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Soil Survey
of
Randolph County, West Virginia

By

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United States Department of Agriculture, in Charge

and

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Bureau of Chemistry and Soils

In cooperation with the
West Virginia Geological Survey and the
West Virginia Agricultural Experiment Station

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SOIL SURVEY OF RANDOLPH COUNTY, WEST VIRGINIA

By B. H. WILLIAMS, United States Department of Agriculture, in Charge, and H. M. FRIDLEY, West Virginia Geological Survey

COUNTY SURVEYED

Randolph County is in the east-central part of West Virginia (fig. 1). It comprises an area of 1,036 square miles, or 663,040 acres, along the eastern edge of the Appalachian Plateau, extending westward from the crest of the Allegheny Mountains. It is very irregular in outline. The maximum length from northeast to southwest is 65 miles, and the greatest width (33 miles) is near the center.

The greater part of the county is included in three massive mountain ranges. A deeply dissected plateaulike area, about 10 by 30 miles in extent, occupies the western and southwestern parts. The main ranges parallel each other and extend in a northeast-southwest direction. Most of the valleys are narrow, steep-sided, and V-shaped, and some of the streams flow through almost perpendicular walled rock- and boulder-strewn gorges. The one exception is the Tygart River Valley with its northern extension along Leading Creek. These streams have reached an approximate temporary base level, and the valley floors average nearly 1 mile wide through the greater part of the county.

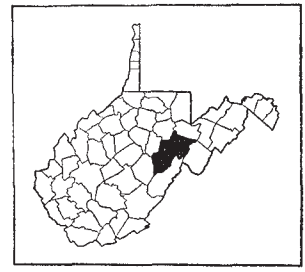

FIGURE 1.—Sketch map showing location of Randolph County, W. Va.

Tygart River drains the northwestern and central parts of the county; the several tributaries of Cheat River the eastern part; and Buckhannon, Elk, and Gauley Rivers the southwestern part. All the streams flow northward, except Elk and Gauley Rivers which flow westward.

The lowest point in the county, approximately 1,750 feet above sea level, is where Tygart River passes into Barbour County, and the highest point, 4,760 feet, is on the Allegheny Mountains in the northeastern corner. The rugged rock-strewn crests of Allegheny, Cheat, Shavers, McGowan, Elk, and Gauley Mountains rise to heights of more than 4,000 feet. Rich Mountain, west of Tygart River Valley, at its southern end reaches an elevation of about 3,750 feet, but the elevation decreases gradually northward to 3,000 feet just above the gap cut by Tygart River which separates this mountain from its northern extension—Laurel Ridge. This ridge decreases

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in height northward to about 2,500 feet at the Barbour County line. The comparatively smooth rounded top of Middle Mountain in the eastern part of the county ranges from 3,200 to 3,760 feet in elevation. The tops of the ridges and knobs of the deeply dissected plateau in the western part drop from an elevation of 3,734 feet on Whitman Knob at the headwaters of Left Fork Buckhannon River to 2,340 feet at a point west of Norton near the Barbour County line. The slopes of Rich Mountain and Middle Mountain are comparatively smooth, only the points and knobs that attain elevations ranging from 3,800 to more than 4,000 feet being rough and rocky.

Tygart River Valley has an elevation of 1,940 feet above sea level at Elkins, with an imperceptible rise to 2,400 feet at Valley Head, 30 miles to the south. An equal distance along Shavers Fork of Cheat River, from the point where it crosses the southern boundary of the county, to Bowden, shows a total drop of more than 1,500 feet, but north of Bowden the fall is somewhat more gradual. All the other major streams have approximately the same rapid fall as has Shavers Fork.

At one time some of the vast amount of water power was used locally by small gristmills and sawmills, but only three gristmills operated by water power were observed during the course of this survey.

In practically all places lying at elevations of more than 3,000 feet, spruce and hemlock were originally the predominant tree growth, together with some mountain maple, sugar maple, birch, and Appalachian cherry (*Prunus pennsylvanica*). Between this and the 2,500-foot elevation, beech, sugar maple, and chestnut were dominant, with some water maple, red oak, and white oak. Below an elevation of 2,500 feet, red, white, and chestnut oaks predominate, together with some chestnut, hickory, water maple, black walnut, butternut, tuliptree, black locust, and yellow locust. Black walnut and butternut are more abundant on soils derived from calcareous rocks. Rhododendron, mountain-laurel, and huckleberry are the principal shrubs, and they grow at all elevations where soil and light conditions are favorable. Blackberry, greenbrier, and wild grape are the principal vine and brambles. Wild grapevines grow in very few places above an elevation of 3,500 feet. Fern, bracken, and numerous mosses grow in abundance at all elevations, provided moisture conditions are favorable.

Immediately following timber cutting, blackberry comes in profusely, together with much fern and bracken on the higher elevations. Even where spruce and hemlock were originally dominant, the hardwoods are the first to reestablish themselves, in many places almost to the exclusion of the conifers, especially if forest fires follow lumbering operations. However, where care is used to protect the young spruce while lumbering is in progress and fires are kept out, these trees will reestablish themselves after a few years. Little or no grass grows in the virgin timber areas. The sedges and so-called "moonshine" grass (*Danthonia spicata*) are the principal native grasses. Moonshine grass establishes itself almost to the exclusion of others in places where the forest growth is sufficiently open or in clearings. On soils derived from calcareous rocks and some of the

heavier soils derived from noncalcareous rocks, bluegrass rapidly establishes itself if there is sufficient seed to give it a start.

Randolph County was established in 1786 by an act of the Virginia Assembly. The earliest settlers, two families, arrived in Tygart River Valley in 1753 and located near the site of the present town of Beverly;[1] but this settlement was not permanent, the settlers either being killed or forced to move on account of Indian hostilities. It was not until 1772 that successful attempts at settlement were made. These second settlements were also made near the present site of Beverly, and a fort was built one-fourth mile south of the present town site. Within a few years all the land in Tygart River Valley was taken up and rapidly settled by colonists from Maryland, Pennsylvania, and eastern Virginia. The present population is largely native white and descended from the early settlers. Recent immigration has been largely to Elkins and the coal-mining sections. Only a very small percentage of the population is Negro, foreign born, or of foreign extraction.

On May 28, 1787, the first county court was held at a point 4 miles north of Beverly, and it was voted to move the court to the present site of Beverly. Here the seat of county government remained until about 1898, when it was moved to its present location in Elkins.

Elkins, the largest town and county seat, has, according to the 1930 census report, a population of 7,345. Beverly, Mill Creek, Norton, and Coalton are important towns, each having a population of less than 1,000. Numerous villages and local trading points are scattered throughout the county. Lumber operations are still in progress at Ellamore and Suncrest. Norton, Coalton, Harding, Mabie, Cassity, and Weaver in the western part were built largely on coal-mining operations and are mainly supported by this industry. Huttonsville, Elkwater, Valley Head, Valley Bend, and Mingo are local trading points for the Tygart River Valley farming section.

The total population is given by the 1930 census as 25,049 which shows a decrease of 1,755 since 1920. Between 1880 and 1910 the population increased about 250 percent, owing largely to the rapid utilization of natural resources and industrial development. The falling off of population in the last decade may be attributed largely to the closing out of many of the larger lumbering operations, which made it necessary for the many hundreds of lumber-company employees to seek new locations.

Randolph County is served by two railroads, the Western Maryland and the Baltimore & Ohio. Short lines operated by lumber companies connect with these main lines to serve certain sections. Many of the short lines are removed as the timber resources are exhausted, but some have been taken over by the railroad systems and added as branch or feeder lines. Motor busses, for passenger service, radiate to points outside the county. About 125 miles of State highways have been completed within this county, additional construction is under way, and other routes have been surveyed. Owing to the rough and mountainous character of the land, the extensiveness of the county, and meager sources of income, many of

[1] MAXWELL, H. HISTORY OF RANDOLPH COUNTY, WEST VIRGINIA. 531 pp., illus. Morgantown, W. Va. 1907.

the county roads are in poor repair and are practically impassable to motor vehicles at certain times of the year.

Tygart River Valley, which is the center of the rural population, is fairly well supplied with telephone connections, but other parts have very poor telephone service or none at all. Schools and churches are available to all rural communities. The more thickly settled sections near the small towns and villages have the advantage of 2- or 4-year high schools, and many students from the rural sections enroll in the Elkins High School. Davis and Elkins College, located in Elkins, gives local opportunities for education beyond the high-school grade.

Coal mining and lumbering are the basic industries. Specialized woodwork and building-material finishing plants and practically all other industries, other than agriculture, are located in Elkins. The principal ones are tanning, founding and welding, the Western Maryland Railway machine and repair shops, the manufacture of concrete building blocks, refrigerator manufacturing, creamery and dairy products, and feed and flour mills. Considerable sandstone has been quarried for local use, and a number of limestone quarries are in operation for agricultural lime, road ballast, and limestone for mixing concrete. Elkins is also the warehousing and wholesaling center for Randolph and surrounding counties.

CLIMATE

The climate is continental, temperate, and healthful. The winters are cold and rather severe, with strong winds to accentuate the coldness on the higher mountains. The temperature is somewhat milder in the protected valleys. The summers are warm but comparatively short. Hot spells are infrequent and last for only a short time, the temperature seldom being as high as 90° F. The nights during summer, even in the hottest weather, are cool, and light frosts may occur on some of the higher mountains in every month of the year. Zero temperatures or below prevail for only short periods.

The average annual precipitation—64.18 inches at Pickens and 44.93 inches at Elkins—is well distributed throughout the year. The heaviest rainfall occurs during the spring and summer, when it is most needed by growing crops and pastures. The much greater rainfall at Pickens is in all probability due to the high barrier formed by Point Mountain and Rich Mountain, that cuts off the moisture from Tygart River Valley. Unofficial reports say that similar high rainfall occurs on the western slope of Allegheny Mountain in the eastern part of the county. According to Weather Bureau reports from stations at Moorefield, in Hardy County, and Brandywine, in Pendleton County, the annual precipitation is little more than half of that on the western slopes of the high mountains, including the Alleghenies and those farther west of these stations. The driest spring and summer months on record at Pickens and Elkins stations show a precipitation of 24.61 and 16.70 inches, respectively, which is approximately 10 inches below normal, yet is sufficient to prevent severe damage to crops from drought. Fall is the driest season, but the average amount of rainfall furnishes sufficient moisture to keep the pastures green until frost. Overflows of bottom lands usually occur in the spring before planting time.

