	F. J. F. Jean, Parkersburg, Wood
60	.140	.036	1.72	1.34	5000	Comp AP	Corn, wheat, pasture	G. J. T. Lowther, Pullman, Ritchie
71	.149	.038	1.82	1.86	0	Some AP, L, M	Corn, oats, timothy, clover	F. T. B. Taylor, Terra Alta, Preston
82	.088	.021	1.95	1.04	3800	None	Corn, wheat, timothy	F. Jer. Plants, Ambrosia, Mason
112	.205	.062	2.48	1.61	1600	Med amts AP, M, L	Alfalfa, cowpeas, clover	G. W. D. Zinn, Phillippi, Darbour
113	.098	.037	1.57	0.96	2200	AP occasionally	Corn, wheat, clover	P. C. A. Jackson, Lewisburg, Greenbrier
126	.096	.033	1.73	1.14	2300	Some AP	Corn, wheat, clover, grass	F. J. D. Sites, Vago, Greenbrier
132	.112	.047	1.60	1.32	1200	Some M, AP	Corn, wheat timothy, clover	F. E. W. Woodson, Cashmere, Monroe
158	.110	.047	1.26	1.16	1400	None	Weeds, wild grass	P. A. Thomas, Middlebourne, Tyler
190	.100	.047	1.50	1.43	2100	None	Potatoes, clover, buckwheat	F. E. R. Smith, St. Marys, Pleasants
229	.077	.032	1.50	0.41	0	None	Corn, orchard	F. Sheely Cr. Or. Co., Berkeley Springs, Morgan
241	.324	.100	1.87	3.14	4000	None	Bluegrass pasture	G. Maxwell, Grove, Doddridge
247	.161	.060	1.85	1.84	6000	Med amts M, AP	Corn, soybeans, clover	G. E. Cokeley, Harrisville, Ritchie
258	.070	.072	2.43	0.47	6000	None	Japan, white clover pasture	F. B. A. Brown, Red House, Putnam
274	.168	.039	1.26	1.19	8400	None	Bluegrass pasture	F. D. Shepherd, Elizaveth, Wirt

UPSHUR SERIES (Continued)

Soil No.	Percentage of Elements				Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C			
304	.214	.046	1.66	2.28	None	(Rocky soil) weeds	P C. A. Scott, Mingo, Randolph
306	.222	.048	0.97	2.52	M & AP occasionally	Corn, wheat, clover	G Chas. Betts, Lorentz, Upshur
318	.247	.088	1.67	2.37	None	White clover, bluegrass	F W. B. Lawson, Berlin, Lewis
323	.193	.064	1.37	1.88	AP & L occasionally	Corn, grass, weeds	F Jim Evans, Reeds Station, Lewis
324	.136	.060	1.24	1.40	AP & L occasionally	Corn, grass, weeds	F Jim Evans, Reeds Station, Lewis
328	.112	.044	1.28	1.20	None	Weeds, grass	F Mr. C. Shaver, Heaters, Braxton
329	.142	.041	1.06	1.82	Med ams AP, M, L	Corn, cowpeas, grain, clover	F J. C. Shaver, Heaters, Braxton
333	.108	.047	1.39	1.24	Some AP, L	Wheat, clover, bluegrass	F E. Morrison, Flatwoods, Braxton
335	.154	.052	0.90	1.76	None	Wheat, clover, grass, corn	F J. Woodzell, Webster Springs, Webster
347	.232	.052	1.86	2.39	None	Pasture, meadow, bluegrass	F H. Conrad, Orlando, Braxton
369	.162	.027	1.67	1.39	None	Corn, clover, grain, weeds	F Harry Boggs, Ivydale, Clay
373	.243	.064	1.41	3.06	None	Apple orchard	G Knobly Mt. Orchard, Keyser, Mineral
388	.066	.019	1.28	0.58	Some M, AP	Corn, soybeans, wheat, clover	G W. Smith, Romney, Hampshire
389	.140	.033	0.64	1.37	None	Weeds, wild grass	P J. B. Rannels, Romney, Hampshire
426	.100	.041	1.28	1.08	Med ams AP, M	Corn, wheat, clover, weeds	P W. L. Love, Spencer, Roane
435	.208	.048	0.96	2.59	M once 10 yrs ago	Wheat, oats, clover, timothy	P J. B. Helmick, Ben Bush, Tucker
436	.260	.052	1.02	3.27	None	Not cultivated	W. Jennings, Ben Bush, Tucker
453	.118	.053	0.83	1.20	None	Clover and grass pasture	F Fred Lewis, Glenville, Glmer
461	.127	.046	1.60	1.33	None	Bluegrass pasture	F H. S. Knight, Big Bend, Calhoun
464	.117	.029	1.02	1.77	None	Bluegrass pasture	G Mrs. J. Strum, Arnoldsburg, Calhoun
481	.122	.033	1.28	1.17	None	Pasture, some bluegrass	F Thos. Harman, Anawalt, McDowell
Ave.	.146	.046	1.48	1.56			