The average annual snowfall at Pickens is 101 inches and about half that amount at Elkins. Light snows have been known to occur in May and October. Practically all the snowfall remains on the ground until spring, except in the open lands of Tygart River Valley. The average date of the latest killing frost at Elkins is May 2, and of the earliest is October 13, giving Elkins and vicinity an average frost-free season of 164 days. The average frost-free period at Pickens and vicinity is 19 days shorter. Prevailing winds are from the west.

Climatic conditions in the mountains are such that the growing season is favorable only for crops that mature within a minimum number of warm or hot days, but they are excellent for growing grass and for cattle and sheep grazing. Tygart River Valley with its higher temperatures is more favorable for corn growing.

Tables 1 and 2 contain data from the records of the United States Weather Bureau stations at Elkins and Pickens which are situated, respectively, at elevations of 1,947 and 2,697 feet above sea level.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Elkins, Randolph Co., W. Va.*

[Elevation, 1,947 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1930)	Total amount for the wettest year (1907)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	32.7	71	−28	3.46	3.63	3.41	10.1
January	30.4	78	−20	3.78	1.55	8.93	12.7
February	31.6	74	−21	3.08	2.78	2.87	11.5
Winter	31.6	78	−28	10.32	7.96	15.21	34.3
March	40.0	84	−3	3.80	3.47	4.75	7.8
April	48.8	88	14	3.62	3.16	3.90	4.2
May	59.2	92	25	4.05	1.98	3.21	(1)
Spring	49.3	92	−3	11.47	8.61	11.86	12.0
June	66.9	95	33	5.06	3.80	7.26	0
July	70.3	94	41	5.38	3.01	11.10	0
August	69.1	99	41	3.86	1.28	5.27	0
Summer	68.8	99	33	14.30	8.09	23.63	0
September	63.0	92	26	3.15	1.44	7.10	0
October	52.3	87	16	2.91	.82	3.73	.6
November	40.3	78	5	2.78	1.46	3.84	4.4
Fall	51.9	92	5	8.84	3.72	14.67	5.0
Year	50.4	99	−28	44.93	28.38	65.37	51.3

[1] Trace.

TABLE 2.—*Normal monthly, seasonal, and annual temperature and precipitation at Pickens, Randolph Co., W. Va.*

[Elevation, 2,697 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1879)	Total amount for the wettest year (1926)	Snow, average depth
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	31.9	72	−20	5.48	6.44	10.57	22.8
January	30.7	80	−16	6.43	3.13	7.74	23.9
February	31.7	80	−24	5.27	3.15	7.26	20.6
Winter	31.4	80	−24	17.18	12.72	25.57	67.3
March	39.5	87	−4	5.88	5.48	9.82	15.3
April	48.2	89	8	5.21	1.09	5.54	7.4
May	57.1	95	23	5.40	3.70	3.57	.1
Spring	48.3	95	−4	16.49	10.27	18.93	22.8
June	64.9	95	33	6.16	4.57	4.14	.1
July	68.4	96	38	6.32	6.13	6.12	0
August	66.5	92	39	5.39	3.64	8.73	0
Summer	66.6	96	33	17.87	14.34	18.99	.1
September	61.7	94	26	4.15	2.63	10.26	0
October	51.6	89	14	4.24	1.64	6.90	1.4
November	40.2	79	0	4.25	3.07	3.76	9.4
Fall	51.2	94	0	12.64	7.34	20.92	10.8
Year	49.4	96	−24	64.18	44.67	84.41	101.0

AGRICULTURE

H. Maxwell, in his history of Randolph County, in giving a list of property left by a family who had been massacred by Indians about 1781, mentions corn, wheat, rye, hogs, cattle, and sheep. Grain and livestock were at that time, without doubt, the mainstays of the earliest settlers, and they have remained so. The first lands to be cleared were the smooth lands of Tygart River Valley, and, as the demand for land increased, the adjacent hills and small valleys were cleared. Later settlers took up land farther back in the mountains, which was suitable mainly for grazing. Between 1845—the date of the construction of the Staunton and Parkersburg turnpike through the county—and 1870, the grazing and farm lands were extended to about their present acreage.

Because this section was practically cut off from the trails of the great western migration of settlers that passed through counties to the north, Randolph County developed a self-sufficing type of agriculture, with little market outlet for farm produce. Because of the nearly impassable mountain trails and the long distances to markets, the farmers found it necessary to market all their surplus crops in the form of livestock that could be driven overland to the point of sale.

Since 1880 the acreage in cultivated crops and hay, according to census reports, has been fairly constant, although there has been some fluctuation from year to year in the acreages of the different

crops grown, and there has been a marked increase in the acre yields in the last two decades.

The present-day agriculture consists principally of the production of hay, corn, wheat, potatoes, and oats; the raising of sheep and cattle; and the fattening of beef cattle for market.

Table 3 gives the value of the different classes of crops and livestock products for 1929 as reported by the Federal census.

TABLE 3.—*Value of agricultural products, by classes, in Randolph County, W. Va., in 1929*

Crop	Value	Livestock and products	Value
Cereals	$308,896	Value of domestic animals, chickens, and bees	$1,346,527
Other grains and seeds	812	Butter, cream, and whole milk sold	135,520
Hay and forage	328,551	Butter churned	99,698
Vegetables (including potatoes and sweetpotatoes)	199,174	Wool and mohair	34,041
Fruits and nuts	24,543	Poultry raised	92,173
All other field crops	262	Chicken eggs produced	130,818
Farm garden vegetables for home use	164,536	Honey produced	3,611
Forest products cut on farms	136,130	Total	1,842,388
Total	1,162,904	Total agricultural products	3,005,292

Table 4 gives the acreage and production of the principal crops in 1929.

TABLE 4.—*Acreage and yields of the principal crops in Randolph County, W. Va., in 1929*

Crop	Acres	Yield	Crop	Acres	Yield
		Tons			*Bushels*
Hay	22,192	22,619	Rye	51	865
			Buckwheat	624	11,420
Corn:		*Bushels*	Potatoes	1,155	140,050
Harvested for grain	5,270	206,761			
				Trees	
		Tons	Apples	86,633	14,390
Cut for silage	369	3,054	Peaches	3,225	440
Cut for fodder	24	-------			
Hogged or grazed off	10	-------		*Vines*	*Pounds*
			Grapes	2,897	14,329
		Bushels			
Wheat	1,014	15,830		*Acres*	*Quarts*
Oats:			Blackberries	34	17,218
Threshed	2,299	66,396	Raspberries	11	3,870
Cut and fed unthreshed	694	-------	Strawberries	7	6,718

Hay occupies by far the largest acreage of any crop, in fact, more than all other crops combined, and corn ranks second in acreage. All the crops grown are fed to horses, cattle, hogs, and sheep. The sale of cattle, sheep, and wool is the main source of revenue. The horses are used for farm work, and the hogs are butchered for home use and local markets. Apples, peaches, pears, plums, and small fruits are grown for home use, and some apples and small fruits are sold locally.

Only small acreages of wheat are grown outside of Tygart River Valley and Leading Creek Valley. Buckwheat and oats are grown largely on the hill and mountain farms. Soybeans are gaining favor with dairymen but are grown only in small patches, and potatoes are grown only in sufficient quantities to supply local needs. Some inter-

est is developing in cooperative marketing of potatoes in the nearby markets of Fairmont and Clarksburg. All other garden crops are grown principally for home use, and any surplus is sold locally. Small patches of beans, tomatoes, and other garden crops are grown on the outskirts of Elkins to supply a part of the local summer trade.

Of the 22,192 acres devoted to hay, 12,096 were in timothy and clover, mixed, 169 acres in clover alone, 41 acres in alfalfa, 8,669 acres in other tame grasses, 116 acres in legumes cut for hay, and 1,055 acres in wild grasses. Hay classed as other tame grasses includes principally redtop and some orchard grass. A number of meadows support a rather heavy stand of crowfoot grass which furnishes a fairly heavy yield of coarse hay. If meadows are allowed to run too long without plowing and reseeding, weeds multiply rapidly and lower the quality of the hay. Much of the hill and mountain land is in permanent pastures, especially in the eastern part of the county, extending high up the slopes of Cheat and Rich Mountains above Tygart River Valley. Much of the pasture land is in bluegrass or a mixture of this and other tame grasses. On soils derived largely from noncalcareous rocks, moonshine grass is the dominant volunteer growth in pastures, and although this grass does not rank so high in food value as bluegrass, it furnishes fairly good grazing. A small acreage of it is cut for hay.

Of the 13,832 cattle reported by the 1930 census, about 30 percent are classed as dairy cattle. Most of the beef cattle are grades of the improved breeds, principally Hereford and Aberdeen-Angus, with some Shorthorn, although there are a few small herds of purebred Hereford and Aberdeen-Angus cattle. Purebred bulls are kept on a number of the farms. The dairy herds are, to a large extent, mixed Jersey, Guernsey, and Holstein-Friesian breeds, and there are some crosses of these and the dual-purpose and beef breeds.

The large number of silos in the larger valleys are used mainly to supply feed for wintering cattle and fattening them for market, principally the latter, as most of the animals not being finished for market are carried through the winter mainly on hay. On most of the mountain farms only breeding cattle and some calves and yearlings are wintered on hay and other available roughage. Most of the small cattle breeders make no attempt to fatten their stock for the market but sell the yearlings and 2-year-olds as feeders to owners of large valley farms. Many of the cattle feeders have extensive pasture farms in the mountains, on which they graze their animals after winter feeding and then market them direct from the range. The larger number of the cattle summered on the Allegheny Mountains and in the "sinks country" of the eastern part of the county are owned or bought by cattlemen and feeders of the Shenandoah Valley in Virginia and the Potomac Valley in Hampshire, Hardy, Grant, and Pendleton Counties in West Virginia.

Dairying is not extensively developed. One or more dairy cows are kept on nearly all farms to furnish a home supply of milk and butter. Any surplus milk or cream, when transportation facilities are available, is sold in Elkins or at nearby markets to creameries and manufacturers of ice cream. In the immediate vicinity of Elkins, small dairy herds are kept to supply the local whole-milk trade or for the sale of cream to the local creamery.

Large numbers of sheep have been kept since the early days of settlement. The 1930 census reports 28,216 sheep, valued at $248,482, and the wool clip in 1929 was worth $34,009. Although the value of sheep represents a small part of the total value of livestock, the sale of lambs and wool furnishes a good part of the income on many small farms. Most of the sheep are Southdowns, Shropshires, Hampshires, or Dorsets, which are considered dual-purpose breeds. The Shropshire and Hampshire are more common in the eastern part of the county, and the Southdown predominate in the central and western parts. The sheep breeders are becoming more interested in the use of purebred rams for improving their flocks.

Hogs are kept on nearly all farms in sufficient numbers to supply home needs. In Tygart River Valley adjacent to Elkins, some hogs are fattened for the local market but not nearly enough to supply the demand.

Horses are raised in about sufficient numbers to meet the local needs for work animals.

Poultry is kept on nearly every farm for home use and to supply local markets. Some chickens, eggs, and turkeys are sold to nearby markets outside the county. An average revenue of about $100 a farm is received from this source.

Most of the apples and peaches are of unimproved varieties, and they give low yields of poor-quality fruit. Some strawberries and cultivated raspberries are sold on the local markets. The small fruits used mainly for home consumption are wild raspberries, blackberries, and huckleberries, which grow in profusion in all the mountain sections. Considerable quantities of these wild berries are sold in the Elkins market by farmers and other people temporarily out of employment.

The use of commercial fertilizer is not general, but it is fairly common on the valley farms and on some of the mountain farms. Poor roads and long distances from railroads are drawbacks to its further and greater use. It is largely used for potatoes. Some is used on corn and oat land but rarely on wheat and buckwheat land. About 75 percent of the fertilizer is home mixed,[2] and sulphate of ammonia, superphosphate, and muriate of potash are the materials used. The acre applications and the mixtures used are as follows: For potatoes, from 800 to 2,000 pounds of 5–12–10;[3] and for corn and oats, from 200 to 500 pounds of 2–12–2 or 4–16–4. On some farms buckwheat is fertilized with 150 to 300 pounds of 16-percent superphosphate (acid phosphate). Wheat usually follows corn or potatoes and receives no fertilizer.

The beneficial effect of lime on nearly all the farming and hay soils has long been recognized. Most all farms, where a lime supply is available at reasonable cost or expenditure of effort, have received applications of lime or wood ashes at one time or another, although not all the land on most of them has been limed. Many farmers burn their own lime, getting both lime and coal cheaply from nearby sources; others prefer the ground limestone which can be bought at a reasonable price from the several crushers located at different

[2] From report of the county agent.
[3] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

points in the county; and a few buy hydrated lime from outside sources. All sections of the county, except the western part, have a practically unlimited supply of high-grade limestone. The common acre application of burned lime ranges from 1,000 to 1,500 pounds, and of ground limestone from 3,000 to 4,000 pounds. The 984 farms reporting the use of fertilizer in 1929 expended $33,454, an average of $34 a farm reporting. This amount is about double that reported 10 years earlier.

The number of farms reporting the hire of labor in 1929 was 619, and the amount expended was $81,597, an average of $131.82 for each farm reporting. Much of the farm labor is hired only as seasonal demands require, largely at harvest time. The prevailing wages range from $1 to $2.50 a day. Tenants or laborers on grazing farms are usually hired for the year and are paid monthly at a rate ranging from $20 to $50, depending on the amount of their time required to attend to the sheep and cattle. Laborers of this type are furnished a house in which to live and land for a garden and home supply of crops. In addition many of them keep a cow for milk, also chickens and hogs to supply the home with meat.

Most of the farms in this county have always been of the owner-operated type and are consequently small. In 1880 the average size was 360 acres, with 23.7 acres, or 6.6 percent, classed as improved land. Since that time the size of farms has gradually decreased until in 1930 the average size was 156.8 acres, with 38.2 acres, or 24.4 percent, classed as improved land which includes crop land and plowable pasture. The percentage of the total county area reported as included in farms increased from 12.7 percent in 1880 to 41.5 percent in 1930.

A large number of farms are small, ranging from 10 to 50 acres in size, but many extensive grazing farms range from 500 to 1,000 or more acres. Many small tracts are held through the mountain sections, adjacent to lumber company or coal-mining company holdings, over which cattle and sheep are ranged with little or no charge.

In 1930, of the 1,755 farms, 1,455 were operated by owners, 238 by tenants, and 62 by managers. There has been a gradual increase in the number of manager-operated farms during the last 40 years and some fluctuation in the number of tenant-operated farms, but no marked change in the number of farms operated by owners. Practically all the tenant farms are operated on the share-crop basis, the tenant receiving one-third and the landlord two-thirds of the crops produced. The landlord furnishes, besides the land, the farm equipment, seed, lime, and two-thirds of any commercial fertilizer used. The arrangements for furnishing work horses and feeding them differ, but these expenses are shared between landowner and tenant. Feeding or fattening of cattle is done jointly in the same proportion as the division of crops.

Machinery used on the smooth-land farms is of the improved horse-drawn or power type. Work animals on farms where improved machinery is used are good grades of the heavy-draft breeds. On the mountain and hill farms, work animals are lighter and walking types of cultivators or single-shovel plows are used in cultivation. On the rougher fields much cultivation is done with the hoe. On most farms, sheds and barns are adequate for housing

all work animals, machinery, and all crops except part of the hay and fodder. On nearly all farms where large numbers of cattle are fed and fattened, silos and feeding barns or sheds are a part of the equipment. Hay fed from the stack is usually brought to the barns. On many of the mountain farms little or no protection is given to the cattle that are wintered.

Farm homes in the valleys and in the better grazing sections are well constructed, painted, and well kept, and many of the more substantial farmhouses are built of brick. Many of the mountain homes are not painted or so well constructed, and many are of the early log-constructed type.

SOILS AND CROPS

The agriculture of Randolph County is largely determined by physiographic features. The country is mountainous, rolling, steeply sloping, and broken, with the exception of narrow stream bottoms and comparatively flat areas on the tops of mountains.

According to the 1930 census, the total area of the county is 663,040 acres, of which 275,146 acres are in farms. Of the land in farms, 67,066 acres are classed as improved, which includes crop land and plowable pasture; 177,768 acres are in woodland and other pasture; 83,391 acres are in woodland not pastured; and 6,921 acres are classed as other land in farms, including roads, land used for buildings, and waste land. These figures show that less than 40 percent of the county is utilized by farmers. The land not included in farms consists of rough mountainous land and land that at present cannot be profitably used for agricultural purposes. It is utilized for forests and to a small extent for grazing.

The best farm land is along the valley occupied by Tygart River and Leading Creek, which crosses the central part of the county in a north-south direction. All the smooth land along this valley is in farms, and at least one-half the land in farms is on the bottom lands and terraces, or second bottoms, of the valley. Most of the narrow valley of Dry Fork in the northeastern part of the county is also farmed, and a few tracts are farmed along the smaller streams in places where the bottoms are wider.

On the uplands, farms have been established on lands which are smooth enough to allow cultivation and are accessible to roads, but in such places farming is conducted on a very small scale. Small farms are more numerous along the western slope of Cheat Mountain. A number of farms are located around the headwaters of Tygart River, on the northern end of Middle Mountain, and in the vicinities of Pickens, Helvetia, Adolph, Norton, and Ellamore. Farms in the rough country consist largely of small patches of cultivated land and larger areas of hay and pasture land. In many sections the small farmer grazes his livestock on the adjacent landholdings of the lumber and mining companies.

The land not in farms (387,894 acres) is for the most part either too rough for cultivation, or, where it is not too rough, the character the soil is not favorable for farms or for the production of good-quality pasture grasses. Such soils are stony, shallow, or infertile.

Although the various soils cannot be grouped absolutely on the basis of their use, practically they may be placed in three groups

on this basis. Some of the soils are either used for cultivated crops or are largely capable of such use. These soils will be considered in their further discussion as farming soils. A second group, consisting of soils which are too rough, steep, and stony to be suitable for cultivation but which produce a good growth of excellent grass for grazing, are classed as pasture soils. The third group includes soils of the rough areas and flat areas, which are extremely stony and unproductive. These soils are forested and are designated forest soils. Farming operations are planned and built almost entirely around the livestock industry, because the large mountain areas are suitable only for grazing, and the valleys are well adapted to the production of grain and hay.

In the following pages the soils of Randolph County are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 5.

TABLE 5.—*Acreage and proportionate extent of the soils mapped in Randolph County, W. Va.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Huntington loam	13,056	2.0	Lowell silt loam	576	0.1
Pope fine sandy loam	2,048	.3	Upshur stony silt loam	65,536	9.9
Philo silt loam	8,896	1.3	Lowell stony silty clay loam	2,368	.4
Atkins silty clay loam	5,056	.8	Dekalb stony silt loam	50,176	7.6
Monongahela silt loam	6,848	1.0	Dekalb stony loam	46,336	7.0
Tyler silt loam	960	.1	Leetonia stony loam	67,072	10.1
Robertsville silty clay loam	1,856	.3	Leetonia stony sandy loam	3,008	.4
Dekalb silt loam	26,048	3.9	Leetonia gravelly silt loam	5,184	.8
Dekalb gravelly silt loam	32,256	4.9	Meigs stony loam	43,776	6.6
Dekalb gravelly loam	6,080	.9	Rough stony land	265,344	40.0
Upshur silt loam	4,352	.7			
Meigs gravelly loam	6,208	.9	Total	663,040	

FARMING SOILS

As already stated, nearly all the land where the surface relief is favorable is used for the production of cultivated crops and hay and in part for pasture. The use to which farm land is put and its production of farm crops or grasses depend to a large extent on the character of the soil. The farming soils are on the river bottoms, valley ridges, and smoother mountain tops. Some of these soils are free of stone, and others contain a comparatively small quantity of gravel and rock fragments as compared with a large part of the county.

Thirteen types of soil are classed as farming soils. Of these, the soils of the Huntington, Pope, Philo, and Atkins series are soils of the first bottoms; the soils of the Monongahela, Tyler, and Robertsville series occur on the high bottoms, or terraces; and the upland soils in this group include the smoother types of the Dekalb, Meigs, Upshur, and Lowell series. None of the stream-bottom and terrace soils contains enough gravel or rock fragments to warrant the separation of a gravelly type.

These soils are, in general, light colored and range from slightly to highly acid, except Lowell silt loam and Upshur silt loam, which, under field tests, usually show a neutral or slightly alkaline reaction.