WESTMORELAND SERIES

Soil No.	Percentage of Elements				Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C			
1	.146	.061	2.12	1.56	None	Bluegrass, clover	F Fred Whitman, Adamston, Harrison
14	.161	.059	1.25	1.71	Med ams M, AP	Corn, oats, clover, potatoes	G F. B. Haller, Rosemont, Taylor
23	.341	.081	1.54	3.86	Unknown	Potatoes, clover, pasture	F G. C. Sturgiss, Morgantown, Monongalia
69	.237	.107	1.50	2.46	Some M, AP, L	Corn, oats, wheat, hay	G J. F. Copeman, Kingwood, Preston
81	.137	.051	1.78	1.72	None	Corn, oats, clover, bluegrass	G Marion Co. Farm, Fairmont, Marion
89	.203	.076	1.74	2.00	None	Corn, oats, clover	G J. S. Nuzum, Colfax, Marion
90	.209	.062	1.37	2.19	M, AP & L once	Corn, clover, soybeans, pasture	G W. D. Zinn, Philippi, Barbour
167	.147	.091	0.78	1.26	Med ams AP & heavy M	Corn, oats, wheat, alfalfa	G M. B. Pierce & Son, Moundsville, Marshall
179	.181	.103	1.46	1.81	None	Bluegrass pasture	G R. M. Whitman, New Martinsville, Wetzel
187	.158	.057	1.91	1.56	None	Bluegrass, clover, pasture	G Pleasant Co. Farm, Melmont, Pleasants
285	.220	.062	1.53	2.00	Some M, AP	Corn, wheat, clover, grass	F T. L. Burner, Philippi, Barbour
Ave.	.194	.073	1.54	2.01			

RIVER FLOOD PLAINS PROVINCE

Second Bottom

ELK SERIES

	15	184	.061	1.10	2.02	3400	None	None	Meadow	F.M. G. Lawson, Flemington, Taylor
	95	.164	.057	1.15	1.81	0	Some M, AP, L	Med amts M, AP, L	Corn, bluegrass, alfalfa	G.J. F. Phillips, Fairmont, Marion
	98	.126	.035	.949	1.28	2000	None	Med amts M, AP, L	Corn, wheat, grass	F.A. Sheets, Lost Creek, Harrison
	99	.137	.042	1.16	1.34	2000	None	None	Red top weeds, briars	P.W. F. Boyers, Fairmont, Marion
	106	.163	.068	1.19	1.48	2000	None	None	Weeds, grass	F.W. E. L. Stont, Bridgeport, Harrison
	124	.080	.019	0.51	1.24	2200	AP once	AP once	Corn, wheat, timothy, clover	P.C. A. Jackson, Lewisburg, Greenbrier
Ave.		.142	.045	1.00	1.53	1600				

HOLSTON SERIES

	12	114	.040	1.06	1.31	1200	None	None	Corn, hay, grass	P.W. J. Smith, Centerville, Wayne
	13	.169	.057	1.68	1.71	3400	None	None	Meadow	P.W. F. Plymale, Centerville, Wayne
	21	.076	.041	0.88	0.76	1400	Some AP	Some AP	Tobacco, grain, hay	P.Mr. Slas, Ona, Cabell
	43	.166	.076	1.86	1.60	3200	Some M	Some M	Corn, wheat, timothy	F.E. C. Crane, Poca, Kanawha
	55	.108	.037	0.99	1.14	0	Med amts M, AP	Med amts M, AP	Corn, timothy, cowpeas	G.I. Sturkey, Ravenswood, Jackson
	57	.056	.018	1.07	0.83	2800	M, AP occasionally	M, AP occasionally	Corn, wheat, clover, timothy	F.M. E. Morgan, Ravenswood, Jackson
	75	.217	.059	1.77	3.14	0	Some M & comp fert	Some M & comp fert	Corn, tobacco, wheat	G.J. H. Moore, Milton, Cabell
	76	.081	.032	1.16	0.77	1600	M once	M once	Corn, oats, wheat, timothy	P.L. T. Kincade, Pt. Pleasant, Mason
	84	.088	.018	0.72	1.01	2200	M once	M once	Corn, wheat, timothy	F. (Near) J. White, Gulloden, Cabell
	110	.094	.036	0.50	0.90	2000	None	None	Corn, wheat, timothy, watermelons	F. Geo. Johnson, Charleston, Kanawha
	113	.162	.040	1.49	1.73	1800	Some M, AP	Some M, AP	Corn, briars, weeds	P. J. E. Colman, West Union, Doddridge
	243	.148	.050	1.23	1.58	8400	None	None	Pasture (weedy)	P. F. Smith, West Union, Doddridge
	259	.127	.040	1.18	1.36	2000	None	None	Bare soil	P. Mt. Vernon, Putnam
	264	.120	.040	1.65	1.28	5400	None	None	Meadow, weeds	P. W. B. Waldon, St. Albans, Kanawha
	265	.112	.045	1.43	1.54	3000	None	None	Corn every year	F. E. Workman, St. Albans, Kanawha
	316	.129	.053	1.08	1.45	7400	M regularly	M regularly	Garden, truck crops	F. S. Buchanan, Buckhannon, Upshur
	317	.184	.061	0.73	2.15	4400	None	None	Not cultivated	Ed. Swisher, Berlin, Lewis
	317a	.131	.056	0.88	1.54	4000	None	None	Corn, soybeans, wheat, hay	Ed. Swisher, Berlin, Lewis
	325	.193	.060	1.31	1.34	2800	Med amts M, AP, L	Med amts M, AP, L	Corn, soybeans, wheat, hay	F. J. B. McLaughlin, Strange Creek, Braxton
	368	.117	.057	1.28	1.74	3400	None	None	Woodland	F. A. Stephenson, Clay, Clay
	380	.185	.037	1.28	2.88	0	Med amts M, AP, L	Med amts M, AP, L	Corn, wheat, clover	F. Harry Boggs, Ivydale, Clay
	396	.100	.026	0.12	1.23	1000	None	None	Hay, grass	Mrs. J. C. Hollway, Rock, Mercer
	400	.076	.019	0.64	0.88	3400	Some M, L	Some M, L	Corn, clover, grain	Mrs. H. Hatter, Kenova, Wayne
	401	.103	.052	1.15	0.86	2000	None	None	Corn, oats, hay	C. A. Hatter, Kenova, Wayne
	411	.096	.052	0.53	0.94	3000	Some M, AP	Some M, AP	Corn, wheat, clover	County Farm, Hamlin, Lincoln
	446	.116	.052	1.09	1.94	3200	Med amts M, AP, L	Med amts M, AP, L	Corn, wheat, hay	W. W. McComas, Wayne, Wayne
	415	.117	.061	0.98	1.12	3600	None	None	Corn, wheat, hay	P. L. J. Vance, W. Hamlin, Lincoln
	418	.125	.046	1.47	1.07	1800	None	None	Meadow	P. Danville, Boone
	419	.108	.047	0.96	1.22	4000	None	None	Corn, hay, weeds	Unneeded, Boone
	422	.165	.061	1.02	1.28	4000	None	None	Corn, grain, grass	F. H. C. Long, Parsons, Tucker
	432	.121	.034	0.57	2.27	2600	Med amts M, AP, L	Med amts M, AP, L	Corn, oats, clover	F. H. C. Long, Parsons, Tucker
	433	.205	.051	0.78	2.17	5000	Med amts M & AP	Med amts M & AP	Clover, corn, potatoes, oats	F. L. C. Long, Parsons, Tucker
	447	.148	.050	0.83	1.39	3600	None	None	Poverty grass, sedge	P. J. T. Tennant, Pentress, Monongalia

HOLSTON SERIES (Continued)

Soil No.	Percentage of Elements				Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C			
451	.142	.054	1.02	1.53	3200	Grass, hay, soybeans	P. F. Kinderberger, Glenville, Gilmer
476	.054	.025	0.40	0.77	800	Corn, millet, weeds	P. Pocahontas Coal Co., Pineville, Wyoming
479	.229	.079	1.28	2.56	2600	Pasture, wild grass	F. Newberry Heirs, Oceana, Wyoming
Ave.	.129	.047	1.06	1.36	2800		

TYLER SERIES

7	.134	.058	1.26	1.37	3400	Hay, corn, oats, wheat	F. Mr. Greel, Davisville, Wood
77	.135	.045	1.74	2.06	5200	Corn, oats, grass	*P. Davisville, Wood
85	.161	.040	0.93	1.77	1800	Corn, meadow, clover	G. W. D. Zinn, Philippi, Barbour
159	.137	.032	1.04	1.67	700	Corn, grass, hay	P. B. F. Kile, Next, Tyler
177	.122	.038	1.06	1.18	2300	Briers, sedge, weeds	F. Wise Estate, New Martinsville, Wetzel
183	.114	.033	1.00	1.20	2100	Corn, grass, hay	P. G. K. Ruttenclutter, St. Marys, Pleasants
246	.138	.047	1.10	1.42	3200	Corn, wheat, clover	*P. Mrs. S. P. Dyer, Harrisville, Ritchie
255	.190	.072	1.92	1.88	4200	Corn every year	G. L. E. Hartley, Red House, Putnam
256	.093	.044	1.20	0.96	3400	Corn, oats, truck crops	*P. L. E. Hartley, Red House, Putnam
260	.104	.033	1.51	1.00	2600	Corn, wheat, meadow	*P. C. S. Handley, Teays, Putnam
275	.140	.035	1.33	1.38	6600	Bluegrass for 30 years	*P. C. R. Hansman, Elizabeth, Wirt
392	.163	.025	0.70	1.48	3800	Marsh grass	*P. Lilly Land Co., Princeton, Mercer
408	.080	.046	0.45	0.71	2600	Corn, soybeans, hay	P. L. R. Sweetland, Hamlin, Lincoln
428	.141	.082	1.02	1.44	4800	Meadow	F. Spencer suburb, Spencer, Roane
448	.148	.050	1.02	1.53	3600	Corn, oats, clover	*P. L. R. Shriver, Mt. Morris, Pa., Monongalia
463	.117	.051	0.96	1.10	1800	Corn every year	F. Matt Wyatt, Grantsville, Calhoun
Ave.	.137	.046	1.14	1.38	3200		