They are all deficient in organic matter, but to less degree in the stream-bottom or overflow land. The upland soils, or those soils developed from the weathered underlying rocks, are shallow and are subject to rather severe erosion in most places if not properly cropped and cared for.

Huntington loam.—Huntington loam is one of the best producing soils in the county. Its friable mellow structure, undulating surface relief, close proximity to natural drains, and the sand or gravel substratum underlying most of it insure excellent drainage, aeration, and early warming up in the spring. Huntington loam is developed from alluvial material deposited along the courses of streams that receive much drainage water from upland soils derived from limestone or lime-bearing rocks.

The surface soil, to a depth of 8 or 9 inches, is friable brown loam. It is underlain, to a depth ranging from 20 to 30 inches, by lighter brown loam or heavy loam that gradually becomes lighter in both color and texture, and, at a depth ranging from 40 to 60 inches beneath the surface, light-brown sand or sand and gravel deposits are reached.

Some variations occur in this soil. In places it has a reddish-brown or chocolate-brown color, the material having been washed from upland areas consisting mainly of Upshur soils that are derived in large measure from limestone or calcareous rocks. The areas of reddish-brown soils occur mainly on the narrow bottoms at the headwaters of Tygart River and along all the tributary streams of Cheat River, that drain from the eastern part of the county. Such areas of reddish-brown soils are rather typical of the Moshannon soils mapped in other counties of West Virginia. They are here included with Huntington loam because of their small extent and relative unimportance for agriculture. Immediately along the banks of Tygart River, narrow strips and patches of Huntington fine sandy loam, too small to separate are included with mapped areas of Huntington loam, and in the broader areas of the loam soil spots of silt loam are included. The largest silt loam area (about 150 acres) is just east of Mill Creek. On the narrow bottoms near the headwaters of File, Riffle, and Becky Creeks, where Huntington loam is mapped, much water-rounded gravel is scattered over the surface and through the soil. Had such areas, which are indicated by gravel symbols, been more extensive, they would have been mapped as a separate soil type.

Typical Huntington loam occurs along Tygart River and its tributary streams. All the land is cleared and is devoted about equally to pasture, corn, wheat, and hay. Some oats, buckwheat, and potatoes are grown in small fields. The pasture areas are confined largely to the sandy strips near the stream banks, small patches surrounded by wet pasture land, and to areas that are rather badly cut by old drainage channels.

Acre yields of corn range from 30 to 65 bushels, wheat from 15 to 25 bushels, oats from 30 to 50 bushels, buckwheat from 25 to 40 bushels, potatoes from 150 to 350 bushels, and mixed timothy and clover hay about 1½ tons.

Pope fine sandy loam.—With the exception of a lighter texture, Pope fine sandy loam differs little from Huntington loam, and is only a little lighter in color through the entire soil profile. However,

Pope fine sandy loam is derived from noncalcareous shales and sandstones. The 6-inch surface layer consists of light-brown friable fine sandy loam which changes abruptly to light yellowish-brown friable heavy fine sandy loam that extends to an average depth of about 30 inches below the surface, where it grades quickly into loose loamy sand. In most areas gravel beds are reached at a depth of about 40 inches.

This soil occurs only along streams in the western part of the county. Coalton is built on the largest area mapped. Most of the land is cleared, and hay and corn are the main crops. Owing to its general occurrence in small patches and narrow strips, this is not an important agricultural soil, except locally.

Philo silt loam.—Philo silt loam occupies imperfectly drained areas associated with the Huntington and Pope soils, and its surface soil is the same color. The main difference is its imperfect underdrainage and the presence of gray mottlings in the subsoil.

To plow depth (6 or 8 inches) Philo silt loam is grayish-brown or light-brown friable silt loam, below which, and extending to a depth ranging from 15 to 18 inches, the material is grayish-brown or yellowish-brown heavy silt loam mottled with brown. It changes rather abruptly to grayish-yellow, pale-yellow, or nearly gray silty clay loam intensely mottled with gray, rust brown, and orange yellow. This material extends to a depth ranging from 24 to 48 inches, where is passes into mottled gray, orange, yellow, and rust-brown silty clay loam or clay.

Areas of this soil occurring on narrow bottoms along Leading Creek and the smaller tributaries of Tygart River, being derived mainly from sandstone and shale, are more acid than the rest of the soil. The areas in the Tygart River Valley and those associated with the Huntington soils are the same soil as Lindside silt loam, mapped in other counties in West Virginia. The surface soil is slightly browner and the upper part of the subsoil is more pronounced yellow brown than is typical for Philo silt loam.

Philo silt loam is an intermediate soil between the well-drained Huntington and Pope soils and the poorly drained Atkins soils, not only in drainage but in position. It occurs principally in flat or slightly depressed areas lying well back from drainage channels, and this location, together with the closely underlying heavy silty clay, causes a water-logged subsoil during the greater part of the year.

During normal crop years, crops on this soil yield slightly less than those on Huntington loam but during dry years slightly more. In seasons of high rainfall yields of grain are below normal. When the land is given applications of lime and some artificial drainage, yields average from year to year above those on Huntington loam. An acre application of about 2 tons of finely ground limestone or 1 ton of burnt lime is required to correct the acidity.

All this soil is cleared and about equally divided between pasture land and crop land. Corn, wheat, hay, and some soybeans, buckwheat, and oats are produced. Liming practically doubles crop yields, especially the yields of clover and timothy.

Atkins silty clay loam.—Atkins silty clay loam occurs principally along Tygart River and Leading Creek, in close association with the Huntington and Philo soils. It has the same origin as these

soils but occurs mainly at the outer edges of the broader bottoms and was laid down by slow-moving water or backwater. Consequently it is a much heavier soil throughout. It occupies nearly flat or slightly depressed positions that act as catch basins for rain water, and the land has little or no natural drainage outlet. At a depth ranging from 10 to 15 feet, the heavy underlying clays that extend to shale bedrock are practically impervious to water, which results in the soil being wet practically the entire year. In its natural state Atkins silty clay loam was marshy or semiswamp land, and after being cleared it supported a growth of wild coarse rushlike water-loving grasses.

The 6-inch surface layer is gray or dark-gray granular silty clay loam containing streaks and markings of rust brown. It is underlain by steel-gray silty clay that contains some faint mottlings of yellow and numerous fine brown specks of iron concentrations, some of which are soft concretions. This layer, in turn, at a depth of 20 or 24 inches, passes into steel-gray silty clay that is marked and mottled with brown and yellow. At a depth ranging from 3 to 4 feet below the surface, the material changes rather abruptly to steel-gray plastic clay highly mottled with yellow and some brown.

A few areas of Holly silty clay loam are included in mapping. This soil is composed of alluvium washed from the upland soils which are derived in part from limestone. These areas, when reclaimed, are slightly more productive than the typical areas.

Atkins silty clay loam before being artificially drained is generally termed crawfish or swamp land, and it produces only coarse grasses low in food value, both for pasture and hay. The soil is very acid, and it requires open-ditch or tile drainage, or a combination of both, and a heavy application of lime in order to produce cultivated grasses, grain, and other crops. Owing to the heavy texture of the surface soil and the nearly water-impervious subsoil, it is a very difficult task to put in tile drains that work efficiently. Many of the farms that are producing good crops have a combined tile and open-ditch drainage system.

Crop yields on thoroughly drained fields of this soil that have been well limed are about the highest of those produced on any soil in the county, but, owing to the heavy texture of the surface soil, most of the land is maintained as meadow land and produces from 1½ to 2 tons of timothy and clover hay an acre. Some corn, soybeans, and potatoes are grown on a few farms. Acre yields of corn range from 40 to 70 bushels; soybeans for hay from 1 to 1½ tons; and potatoes, with an acre application of 1,000 pounds of 5–12–10 fertilizer, have produced as high as 400 bushels.

Monongahela silt loam.—Monongahela silt loam occurs principally in the Tygart River Valley. It occupies terrace or bench positions well above overflow at the wider points in the valley and at the junction of tributary streams with Tygart River. It has a light-colored surface soil and a yellow subsoil that becomes mottled with gray, shades of yellow, and brown at a depth ranging from 20 to 30 inches below the surface, showing an arrested downward movement of soil water that renders the lower part of the subsoil wet during periods of heavy rainfall. The parent material of this soil is old alluvium that has lain for a long time, has been considerably leached, and has accumulated sufficient heavier soil particles in the lower

part to form a rather compact or hardpan layer. This is the mottled layer of the soil profile.

Most of the Monongahela soil has a decidedly compact or semicemented subsoil. Some very nearly typical areas are mapped along Leading Creek north of the town of Elkins. Other than the difference in degree of subsoil compaction, this soil varies little in soil characteristics, but the Monongahela soil mapped in this county has received considerable influence or deposits of material from upland soils developed from limestone, whereas most of that mapped in other counties of West Virginia was laid down by streams rising in and flowing from soils derived from sandstone and shale.

The surface soil of Monongahela silt loam to plow depth is yellowish-brown friable silt loam that changes abruptly to yellow or light brownish-yellow friable silt loam which extends to a depth ranging from 20 to 30 inches beneath the surface, at which depth it becomes yellow slightly compact silt loam faintly mottled with gray and orange yellow. The material, at a depth of 40 inches or less, becomes more compact and is considerably mottled with gray, orange, and light brown. It continues to a depth of 50 inches below the surface, where it may become less compact and, at a depth ranging from 60 to 70 inches, may pass either into lighter materials of sand and gravel that occur as thin deposits over shale beds, or into heavy yellow and gray marbled clay that is practically impervious to water.

Nearly all this land is cleared and is used for corn, wheat, hay, oats, and some buckwheat, potatoes, and other crops. Very little is used as permanent pasture. Owing to its smooth surface relief and the ease with which it is handled, it ranks high as a farming soil. Field tests show this soil to be fairly acid, and it gives good response to applications of lime. The humus content is comparatively low, and applications of manure or turning under green-manure crops would correct this. Applications of commercial fertilizer give good results on all crops.

Crop yields are somewhat lower than on the nearby well-drained flood-bottom soils or on areas that have been drained and limed, but yields are higher than on the adjacent uplands. Acre yields of corn range from 25 to 45 bushels, wheat 15 to 20 bushels, oats 30 to 40 bushels, buckwheat 20 to 30 bushels, potatoes 150 to 250 bushels, and mixed timothy and clover 1 to 1½ tons. Corn and oats usually receive acre applications ranging from 200 to 400 pounds of 2–12–2 or 4–16–4 fertilizer and potatoes from 800 to 2,000 pounds of a 5–12–10 mixture.

Tyler silt loam.—Tyler silt loam occurs in close association with Monongahela silt loam along Leading Creek, and it has the same origin. In surface appearance it is much the same as Monongahela silt loam, but it becomes mottled immediately below plow depth and is not so compact as the Monongahela soil.

The 6- or 7-inch surface layer is gray or grayish-brown friable silt loam. Below this depth the material changes abruptly to yellow or pale-yellow heavy silt loam that extends to a depth of about 16 inches and is mottled with gray, some orange, and light brown. Below this the material grades quickly into gray, yellow, and orange silty clay loam or silty clay, which extends to bedded shales at a depth ranging from 3 to 5 feet below the surface. This soil repre-

sents a shallow alluvial deposit that was laid down on shale beds which had been smoothed off by stream action before deposition began. The surface has a gentle streamward slope that aids in the removal of some of the excess rainfall, but the heavy subsoil and closely underlying shale practically prevent underdrainage. Numerous crawfish burrows extend down to the shale beds.

Tile drains alone in this soil have low efficiency, but in connection with open-ditch drainage and applications of lime they bring the land to a suitable condition for crop production. About one-half of this land is maintained in permanent pasture sod of wild and native grasses, and the rest is used for corn, hay, wheat, and oats. On fields that have been given reasonably good drainage and limed, crop yields compare favorably with those obtained on Monongahela silt loam, but where the land is not so well drained, yields are much lower.

The gently sloping surface relief, together with the heavy texture, makes this soil slow to absorb rainfall, consequently it is never so nearly saturated and wet as the lighter textured Monongahela soil. This soil is very acid and has a high lime requirement.

An area 2½ miles north of Elkins, where surface drainage has been facilitated and heavy applications of lime and wood ashes have been made, is producing crops of corn, wheat, and timothy and clover hay comparable with those produced on the Monongahela soil. On untreated soil only moonshine grass and other coarse wild grasses, that are used for pasture, grow.

Robertsville silty clay loam.—Robertsville silty clay loam occurs only on terraces along Tygart River between Elkins and Huttonsville. It has its origin from the same sources as Tyler silt loam, but it bears little resemblance to the Tyler soil, as it is extremely poorly drained, decidedly gray in both the surface soil and subsoil, and highly mottled in the subsoil. It occupies nearly flat or slightly depressed positions, whereas Tyler silt loam has an undulating or gently sloping surface relief, giving it fair or good surface drainage.

Robertsville silty clay loam bears the same relation to Tyler silt loam that the Atkins soil does to the Huntington, Pope, and Philo soils. The profile of Robertsville silty clay loam is practically identical with that of the Atkins soil. The main difference between the two soils is that the Robertsville soil occupies a position well above overflow, whereas the Atkins soil is subject to periodic inundation.

The surface soil of Robertsville silty clay loam is gray or light grayish-brown granular silty clay loam that changes quickly, at a depth of 7 or 8 inches, to gray silty clay loam marked or specked with brown and having some mottlings of pale yellow. This material, at a depth ranging from 15 to 20 inches, changes quickly to gray plastic silty clay intensely mottled with yellow, orange, and light brown, which extends to a depth ranging from 3 to 4 feet below the surface, where it passes into stiff plastic clay showing about equal proportions of gray and yellow colors. This layer extends to a depth of 6 feet or deeper.

Problems of drainage, liming, and crop production on this soil are about the same as on the Atkins soil, although the slightly higher elevation at which the Robertsville soil occurs facilitates drainage to some extent. Acre applications ranging from 3 to 5 tons of

ground limestone are necessary to correct the acidity. Much of this land is maintained as pasture or meadow, consisting largely of wild coarse grasses, except in places where some reclamation work and liming has been done in order to produce tame-hay grasses. The crops generally planted are corn and oats, and where the land has been properly drained and limed these crops do well; otherwise yields are low, and oats are subject to rust.

Dekalb silt loam.—Dekalb silt loam occupies the second largest acreage of the farming soils. With the exception of a few small areas, it occurs only along the valleys of Tygart River and Leading Creek, where it occupies the low rolling to steeply rolling valley ridges and hills. It is confined almost entirely to an area underlain by soft shale rocks, that extends as an irregular belt almost surrounding the valley. Owing to the completeness with which the underlying rocks weather, only small quantities of shale chips and fine gravel fragments are scattered over the surface and through the soil.

Cultivated fields have a rather varicolored surface appearance, ranging from gray or grayish yellow to grayish brown and light brown in places, the color being determined largely by the organic content and depth of plowing. Below plow depth, which ranges from 4 to 6 inches, the friable silt loam surface soil changes abruptly to yellow or light brownish-yellow friable heavy silt loam which gradually becomes heavier with depth, and, at a depth ranging from 15 to 18 inches beneath the surface, passes into grayish-yellow silty clay loam that shows some gray, brown, and red streaks and mottlings and contains some fragments of rotten or partly weathered shale. At a depth ranging from 24 to 30 inches below the surface, partly weathered or bedded shale is present.

About 60 or 70 percent of the land is cleared, approximately one-half of which is utilized as pasture and the rest for corn, small grain, and hay, with small acreages of buckwheat and potatoes. The surface relief is such that practically all the cleared land could be cultivated, but only with rather severe loss of soil through erosion and rapid depletion of plant nutrients. Consequently, an unsystematic, rather extended system of crop rotation is generally practiced. Probably one-fourth or less of the cleared area is in cultivated crops in any given year. Corn, small grain, hay, and pasture is the usual order of crop rotation. Corn and small grain seldom succeed themselves on the same land, but the hay and pasture period of the rotation extends from 2 to 4 years. The sod in many run-down pastures is turned over for the planting of wheat, oats, or rye, after which the land is returned to hay grasses which, after one or two crops have been removed, are used as pasturage. As a general rule, pasture fields that are not disked or plowed and reseeded to tame grasses after a few years begin to grow up to sedges, wild grasses, and brambles, which furnish only sparse grazing.

Crops of corn, wheat, and oats commonly receive acre applications ranging from 200 to 400 pounds of 2–12–2 fertilizer, and potatoes receive about double that quantity. At one time or another a large part of the cropped land has received small applications of lime or wood ashes. Corn yields range from 15 to 25 bushels an acre, oats and buckwheat about the same, and wheat from 10 to 20 bushels. Potatoes, which are generally planted on selected fields or fields

improved above the average in fertility, produce from 100 to 150 bushels an acre.

Dekalb gravelly silt loam.—Dekalb gravelly silt loam differs little from Dekalb silt loam, other than in an increased quantity of gravel over the surface and throughout the soil. This soil occupies the lower valley ridges, which have a little sharper relief than the silt loam areas, and an intermediate belt of ridges lying between the lower ridges of Dekalb silt loam and the higher ridges of Dekalb stony silt loam. It also caps the crest of the lower lying northern end of Cheat Mountain, occurs along some of the ridges on both sides of Tygart River and Leading Creek Valleys, is in the vicinity of Harding, and occurs in other widely scattered places.

The 5- or 6-inch surface soil is grayish-brown or yellowish-brown friable gravelly silt loam which changes rather abruptly to yellow or light brownish-yellow friable gravelly silt loam that extends to a depth ranging from 15 to 20 inches beneath the surface, where it grades into yellow or brownish-yellow heavy silt loam or silty clay loam, that continues downward to partly weathered and disintegrated shale and sandstone at a depth ranging from 30 to 40 inches beneath the surface. In most places, below a depth of 24 inches, various quantities of gray, orange, and brown mottlings are present. The gravel consists of the unweathered part of the fine-grained sandstone that is interbedded with the softer shale, from which most of the soil material is weathered.

Only about 25 percent of this soil on the valley ridges is cleared, about half of which is maintained in pasture sod. On the mountain tops and in sections where it represents most of the tillable land, it is largely cleared and used for cultivated crops and hay, the adjacent rougher lands being used for pasture. Corn, oats, and buckwheat are the leading crops, and some wheat and potatoes are grown. Crop yields from this land on the mountain tops of the more rugged sections average higher than those on the valley ridge areas, owing to the increased use of manure, lime, and fertilizer in order to obtain maximum production from the limited area of available cropping soils in these localities. Maximum acre yields are about as follows: Corn 35 bushels, oats 45 bushels, buckwheat 30 bushels, wheat 20 bushels, and potatoes as much as 300 bushels where from 800 to 1,200 pounds of 4–12–4 fertilizer are used. Average yields on this soil as a whole, however, are considerably lower or about the same as on Dekalb silt loam and similar light-colored upland soils. Pasture grasses on permanent sod land of this soil are largely moonshine and other wild grasses, but bluegrass makes a sparse growth. The income of the farmers on land of this kind is obtained from the sale of calves, feeder cattle, lambs, and wool, supplemented by some poultry and eggs and any surplus of potatoes that may be produced.

Dekalb gravelly loam.—Dekalb gravelly loam, as it occurs in the eastern part of the county, occupies comparatively smooth bench-like areas on the middle slopes of the more massive mountains. It occupies similar positions around the headwaters of Tygart River, but throughout the western part of the county it occupies the smooth rounded ridge tops. This soil differs from Dekalb silt loam and Dekalb gravelly silt loam principally in that it is developed from weathered thick-bedded fine-grained sandstone and has more favorable surface relief.

The surface soil, to a depth of about 5 inches, is grayish-brown or yellowish-brown friable gravelly loam which passes into yellow or brownish-yellow friable loam containing less gravel than the layer above. This material, in turn, at a depth ranging from 15 to 20 inches below the surface, grades into yellow or pale-yellow friable silt loam or heavy loam that extends to disintegrated sandstone at a depth ranging from 30 to 36 inches.

Approximately 75 or 80 percent of this land is cleared. As it occurs largely in sections where extensive areas of grazing soils are present, it is used principally for grain and hay. Oats occupy the largest acreage of the grain crops, with buckwheat, corn, and wheat ranking in the order named. Hay occupies about one-third of the cleared land. In the northwestern part of the county, potatoes are grown commercially on a small scale. The wheat and corn acreages are small, because wheat winter-kills on the exposed mountain slopes, and corn is often damaged by early frost. Oats return good yields of grain and of forage when they are cut before the grain is thoroughly ripened. All feed crops are used in wintering cattle to be pastured on the nearby grazing areas during the summer.