WHEELING SERIES

6	.171	.112	1.15	1.92	3000	Meadow, some clover	G. J. B. Kester, Belmont, Pleasants
79	.091	.044	1.28	0.89	2000	Wheat, corn, timothy, grass	G. Ed. Kyle, Cox's Landing, Cabell
83	.189	.181	1.17	1.58	0	General crops	G. W. A. Proctor, Ravenswood, Jackson
94	.174	.078	1.31	1.57	1400	Corn, wheat, timothy	G. Dr. Keefer, Belleville, Wood
111	.097	.077	1.08	1.07	3600	Wheat, wheat, timothy	P. Follansbee, Brooke
160	.175	.102	1.25	1.75	700	Corn, clover, alfalfa	J. R. Wells, Bens Run, Tyler
162	.145	.173	0.75	1.73	1500	Clover, corn, grain	F. Reynolds Memo. Hosp. Glendale, Marshall
165	.190	.105	0.83	2.01	2800	Corn, wheat, timothy	G. Thos. Scott, Moundsville, Marshall
173	.220	.159	0.78	2.70	4000	Corn, grass	F. A. F. Cochran, New Martinsville, Wetzel
174	.121	.084	0.74	1.25	3000	Corn, soybeans, grain	F. J. D. Morgan, Steelton, Wetzel
181	.072	.087	0.78	0.76	2100	Corn, wheat, clover	G. W. Bills, Billsville, Pleasants
186	.161	.105	1.26	1.79	1700	Meadow, corn	G. County Farm, Belmont, Pleasants
353	.143	.059	1.71	1.94	2600	Corn, clover, oats, wheat	G. J. G. Watson, New Cumberland, Hancock
Ave.	.149	.104	1.10	1.61	2100		

First Bottom HUNTINGTON SERIES

46	213	.980	1.62	2.57	2400	None	Meadow, clover	G. G. Smith, Flemington, Taylor
49	.295	.132	.935	3.35	3000	None	Corn, oats, timothy, clover	G. R. Underwood, Wellsburg, Brooke
50	.101	.643	.935	2.74	0	None	Corn, corn, watermelons	G. W. C. Scott, Sherman, Jackson
52	.099	.352	1.21	1.82	0	None	Corn, corn	G. W. C. Scott & Adams, Sherman, Jackson
62	.077	.039	.921	0.71	800	None	Corn, wheat	G. J. W. Miller, Mineral Wells, Wood
63	.136	.672	0.71	1.88	800	Some M, AP	Corn, wheat	G. E. J. Humphry, Belleville, Wood
73	.058	.046	0.71	0.82	2400	None	Corn, grass	G. H. T. Butcher, Mineral Wells, Wood
80	.148	.077	1.13	1.50	2200	AP, L, M, occasionally	Corn, wheat, timothy	G. I. Z. Swisher, Pt. Pleasant, Mason
86	.192	.056	1.37	2.07	3800	None	Old meadow	*P. M. McRedith, Fairmont, Marlon
88	.216	.062	1.25	2.16	1800	None	Corn, oats, meadow	G. L. D. Blake, Lost Creek, Harrison
100	.291	.068	1.37	3.12	3600	Some AP, M	Grasses, some clover	F. Jackson Arnold, Lost Creek, Harrison
101	.320	.092	1.61	2.56	2200	None	Corn	G. A. J. Lodge, _____, Harrison
103	.352	.071	1.40	2.42	1200	None	Grasses, pasture	F. A. A. Long Bros., Bridgeport, Harrison
154	.171	.065	2.06	1.64	4000	Some AP	Corn, clover, soybeans	G. Tyler Co. Farm, Middlebourne, Tyler
161	.182	.069	1.39	3.18	800	None	Corn, corn, clover	G. Chas. Kull, Moundsville, Marshall
164	.136	.054	0.85	3.18	0	Not	Corn, wheat, sweet clover	G. Thos. Scott, Moundsville, Marshall
168	.228	.108	0.72	3.33	300	Some AP, L	Potatoes, alfalfa	G. P. Burkle, Wheeling, Ohio
170	.164	.105	0.87	1.81	1900	None	Corn, clover	G. E. M. Williams, New Martinsville, Wetzel
176	.120	.081	0.93	3.46	0	Some M	Corn, meadow	G. J. W. Bills, St. Marys, Pleasants
182	.128	.080	1.30	1.17	2300	None	Bluegrass meadow	F. W. M. Hammond, Mole Hill, Ritchie
244	.123	.033	1.50	1.17	3000	None	Corn, clover	*F. Mrs. K. B. Cokeley, Harrisville, Ritchie
245	.127	.047	1.60	1.27	4200	AP yearly	Meadow, no clover	G. Irving Ingram, Elizabeth, Wirt
252	.132	.052	1.46	1.32	5400	None	Corn, clover	G. T. N. Erskine, Teays, Putnam
261	.116	.038	1.55	1.27	1200	None	Corn, for several years	G. Allen Workman, St. Albans, Kanawha
263	.122	.063	1.67	1.25	400	None	Milliet, grass	F. Mrs. W. S. Edwards, Millikin, Kanawha
268	.156	.049	1.66	2.60	1800	None	Corn, every year	G. D. Dickinson, Phillip, Barbours
288	.240	.074	1.68	2.64	6000	AP yearly	Iron, rag weeds	F. W. J. Strader, Beverly, Randolph
299	.153	.079	1.56	2.35	4000	None	Unknown	F. W. J. Strader, Beverly, Randolph
299a	.266	.079	1.53	2.62	4000	None	Corn, clover, wheat, timothy	G. E. H. Crouch, Huttonsville, Randolph
301	.199	.052	1.25	1.80	4800	Some M, AP	Corn, clover, wheat, meadow	G. E. H. Crouch, Huttonsville, Randolph
301a	.169	.035	1.01	1.47	4800	Some M, AP	Corn, every year	G. Hudson Heirs, New Cumberland, Hancock
254	.171	.064	0.64	2.46	2600	Some AP, M, L	Corn, every year	F. A. Stephenson, Clay, Clay
367	.196	.048	1.35	2.24	2600	M occasionally	Corn, wheat, timothy, clover	G. S. L. Dodd, N. Mountain, Berkeley
376	.136	.058	1.28	1.61	1900	Med amts M, AP, L	Corn, wheat, timothy, clover	G. S. L. Dodd, N. Mountain, Berkeley
377	.143	.075	1.15	1.65	1800	Med amts M, AP, L	Corn, wheat, timothy, clover	G. S. L. Dodd, N. Mountain, Berkeley
378	.117	.070	0.90	1.33	400	Med amts M, AP, L	Corn, wheat, clover	G. Tom Bowling, Spanishburg, Mercer
394	.172	.039	1.73	1.91	0	AP every 2 years	Corn, every year	*Mrs. J. W. Hatters, Kenova, Wayne
399	.159	.050	1.92	4.56	600	None	Corn, clover	F. W. T. Black, Myria, Lincoln
410	.063	.023	1.62	0.55	800	None	Corn, wheat, hay	F. County Farm, Hamlin, Lincoln
416	.133	.056	1.41	1.37	4400	Small amts M, L	Orchard	F. H. W. Miller, Griffithsville, Lincoln
414	.104	.056	0.90	0.97	3000	None	Corn every year	P. Ben Polly Farm, Danville, Boone
416	.168	.070	1.50	1.62	3200	None	Corn, wheat, hay	*R. D. Hersman, Spencer, Roane
424	.133	.062	0.70	1.19	2800	Med amts M, AP	Corn, oats, grass	*F. A. D. Adams, Etam, Preston
429	.249	.084	1.47	3.01	1600	Some AP	Clover, potatoes, corn, oats	F. C. L. Jones, Parsons, Tucker
431	.203	.072	1.15	2.13	3000	Med amts M, AP, L	Corn, oats, hay	F. C. L. Crim, Gormanita, Grant
431	.193	.065	1.02	2.86	3000	Small amts M, AP	Meadow	*P. Wolverton Heirs, Grantsville, Calhoun
460	.172	.052	1.09	1.99	2400	M occasionally		

HUNTINGTON SERIES (Continued)

No	Percentage of Elements				Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield	Owner, Address, and County
	N	P	K	C			
465	.190	.089	0.83	1.96	None	Meadow, corn	G. F. L. Hays, Arnoldsburg, Calboun
471	.335	.052	0.96	4.03	None	Meadow	*P. C. R. Lilly, Ghent, Raleigh
475	.132	.045	1.02	3.40	None	Meadow	G. Bill Brewer, McGraw, Wyoming
482	.062	.027	0.51	0.84	M every 2 years	Corn, mostly	P. Pocahontas Fuel Co., Pageton, Wyoming
Ave.	.169	.062	1.26	2.08			

MOSHANNON SERIES

51	.107	.052	1.08	1.13	2400	None	Corn, wheat, clover, timothy	G. Virgil Bowser, Crow Summit, Jackson
53	.083	.044	1.25	0.84	2600	None	Corn, grass	F. F. A. Morgan, Ravenswood, Jackson
54	.107	.048	1.21	1.19	1400	None	Corn, clover, grass	F. F. A. Morgan, Ravenswood, Jackson
78	.165	.036	1.95	1.58	5200	None	Corn, grain, timothy	F. John McCausland, Buffalo, Mason
96	.172	.061	1.63	1.52	3800	Some M, AP, L	Corn, oats, grass	L. N. Beatty, Mannington, Marion
102	.121	.043	1.24	1.02	1800	Some M, AP	Corn, wheat, timothy, clover	F. C. S. Kalt, Crow Summit, Jackson
116	.171	.051	1.23	1.82	2700	Some M, AP, L	Corn, wheat, clover	F. J. S. McNeal, Hillsboro, Pocahontas
194	.292	.100	1.44	1.69	0	Some M, AP, L	Corn, wheat, grass	G. H. Anderson, Franklin, Pendleton
253	.149	.058	1.25	1.62	1800	None	Meadow	L. E. Finharty, Elizabeth, Wirt
254	.115	.049	1.26	1.26	3600	None	Meadow	F. C. E. McCoy, Elizabeth, Wirt
305	.211	.043	1.06	2.68	7600	Some M, AP	Corn, wheat, clover, grass	G. E. Smith, Buckhannon, Upshur
312	.157	.059	1.23	1.81	0	Some M, AP	Corn, hay	R. S. Reger, Buckhannon, Upshur
313	.175	.057	1.28	1.95	6200	Some M, L	Corn, hay, clover	W. H. Young, Buckhannon, Upshur
319	.167	.063	1.60	1.66	8000	None	Bluegrass meadow	Geo. White, Freemansburg, Lewis
322	.168	.042	1.00	1.96	4800	AP, L once	Corn, corn	F. J. C. Shaver, Heaters, Braxton
331	.196	.057	1.37	1.97	4600	None	Unknown	J. C. Hoover, Webster Springs, Webster
344	.145	.051	1.02	1.66	2800	None	Bluegrass pasture	*F. N. G. Moore, Orlando, Gilmer
348	.111	.041	1.03	1.03	600	Some M	Meadow	G. W. A. Leatherman, Keyser, Mineral
370	.113	.041	0.83	1.06	0	Med ams M, AP, L	Corn, wheat, clover	F. State Hospital, Spencer, Roane
427	.111	.062	1.41	1.30	0	Med ams M, L	Truck crops	G. J. W. Minear, St. George, Tucker
430	.220	.074	1.35	2.19	2400	Some M, AP	Corn, grain, timothy, clover	F. Floyd Bell, Glenville, Gilmer
452	.137	.056	1.35	1.76	3000	Med ams AP, M	Corn, wheat, meadow	
Ave.	.154	.055	1.27	1.57	3000			