Upshur silt loam.—Upshur silt loam has no counterpart in the farming-soils group as regards color, but, like much of Dekalb gravelly loam, it occurs on smooth benches and benchlike slopes on the larger mountains. It occurs only on the high slopes above the head of Tygart River Valley and in the eastern part of the county. Although it is among the least extensive of the upland soils, it constitutes all or a large part of the tillable land on a number of farms. The reddish-brown or chocolate-brown color of Upshur silt loam is the same as that of the underlying limy shales from which it is derived. It is one of the few soils in this county that is not acid or highly acid.

The 6-inch surface layer of Upshur silt loam is dark chocolate-reddish-brown granular and friable silt loam. It is abruptly underlain by reddish-brown or Indian-red heavy silt loam which, at a depth ranging from 16 to 24 inches, grades into silty clay loam with little or no change in color. This material extends to the partly weathered red shale lying at a depth ranging from 30 to 48 inches beneath the surface. Locally, some shale fragments are scattered over the surface and through the soil. Where this soil occurs in a series of two or more benches, one above the other, the short, steep slopes between the benches have considerable gravel scattered over the surface, the soil is somewhat shallower than on the benches, and, in places, erosion has exposed outcrops of the underlying shale.

All this land is cleared. About 50 percent of it is utilized as hay meadows to furnish winter feed for livestock that are held on the adjacent and nearby grazing lands, and the rest is planted largely to corn and oats, with some buckwheat, wheat, and potatoes. Acre yields of oats range from 30 to 50 bushels, corn 25 to 35 bushels, buckwheat 20 to 30 bushels, potatoes 150 to 200 bushels, and hay 1 to 1½ tons.

Meigs gravelly loam.—Meigs gravelly loam represents small undifferentiated areas of Dekalb gravelly loam, Upshur gravelly loam, and Upshur gravelly silt loam, or red Upshurlike material derived from lime-free sandstone and shale. The small areas of red and

gray soils are so intricately mixed, one grading into the other, that it is not possible to separate them into their respective soil types.

This soil is closely associated with the Upshur soils and in many places occupies an intermediate strip between Upshur soils and Dekalb soils. The largest areas lie near Dry Fork, along Glady Fork, on Middle Mountain in the eastern part of the county, southeast of Elkins on Cheat Mountain, and around the headwaters of Tygart River. Crops, crop yields, and farming practices are the same as those on Dekalb gravelly loam and Dekalb gravelly silt loam.

Lowell silt loam.—Lowell silt loam occupies a very small acreage in this county. It occurs mainly in the vicinities of Monterville and Mace, on the slopes of Cheat Mountain and Elk Mountain, and on a strip of high land that connects these two mountains above the head of Tygart River Valley. Only two small bodies are mapped elsewhere. Like Upshur silt loam, this soil occupies narrow benches, rounded or flattened crests of ridges, and a few lime-sink depressions. It represents patches of smooth stone-free soil within the large areas of Upshur stony silt loam and Lowell stony silty clay loam.

The surface soil of Lowell silt loam, to a depth of 4 or 6 inches, is grayish-brown or yellowish-brown friable silt loam. This material changes rather abruptly to yellow or light brownish-yellow heavy silt loam that extends to a depth of about 12 inches, where it quickly grades into brownish-yellow silty clay loam that shows faint markings or mottlings of gray and brown. This material, at a depth of 18 or 20 inches, passes into dull brownish-yellow clay, mottled with brown and gray, which extends to the bedded limestone lying at a depth ranging from 24 to 30 inches below the surface.

This soil is locally of considerable importance as it, together with Upshur silt loam, represents all or nearly all the tillable soil on some of the large grazing farms. All the land is cleared, about 50 percent being in hay meadow and the rest planted largely to oats and corn, with some wheat and buckwheat. Owing to the influence of lime deposited from drainage waters, the lime requirement is small or no lime at all is necessary for the best growth and development of crops. Yields are about the same as on Upshur silt loam and slightly higher than on the Dekalb and Meigs soils.

PASTURE SOILS

The group of pasture soils includes only two soils—Upshur stony silt loam and Lowell stony silty clay loam. Both are derived from limestone or shale containing some lime material, and both show neutral or slightly acid reactions. Because of the steep and stony character of the land, these soils cannot be used for hay and cultivated crops. An average of about one-fourth and in many places one-half the surface of these soils is covered by stone and boulders or is occupied by outcropping rock ledges, but the soil between the rocks is of such quality that it will produce more abundant and superior grazing than the acid soils that are not nearly so stony. The high elevations of these soils, ranging from 2,500 to 4,500 feet above sea level, afford summer climatic conditions that, together with an abundant rainfall and good quality soil, seem to be almost

ideal for the growth of bluegrass which constitutes a high proportion of the pasture sod.

Upshur stony silt loam.—Upshur stony silt loam as a whole does not show so pronounced a dark chocolate-red or Indian-red color as Upshur silt loam. Other than this, the soil mass is largely the same. However, the stony silt loam is much more variable in depth to the underlying rock. The soil material ranges from only a few inches thick over the rock near outcropping ledges to as much as 4 feet in places. The average depth to bedrock is, probably, about 30 inches.

The 1- or 2-inch surface layer of this soil in pasture land is, in general, rather dark brown or dark reddish brown, and it contains an abundance of grass roots. Below this and continuing to a depth of 8 or 10 inches is light Indian-red friable silt loam which grades rather quickly into slightly redder friable silty clay loam that extends to a depth of about 18 inches below the surface, where it changes to bright Indian-red silty clay or clay, extending to bedrock.

This soil is developed from weathered interbedded limy red shales, impure red or brown sandy limestone, and gray nearly pure limestone, and the soil color is inherited from that of the rock material from which it is derived. Small light-colored patches and soil having a brown or somewhat red surface soil with a yellow subsoil are included. Much of this light-colored material is derived from the gray limestone. At the contact of the Upshur soil with the Dekalb soils or rough stony land, the surface soil and subsoil are lighter brown and have very little of the Indian-red color. In many places the light color is an indication of a loamy or slightly sandy texture. Numerous ledges of shale and sandy limestone outcrop on the steeper slopes, and ledges of gray limestone outcrop along the lower positions. Many fragments and boulders of these rocks and gray sandstone from the higher lying Dekalb soils and rough stony land are scattered over the surface and embedded in the soil.

Upshur stony silt loam occupies large areas in the eastern part of the county. Rich Mountain, throughout its entire length of more than 25 miles, except on the lower western slope and some of the highest peaks and knobs, is occupied by this soil. Similar large areas occur on the lower slope of Allegheny Mountain and, at a point east of Harman, extend to the mountain crest. An irregular belt, averaging about one-half mile in width, extends along the upper middle slope of the east side of Shavers Mountain. Similar belts lie along the west slope of Cheat Mountain and the east slope of Laurel Ridge and its southern extension (Rich Mountain), and they widen, converge, and join above the head of Tygart River Valley near Mace, at the southern boundary of the county.

About 65 or 70 percent of this soil is cleared. With the exception of small garden patches and an occasional field of oats or hay meadow from 1 to 3 acres in extent on the less stony and steep places, it is all maintained in permanent pasture sod. Practically none of it was plowed in establishing the pastures. The original tree growth was either " deadened " and left standing, or cut and burned, and native grasses came in readily when the vegetation was thinned or the land cleared. Bluegrass came in more slowly but is now the domi-

nant grass on most of the pasture land. Excellent grazing is obtained from about May 15 until late October or early November, at which time the lambs are marketed and the feeder cattle are removed to the valley farms for wintering or fattening on grain. Cattle and sheep held over winter in the mountainous grazing sections are "roughed" through with a minimum of feeding, many of them being forced to go through the winter largely on browse and what little grass can be picked up in places bare of snow. During periods of blizzard and heavy snow, however, some feeding must be done.

Lowell stony silty clay loam.—Lowell stony silty clay loam has the gray-brown surface soil and yellow subsoil coloring of the Dekalb upland soils and the better drained terrace soils. It differs from the Dekalb soils in that it is developed from limestone material and gives a neutral, or lime, rather than an acid reaction.

The 2- or 3-inch surface layer is grayish-brown friable silt loam and is underlain by yellowish-brown heavy silt loam or silty clay loam, that, at a depth of 6 inches, grades into brownish-yellow silty clay loam. This material, in turn, at a depth of 12 or 14 inches, grades rather quickly into dull brownish-yellow silty clay or clay, which extends to bedrock lying at a depth ranging from 20 to 40 inches below the surface. In places, where the soil material extends below a depth of 24 inches, it becomes faintly mottled with gray and brown. Numerous outcropping ledges, boulders, and fragments of limestone are present in all areas of this soil.

The limestone from which this soil is derived lies, stratigraphically, just below the red shales and limy rocks that give rise to the Upshur soils. In most places where the mixing of the red Upshur material from the higher slopes has imparted a red color to the limestone soil, it is included with the Upshur stony silt loam areas that have outcroppings of gray limestone; but where the surface features flatten out to some extent and the limestone lies on projecting shoulderlike ridges and divides, the soil is not affected by the red material from above, consequently, a yellow soil has developed from the pure limestone.

Lowell stony silty clay loam occupies moderately steep slopes, benches, and rounded ridge tops in close association with the Upshur soils in the southwestern part of the county and in the country between Mace and Monterville. Only a few small areas occur elsewhere.

All the land is cleared and in pasture. It supports an excellent sod of bluegrass and has about the highest carrying capacity of the pasture land in the county as a whole.

FOREST SOILS

The forest soils are not classed as such because any special characteristic makes them better adapted to timber growing than any other soil or group of soils. Owing to their steep and broken relief and extremely stony surfaces, they cannot be used profitably as farming soils under present economic conditions and land utilization. They are best suited to growing timber.

Dekalb stony silt loam, Dekalb stony loam, Leetonia stony loam, Leetonia stony sandy loam, Leetonia gravelly silt loam, Meigs stony loam, and the miscellaneous classification—rough stony land—

are included in this group. Although some areas of these soils have comparatively smooth relief, even in such places the surface is strewn with stony fragments, large boulders, and rock outcrops.

Dekalb stony silt loam.—Dekalb stony silt loam, as mapped along the upper middle slopes of Cheat Mountain and Rich Mountain (Laurel Ridge), differs little from Dekalb silt loam and Dekalb gravelly silt loam, occurring on the same slopes at lower elevations. The principal differences in these soils are that Dekalb stony silt loam has considerably sharper relief and a much larger content of stone.