RIVER FLOOD PLAINS PROVINCE

First Bottom

POPE SERIES

July, 1924]

ANALYSES W. VA. SOILS

23

292	.216	.052	1.37	2.54	7200	Med amts	M, AP	Corn, clover	F R. S. C. Green, Philippi, Barbour
309	.155	.034	1.14	2.08	10000	None		Sage grass, weeds	P R. G. Smith, Rock Cave, Upshur
314	.265	.076	1.33	3.24	9600	Some L		Corn, hay, clover	G H. Carper, Buckhannon, Upshur
330	.164	.081	0.75	1.84	3600	None		Not cultivated	J. C. Shaver, Heaters, Braxton
334	.167	.057	0.61	1.97	1000	Some L		Corn, grain	* F Brewster Estate, Holly, Braxton
340	.068	.030	0.65	0.91	3600	Some M, AP		Hay, weeds, grasses	F J. F. Miller, Cowen, Webster
341	.272	.059	1.41	3.19	4200	None		Not cultivated	W. H. Cunningham, Webster Spr'gs, Webster
Ave.	.186	.055	1.03	2.25	5600				

MISCELLANEOUS SOILS

11	.075	.031	0.95	0.88	800	Mixed fert & L	once	Tomatoes, wheat, clover	F M. R. Henry, Stodiers Cross Roads, Morgan
20	.324	.038	0.37	8.78	3800	Unknown		Orchard	F Ed. Leatherman, Keyser, Mineral
22	.144	.103	2.83	1.58	1800	Some M		Corn, wheat, clover	F C. R. Norris, Martha, Cabell
25	.121	.071	2.57	1.45	1800	400 lbs	4-10-8 yearly	Orchard	G John Miller, Martinsburg, Berkeley
27	.215	.085	2.01	1.24	1400	Some M & comp fert	4-8-7	Orchard	P Gray Silver, Martinsburg, Berkeley
30	.123	.065	1.96	1.24	1800	Some M		Corn, oats, wheat	P O. Aler, Martinsburg, Berkeley
31	.085	.037	1.08	1.01	200	Some M		Orchard	G A. R. Feitner, Martinsburg, Berkeley
34	.127	.066	1.57	1.30	3000	Some M		Orchard	P Dr. Shipper, Martinsburg, Berkeley
35	.130	.088	1.95	0.90	2400	Some AP		Corn, clover, grass	F Geo. Schroades, Martinsburg, Berkeley
41	.106	.074	0.60	1.33	5000	None		Unknown	E. P. Foster, Gauley Bridge, Nicholas
44	.255	.079	1.10	2.85	6800	None		Meadow	* F L. E. McClung, Rupert, Greenbrier
45	.184	.035	0.85	1.32	4000	Some M, AP		Corn, grain, hay	F J. O. McClung, Rupert, Greenbrier
46	.141	.058	0.69	1.42	2600	None		Unknown	F D. Tuckwiller, Lewisburg, Greenbrier
48	.116	.061	1.62	1.45	5600	None		Pasture, swamp grass	* P R. T. Bradberry, Sherman, Jackson
68	.199	.046	1.23	2.28	1600	Some M, AP		Corn, wheat, timothy, clover	F L. E. Moore, Huntersville, Pocahontas
117	.161	.074	1.38	1.66	3300	Heavy M, AP		Corn, grain, clover, alfalfa	G W. G. Cochran, Onoto, Pocahontas
119	.080	0.85	2.33	4900	Med amts AP, M			Corn, grain, clover	G Uriah Heavener, Boyer, Pocahontas
122	.274	.086	1.46	2.80	5400	None		Bluegrass, red top	F Mr. White, Lewisburg, Greenbrier
125	.133	.064	0.76	1.59	2000	None		Corn, wheat, clover, timothy	F J. E. Hansbarger, Peterstown, Monroe
128	.182	.070	2.09	1.58	3100	None		Corn every year	F J. E. Hansbarger, Peterstown, Monroe
129	.216	.090	1.96	1.93	2100	Med amts AP, M		Corn, wheat, clover, timothy	G J. Grimmett, Buck, Summers
130	.134	.028	0.99	1.32	2700	Some AP, L, M		Corn, grain, clover, timothy	F T. G. C. Grimmett, Buck, Summers
134	.128	.059	0.56	1.40	2500	Some M, AP		Corn, wheat, clover, timothy	F T. W. Serrell, Forest Hill, Summers
139	.130	.043	0.95	1.18	2500	Some comp fert		Red top, swamp grass, timothy	* N. T. Nutter, Persinger, Nicholas
140	.118	.028	0.91	0.89	3000	Some comp fert		Meadow	* K. B. McCue, Muddlety, Nicholas
142	.091	.031	0.81	0.89	3000	None		Red top, grass	F Dr. C. McGary, Wheeling, Ohio
149	.281	.054	1.05	3.36	6100	None		Corn, wheat, clover, timothy	F A. C. Boggess & Son, Harman, Pendleton
152	.244	.057	1.49	2.81	6300	None		Corn, wheat, meadow	F C. E. Hedrick, Harman, Pendleton
171	.194	.093	0.87	2.01	6700	Some AP, L, M		Bluegrass sod	F J. F. Bennett, Franklin, Pendleton
190	.172	.083	1.92	0.81	1200	Med amts AP, L		Corn, wheat, clover, timothy	G S. B. McClung, Franklin, Pendleton
191	.081	.025	1.52	0.56	1300	None		Corn, wheat, clover, timothy	G O. R. Mallow, Franklin, Pendleton
193	.043	.022	1.50	0.21	2300	Med amts AP, M		Corn, grain	G H. Whiting, Shepherdstown, Jefferson
197	.152	.053	1.75	0.78	2800	None (muck soil)			
198	.104	.068	2.04	0.84	400	Med amts AP, M			
204	.185	.053	1.26	1.07	0	Some M			