On the middle mountain slopes and valley ridges above Tygart River Valley and in the northern part of the county, the organic accumulation is only 1 or 2 inches thick and the 6- or 7-inch surface soil is light grayish-brown or grayish-yellow silt loam that changes quickly to light brownish-yellow friable heavy silt loam. At a depth ranging from 15 to 18 inches below the surface, the material grades into yellow friable silty clay loam which extends to bedrock lying at a depth ranging from 24 to 36 inches below the surface.

Only a few small patches of this soil are used for either pasture or crops. In sections where little of the land is suitable for crops, small parts of the less stony areas are cleared for hay meadows and some cultivated crops. Such areas have had, in order to facilitate farming operations, some of the larger stones either removed from the fields or thrown into piles, and where such fields are of sufficient size to be mapped they have been shown as Dekalb gravelly silt loam. On farms with a large part consisting of this kind of land, cattle and sheep are ranged in the surrounding forest and cut-over land, where they subsist on browse and a sparse growth of native grasses. The necessary hay for winter feeding is grown on small patches from which the stones have been removed.

Dekalb stony loam.—Dekalb stony loam, like Dekalb stony silt loam, includes the areas on the middle slopes of the mountains, which have a decidedly brown surface soil, and the lower lying areas which have a grayish-brown surface soil. The organic-matter accumulation on the surface of this soil increases with the increase in elevation at which the areas occur.

In the steeply rolling sections near Norton, Cassity, and Ellamore and along the middle slopes of Cheat Mountain and Rich Mountain (Laurel Ridge), this soil, beneath the surface covering of about 1 inch of leaf mold, has a light-brown or grayish-brown loam surface soil which extends to a depth of about 7 or 8 inches, where it changes rather abruptly to yellow friable heavy loam. At a depth of 18 or 20 inches below the surface, the material grades into yellow friable silt loam that extends to disintegrated sandstone lying at a depth ranging from 30 to 36 inches.

Ledges of sandstone outcrop along draws, on steep slopes, and at the breaks from one narrow benchlike slope to another. Some small patches of the less stony soil on the more favorable slopes are cleared for cultivated crops and hay, and some of the larger areas are cleared or partly cleared for pasture. Crop yields on these patches are low, and native grasses which grow only on acid soils provide only poor or fair pasture.

Leetonia stony loam.—The large areas of Leetonia stony loam occurring on Middle Mountain in the eastern part of the county,

and in the vicinities of Helvetia and Pickens and east of Pickens in the western part, have slightly more modified relief, a deeper accumulation of organic matter on the surface, and a surface soil of decidedly browner color.

Leetonia stony loam is developed on the smoother parts of the mountains, above an elevation of 3,000 feet. On Point Mountain in the section west of Monterville, on Middle Mountain, and on the upper slopes of Allegheny Mountain in the southeastern corner of the county, the topmost inch or two of soil beneath the organic covering is decidedly gray light loam which changes abruptly to brown or coffee-brown silt loam. This, in turn, at a depth of 4 or 6 inches, changes abruptly to brownish-yellow friable silt loam. At a depth ranging from 20 to 24 inches below the surface, the material grades into yellow heavy silt loam or silty clay loam, which extends to bedrock at a depth ranging from 30 to 40 inches below the surface. Rock fragments of hard fine-grained sandstone are scattered profusely over the surface and embedded in the soil.

Leetonia stony sandy loam.—Leetonia stony sandy loam occurs in comparatively small bodies widely scattered throughout the county. The principal areas are north and east of Harman, southwest of Cassity, north of Pickens, near Osceola, east of Weaver, and south of Monterville. This soil differs from the Dekalb soils in that it is derived from massive sandstone formations rather than from shale or interbedded shale and sandstone.

North of Harman much of this soil is included in rough forested or brushy areas within large pasture farms located on soils derived largely from limestone formations, but in other places the greater part remains in second-growth forest. During the year of this survey (1931), one small body near Fairview was planted to corn, potatoes, and hay.

The 6- to 7-inch surface soil in cultivated fields consists of grayish-brown sandy loam which changes rather abruptly to yellow sandy loam gradually becoming heavier with depth. At a depth of about 15 inches beneath the surface the material passes into brownish-yellow loam that extends to partly weathered material at a depth ranging from 30 to 36 inches below the surface. On Allegheny Mountain, the soil beneath the 2- or 3-inch organic covering is a layer of ash-gray sandy loam about 5 or 6 inches thick, which is abruptly underlain by a 3-inch layer of dark-brown or coffee-brown loam. At this depth the soil material makes an abrupt change to yellowish-brown loam or silt loam that extends to disintegrated rock lying at a depth of about 30 inches.

Leetonia gravelly silt loam.—Leetonia gravelly silt loam occurs on the high crest of Allegheny Mountain, where a 2- to 4-inch accumulation of organic matter covers most of the surface, with as much as 6 inches in places that have been somewhat protected from forest fires. Beneath the organic layer the surface soil, to a depth of 5 or 6 inches, is brown or dark yellowish-brown silt loam that gradually becomes heavier with depth and, at a depth of 18 inches, is underlain by brownish-yellow silty clay loam which continues to bedded shale and sandstone lying at a depth ranging from 30 to 40 inches below the surface. A quantity of small fragments of sandstone are on the surface and throughout the soil mass.

Most of the land is forested.

Meigs stony loam.—Meigs stony loam consists of a mixture of Dekalb stony loam, Dekalb stony silt loam, Upshur stony loam, and a fine sandy loam of reddish-brown or Indian-red Upshurlike material, all of which are too closely associated and intermixed to separate into soil types. Only a small quantity of the reddish-brown material is derived from the lime-bearing rocks that give rise to the Upshur soils, most of it coming from interstratified red and gray shales and sandstone, that show no lime under field tests.

Meigs stony loam occurs in large areas along the Allegheny Mountain slopes south of Whitmer and as almost continuous belts along the steep slopes on one or both sides of Laurel Fork and Glady Fork. Long narrow strips lie along the middle slope of Cheat Mountain, widening and becoming more continuous as they extend southward. A similar belt, beginning at a point west of Huttonsville on Rich Mountain (Laurel Ridge) and continuing southward, widens out to reach the valley floor at Valley Head and joins with the areas on Cheat Mountain, thence extends 5 miles farther south on both sides of Tygart River to Mingo.

This soil occupies steep slopes, precipitous breaks, and narrow sharp ridges. The surface is strewn with rock fragments, and numerous ledges of red, gray, and brown shale and sandstone outcrop on the steep slopes and narrow stream-cut gaps in the ridges. Little or none of the land is used for cultivated crops or hay, but a number of small areas are included with the surrounding better pasture soils.

Rough stony land.—Rough stony land includes all land areas that are too broken, steep, or stony to be included or classified with some of the more definitely developed soil types. It occupies a rather large area on Allegheny Mountain in the northeastern corner of the county, all the steep upper slopes and crests of Cheat Mountain and Shavers Mountain, and large wide-spread areas throughout the western third. Numerous widely scattered smaller areas occur in all sections, except in the valleys of Tygart River and Leading Creek and on the adjacent slopes and low valley ridges.

On the high elevations of Allegheny, Cheat, and Shavers Mountains, rough stony land consists of old stream-dissected plateau remnants of massive conglomerate sandstone. On these mountains thousands of acres are strewn with rock fragments and massive boulders, with little or no soil in evidence. Shavers Fork, separating Cheat and Shavers Mountains, throughout its entire length from the southern county boundary to Bowden, traverses a precipitous rock-walled gorge, and in many places rock slides almost block the river channel. On the western side of the county, massive blocks of conglomerate sandstone are not so much in evidence, except along the crest and parts of the upper slopes of Rich Mountain, where much of the rock consists of thick-bedded quartzitic sandstone, numerous ledges of which outcrop on the slopes and along deep stream-cut draws. Angular blocks and fragments, broken from the ledges are strewn on the slopes below.

Rough stony land is wholly nonagricultural, except a few small bodies of stony or gravelly soil that are included, as they are too small to map separately. Most of the large areas occur at high elevations, and they were at one time rather heavily forested with

spruce, hemlock, and some hardwoods, the roots of trees penetrating the rock crevices to underlying sources of plant nutrients. On the lower elevations, hardwoods, with some hemlock, constitute the principal tree growth.

Only comparatively small areas of virgin timber remain, and this is rapidly being taken out. Sections in which the timber was cut a number of years ago and which have been protected from forest fires, now support an excellent stand of second-growth trees of the original species. Areas in which fires were allowed to burn unchecked during a period of years after lumbering operations were discontinued, now support only a brushy growth of hardwoods, or, as in the "Allegheny-plains" section, only bare rocks, ferns, bracken, and huckleberry bushes cover the ground.

SOILS AND THEIR INTERPRETATION

Folding and deep-stream dissection have obliterated most of the plateau features in the central and eastern parts of Randolph County, which is made up of northeast-southwest trending mountains and valleys. For the most part, the valleys are narrow and steep-sided, the one exception being Tygart River Valley and its northern extension along Leading Creek, where the streams have reached temporary base level and the valley floor has widened to an average of approximately 1 mile through almost the entire length of the county. In the western and southwestern parts, the monoclinal plateau is more pronounced, although it has been thoroughly and deeply dissected by streams.

The tops of the mountains in the eastern, central, and southern sections of the county have a general range in elevation from 3,500 to 4,000 feet above sea level, with many peaks exceeding 4,000 feet. The plateau area in the western part has a general northwestward dip, from an elevation of approximately 3,000 feet at the base of the steep slopes of Rich Mountain to an average of about 2,500 feet along the western boundary.

The county is included in that broad region of soils lying westward from the middle Atlantic coast, that has been designated as the gray-brown podzolic soils region. It is a region of comparatively high rainfall—about 50 inches—and the rainfall, in connection with the high elevations, results in conditions on the crests and upper slopes of the mountains favorable for the development of the brown podzolic soils and, to some extent the true podzols common to sections much farther north. The lower mountains, slopes, and valley ridges show the true soil characteristics of the region—gray-brown surface soils and light-colored subsoils.

The soils are divided into series on the bases of certain characteristics common to soils in other sections of the State, as well as to the soils in surrounding States. The soil types indicate only textural differences. Five series of upland soils residual from the weathered underlying rock formations are mapped. These include 14 soil types, 5 of which are in the Dekalb series, 3 in the Leetonia series, and 2 each in the Upshur, Lowell, and Meigs series. The alluvial soils include 7 series with only 1 type in each. The Monongahela, Tyler, and Robertsville are developed on terraces, or second-bottoms;

and the Huntington, Pope, Philo, and Atkins are derived from materials deposited in the first bottoms. Rough stony land includes steep and stony areas on which little or no soil development has taken place.