MISCELLANEOUS SOILS (Continued)

Soil No	Percentage of Elements			Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield	Owner, Address, and County
	P		C			
206	.101	.042	7.54	0.55	Poverty grass	C. N. Stuckey, Martinsburg, Berkeley
208	.128	.030	2.67	0.59	Corn, wheat, clover, grass	William Linton, Jones Springs, Berkeley
210	.136	.034	1.10	0.80	Corn, wheat, clover	G. M. Knott, Shepherdstown, Jefferson
213	.121	.047	3.11	1.10	Corn	E. Vannorsella, Berkeley Springs, Morgan
221	.122	.068	2.24	1.04	Barren soil	J. W. Hovensale, Berkeley Springs, Morgan
223	.145	.040	1.36	1.23	Corn	Sleepy Cr. Or. Co., Berkeley Sprs, Morgan
226	.105	.030	1.44	0.69	Orchard grass, crimson clover	C. F. Miller, Cherry Run, Morgan
227	.184	.093	2.07	0.87	Tomatoes, corn, wheat	W. S. Funkhouser, Moorefield, Hardy
230	.147	.056	1.62	0.94	Orchard	G. Methias, Methias, Hardy
231	.099	.035	1.63	0.45	Corn, wheat, clover	F. Snyder, Wardensville, Hardy
233	.538	.071	1.31	2.99	Corn, grass	*P State Farm, Wardensville, Hardy
234	.074	.024	0.71	0.43	Grass, weeds	*P State Farm, Wardensville, Hardy
235	.108	.037	0.92	0.61	Corn, grass	*P State Farm, Wardensville, Hardy
236	.260	.063	1.28	1.45	Corn	G. Bosley, Moorefield, Hardy
237	.195	.051	2.20	0.96	Corn, wheat, grass	H. Cunningham, Moorefield, Hardy
238	.292	.072	2.38	1.37	Corn, wheat, clover	A. Workman, St. Albans, Kanawha
267	.166	.114	1.43	1.86	(Soil along river)	A. M. Allender, Grafton, Taylor
283	.161	.048	0.92	1.95	Not cultivated	W. D. Zinn, Philippi, Barbour
291	.153	.066	1.19	1.80	Corn, rye, vetch, clover	A. H. Bolyard, Philippi, Barbour
294	.088	.032	0.66	1.69	Rough stony land	Elkins, Randolph
296	.124	.057	0.97	1.52	Corn, grain, clover	H. W. Hutton, Huttonsville, Randolph
300	.148	.037	2.00	1.14	Weeds, grass	F. P. Marshall, Mingo, Randolph
302	.267	.065	1.13	2.75	Corn, grass	F. J. H. Bailey, Weston, Lewis
321	.244	.172	1.03	5.21	Garden, truck crops	F. L. D. Smith, Cowen, Webster
336	.238	.055	1.10	3.12	Corn, wheat, grass	*P F. Smith, Cowen, Webster
338	.491	.149	0.90	5.98	Moss, weeds	G. W. A. Leatherman, Keyser, Mineral
371	.489	.097	1.80	5.27	Corn, wheat, clover	G. S. H. Williams, Romney, Hampshire
381	.153	.054	0.64	1.23	Corn, wheat, clover	Mr. Taylor, Romney, Hampshire
382	.279	.066	0.58	3.77	Orchard	G. S. H. Williams, Romney, Hampshire
383	.159	.076	0.70	1.41	Corn, wheat, hay	Romney, Hampshire
384	.107	.016	1.37	2.03	Grass, clover	*P Mr. Johnson, Princeton, Mercer
391	.133	.023	0.77	1.55	Potatoes	F
423	.112	.046	1.03	1.19	Meadow, some clover	F
440	.257	.045	0.57	6.55	Corn, oats, clover	F
484	.297	.116	1.28	1.84	Meadow, some clover	F
Ave.	.178	.058	1.44	1.83		F

TABLE III.—Average Content of Nitrogen, Phosphorus, Potassium, and Carbon, and the Average Lime Requirement of the Important Soils in West Virginia.

Soil Series	Analyzed Samples	Percentage of Elements				Average CaCO ₃ Lbs. per Acre	Remarks
		Average					
		N	P	K	C		
Brooke	7	.176	.064	1.71	1.87	1800	Good soil
Hagerstown ..	30	.139	.062	2.48	1.11	500	Good soil
Huntington	51	.169	.062	1.26	2.08	2400	Good soil
Moshannon	22	.154	.055	1.27	1.57	3000	Good soil
Westmoreland ..	11	.194	.073	1.54	2.01	2300	Good soil
Wheeling	13	.149	.104	1.10	1.61	2100	Good soil
Dekalb	151	.137	.043	1.11	1.65	3200	Poor to fair soil
Meigs	26	.128	.043	1.25	1.36	3100	Poor to fair soil
Holston	36	.129	.047	1.06	1.43	2800	Poor to fair soil
Tyler	16	.137	.046	1.14	1.38	3200	Poor to fair soil
Upshur	39	.146	.046	1.48	1.56	3100	Fair soil
Elk	6	.142	.045	1.00	1.53	1600	Fair soil
Pope	7	.186	.055	1.03	2.25	5600	Fair soil
Miscellaneous Soils	70	.178	.058	1.44	1.82	2300	
Weighed Ave.	485	.150	.052	1.31	1.65	2700	

Soil fertility problems can not always be solved in a short time. Several years of field investigation may be necessary to determine the limiting factors. However, the conclusions in this report should not be very far from correct because of the large number of soils studied. The correlation between the amounts of plant nutrient elements in the soil with the fertility is important both from a scientific and a practical viewpoint.

In general, the data indicate that the availability of the plant nutrients is proportional to the amounts of the elements in the soil and to the degree to which good soil management is practiced. Most crops are indirectly dependent for a large part of their nutrients upon the decomposition of roots, stems, leaves and other forms of organic matter in the soil. The nutrients in the organic matter are made available during the process of decomposition, and the carbon dioxide evolved aids in the solution of mineral matter. There is to a certain extent a rotation of the nutrients from one crop to another. Frequent and liberal applications of farm manures, green manures, and other forms of organic matter are highly recommended to help maintain the supply of available plant nutrients in the soil.

It must be recognized that maximum crops can not be produced on soils which are low in phosphorus and nitrogen, unless these are added in a form which can be easily utilized by the plants. This is true for potassium and lime also. If the soil is very acid no permanent improvement can be made without the addition of lime. It should be understood, however, that lime alone will not restore the fertility to all acid soils. Lime will correct the acidity and make the soil more active, but it does not supply any of the other plant nutrients that may be deficient. Under a careful system of crop rotation, including a legume every two or three years, the greater part of the nitrogen may be supplied from the atmosphere, but the phosphorus, potassium, and lime must be added in case they are deficient. When clovers fail, very likely the soil needs lime and phosphates.

Recent investigations¹ show that the value of the crop yields on many of the soils in West Virginia is less than the cost of production. In order to avoid this loss, the farmer will have to adopt a system of crop rotation including more legumes, a more economical use of farm manures and the use of liberal amounts of phosphate fertilizers and lime. Many of the less productive soils will give profitable returns with the use of complete fertilizers.

SUMMARY AND CONCLUSIONS

The content of nitrogen, phosphorus, potassium, and carbon, and the lime requirement of 485 soil samples representing the important series in West Virginia have been determined. The general fertility and conditions of these soils are discussed. The results may be summarized as follows:

1.—The soils derived from sandstone and shale have a lower content of nitrogen and phosphorus than do the soils derived from limestone. The sandstone and shale soils are more acid and less fertile than the limestone soils.

2.—About 50 per cent of the Dekalb and Meigs series, and about 33 per cent of the Tyler, Holston, and Upshur series have less than .04 per cent phosphorus. These soils are of low fertility.

3.—More than 45 per cent of the Dekalb, Meigs, Upshur, and Holston soils contain less than .12 per cent nitrogen. In general, the nitrogen is in proportion to the organic carbon in all the soils studied; it is about 8 to 10 per cent of the carbon for most of them.

¹Unpublished data, Department of Farm Economics, W. Va. Agr. Exp. Sta.

4.—More than 90 per cent of all the sandstone and shale soils are acid, and are not very fertile. An average of 3000 pounds of lime per acre is required to neutralize the acidity of the sandstone and shale soils.

5.—Poor drainage conditions, no doubt, limit the productivity of many of the soils in the state. This is particularly true with some of the Tyler and Holston soils.

6.—All of the soils average 1 per cent potassium or more. A few sandy ones are low in potassium. Many of these sandy soils and others which are low in organic matter will probably respond to potash fertilizers.

7.—There is a fairly good correlation in all the soils studied between the nitrogen, phosphorous, the carbon, the lime requirements, and the fertility. In general, the higher the nitrogen and phosphorus, and the lower the lime requirement, the higher is the fertility.

8.—Most of the sandstone and shale soils respond to acid phosphate, nitrates, manures, and lime. These soils comprise over 80 per cent of the soils in West Virginia.

9.—The Brooke, Hagerstown, Westmoreland, Huntington, Mo-shannon, and Wheeling soils are in general more fertile and less acid than the sandstone and the shale soils. The first three soils have a limestone origin; the last three are river flood plain soils, but contain some material washed from limestone formations.

10.—The limestone soils contain an average of .06 per cent phosphorus or more, and about .15 per cent nitrogen. The potassium in the Hagerstown soils averages much higher than in the other soils, but the organic carbon is lower.

11.—Soils which contain less than .12 per cent nitrogen, and less than .04 per cent phosphorus have, in general, a low fertility. There are, however, many soils in the state which contain much higher amounts of nitrogen and phosphorus, and are still unfertile.

12.—Lime, acid phosphate, and nitrogenous fertilizers will very likely give profitable returns on most of the sandstone and shale soils, and in many cases also on the limestone soils.