On all elevations ranging up to 3,000 feet above sea level, the tree growth is largely deciduous, but above this elevation the growth changes to conifers, with spruce and hemlock predominating on the higher elevations. This line of change in vegetation also marks rather definitely the change from the light-colored soils with a shallow covering of organic matter over the surface to the soils with a comparatively thick surface accumulation of forest litter over a gray podzol layer resting on a brown or yellowish-brown subsoil.

All the upland soils are shallow and bear a direct relation to the underlying geological formations. Soil texture and, in some places, soil color are determined by the texture and color of the rocks from which the soils are derived. Because of steep slopes, high rainfall, and the shattered rock stratum, leaching out of soluble soil material and erosion almost keep pace with rock weathering, which results in young, or immature, soils over most of the county. The only soils of marked profile development are the soils on the old terraces having nearly flat surface relief. Those developed from the materials produced by weathering of the underlying rocks show a gradually increasing clay content in the profile from the surface downward, but there is no definite horizon of concentration of the heavy material.

The Leetonia soils have been separated from the Dekalb soils in this county, in order to correlate uniformly with soils as mapped in other surveys throughout the Appalachian region, these two soils resulting from different and distinct processes of development. On the higher mountain elevations, where the rainfall is heavier, the winters much more rigorous, and the summers cooler than in the lower mountains and valleys, climatic conditions favor the growth of coniferous forests that normally occur in latitudes much farther north. This climatic difference, together with the coniferous forest growth, makes conditions for soil development very nearly the same as those in the New England States and parts of the North Central States and eastern Canada, where the podzols and brown podzolic soils are common. At the lower elevations, where the forest growth consists predominantly of hardwoods, the soils are light colored and compare with the Muskingum soils as mapped in adjoining States. The typical Dekalb soils occupy the intermediate elevations where the soils have a thick accumulation of organic matter but have developed no gray layer.

The heavy texture of most soils in Randolph County has a tendency to slow down the podzolic processes. It is only in Leetonia stony sandy loam that the true podzol profile is clearly defined. On a benchlike position of the Allegheny Mountain slope, 1 mile east of Osceola, at an elevation of 3,800 feet above sea level, the profile of Leetonia stony sandy loam is as follows:

A_0 and A_1. 0 to 3 inches, partly decomposed leaf litter and humous soil.
A_2. 3 to 10 inches, gray loose fine sandy loam.
B_1. 10 to 13 inches, dark-brown or coffee-brown loam.
B_2. 13 to 20 inches, yellowish-brown loam.
B_3. 20 to 28 inches, brownish-yellow silt loam.
C. 28 inches+, disintegrated and partly weathered sandstone.

This soil with the strong podzol development, occurs only in comparatively small areas widely scattered throughout the county, and, owing to the well-defined horizons of the profile, it furnishes a good basis for the comparison of adjacent related soils. Leetonia stony loam, at elevations above 3,500 feet, shows a fairly well advanced podzol development; that is, the topmost 3- or 4-inch layer of mineral soil has the decidedly gray leached appearance that changes rather abruptly to a brown or light coffee-brown layer of about equal thickness, below which is the usual brownish-yellow subsoil of the Dekalb soil. In Leetonia stony silt loam the gray layer is so faintly developed that it is barely noticeable if present at all, and the coffee-brown horizon lies just beneath the organic covering. Sufficient bases still remain in the upper 4 inches of soil to precipitate the iron, alumina, and organic acids.

The profile of Dekalb stony silt loam (Muskingum equivalent), as observed 3 miles northeast of Elkins, in second-growth hardwood forest, at an elevation of 2,600 feet above sea level, is as follows:

A_0 and A_1. 0 to 1½ inches, brown leaf mold and silty humous soil.
A_2. 1½ to 6 inches, gray-brown or grayish-yellow silt loam.
A_3. 6 to 15 inches, light brownish-yellow heavy silt loam.
B. 15 to 30 inches, yellow friable light silty clay loam, with bedded sandstone and shale below a depth of 30 inches.

The profile just described closely approximates that of all the Dekalb soils at the lower elevations, the main difference being in the various shades of yellow, gray, and brown in the surface soil and subsoil. The stone content and textural differences make it necessary for the separation of the several types of the Dekalb soils.

No chemical analyses are available for the West Virginia Dekalb and related soils, but analyses of soils from surrounding States having soil-profile development comparable to the soils of Randolph County have been selected, and they reflect the processes and the extent of development that has taken place in soils of this county.

A sample of Dekalb stony loam from Lycoming County, Pa., showing the approximate profile development of Leetonia stony loam of Randolph County, W. Va., shows by the high percentage of SiO_2 present in the gray layer that much of the other mineral constituents has been removed through leaching. The B horizon, or coffee-brown layer, shows a decrease of 17 percent of SiO_2 but a combined increase of nearly 100 percent of Fe_2O_3 and Al_2O_3, which would indicate it as a zone of concentration of colloidal material. Below this the silica remains very nearly constant, with a slight increase in iron and alumina.

The analysis of another sample representative of the young Dekalb (Muskingum) soil of the valley ridges shows a decrease of only 6 percent of silica from the surface soil to the subsoil and a correspondingly small increase of the iron and alumina ratio, indicating less migration from the surface soil to the subsoil.

The Upshur and Lowell soils occurring at elevations ranging from 2,500 to 4,500 feet above sea level, developed wholly or in part from calcareous rocks, do not show the general podzol profile of the Dekalb soils at similar elevations. This is owing in part to their steep surface relief, that causes some colluvial mixing of the surface material, and to the more active agencies of erosion, which keep the soil young. On some of the smoother areas, the red color of the

Upshur soils has a leached gray cast in the topmost 3 or 4 inches, indicating the beginning of podzolization. Such leaching processes are active on the higher lying areas of Meigs soils, principally on Allegheny Mountain.

The alluvial soils have a surface relief favorable for soil development, but, owing to outside agencies or conditions of drainage, only a few of the better drained old high terraces have a definite profile development. Monongahela silt loam represents the outstanding soil profile development on alluvium within the county. This soil consists of material washed from uplands weathered from sandstone and shale and redeposited along streams. Following is a profile description of this soil, as observed one-half mile south of Gilman, in a pasture field occupying a high well-drained terrace of Leading Creek:

A_1. 0 to 2 inches, grayish-brown friable silt loam.
A_2. 2 to 8 inches, grayish-yellow friable silt loam.
A_3. 8 to 16 inches, yellow or pale-yellow friable silt loam.
B_1. 16 to 22 inches, pale-yellow slightly compact silt loam mottled with gray, yellow, and orange.
B_2. 22 to 38 inches, very compact hard tight grayish-yellow silt loam intensely mottled with yellow, gray, orange, and rust brown.
C. 38 to 50 inches, gray stiff silty clay mottled with yellow, orange, and some brown, the mottlings not being so pronounced as in the B horizon.

Tyler silt loam is a soil of good or medium surface drainage but of poor subsoil drainage, which prevents soil development. Robertsville silty clay loam occupies flat or slightly depressed positions and is poorly drained throughout.

The flood-bottom soils, because of periodic overflow and additions of fresh alluvium, are kept in an immature stage. The bottom soils are about equally divided between the well-drained and imperfectly or poorly drained soils. The poorly drained soils are of little agricultural value unless some artificial drainage is provided, and even where this is provided, the highly acid condition of these soils results in low yields of most crops unless applications of lime are made.

Table 6 shows the differences in pH values of reclaimed Atkins silty clay loam and the virgin soil in locations only 300 feet apart.

TABLE 6.—*pH values of reclaimed and virgin Atkins silty clay loam from Randolph County, W. Va.*[1]

Soil condition and sample no.	Description	Depth	pH
Reclaimed:		*Inches*	
223106	Tile drained in 1912, 2 to 3 tons of wood ashes to the acre applied in 1915, and 2 tons of ground limestone in 1927.	0–6	6.1
223107		6–24	4.8
223108		24–40	4.6
223109		40–70	5.1
Virgin:			
223106	300 feet distant from above sample	0–1	4.0
223106a		1–6	4.5
223107		6–24	4.6
223108		24–40	4.6
223109–09a		40–70	4.8

[1] Determinations made by the hydrogen-electrode method in the laboratories of the Bureau of Chemistry and Soils.

The difference between draining and liming and no draining and liming of this soil means the difference between good crops of corn, timothy, clover, potatoes, and soybeans, and crops of weeds, coarse wild grasses, and some timothy and redtop.

Table 7 gives the pH values of samples of three soils from Randolph County.

TABLE 7.—*pH values of three soils from Randolph County, W. Va.*[1]

Soil type and sample no.	Depth	pH	Soil type and sample no.	Depth	pH
Dekalb silt loam:	*Inches*		Upshur stony silt loam—Contd.	*Inches*	
223101	0– ½	5.1	223144	3–10	4.7
223102	½– 1	4.2	223145	10–18	4.8
223103	1– 5	4.4	223146	18–36	4.8
223104	5–17	4.7	Atkins silty clay loam:		
223105	17–28	4.7	223188	0– 8	4.2
Upshur stony silt loam:			223189	8–16	4.6
223142	0– 1½	4.4	223190	16–46	4.8
223143	1½– 3	4.6			

[1] Determinations made by the hydrogen-electrode method in the laboratories of the Bureau of Chemistry and Soils.

SUMMARY

Randolph County lies along the eastern side of West Virginia, occupying a position on the highest part of the Appalachian Plateau. It comprises an area of 1,036 square miles, or 663,040 acres. It is mountainous throughout, with generally deep-cut, narrow, and steep-sided valleys, the one exception being Tygart River Valley and its northern extension along Leading Creek. The streams of this valley have reached temporary base level, and the valley has widened to an average width of about 1 mile. The mountains rise on both sides in a series of valley ridges and steep slopes to elevations as much as 2,500 feet above the valley level. The maximum range of elevation within the county is more than 3,000 feet, and the highest point, in the northeastern corner, rises to 4,760 feet above sea level.

All drainage waters eventually find their way westward to Ohio River through the various tributary streams that rise in this part of West Virgina and flow in accordance with the dip of the Appalachian Plateau.

In 1930 Randolph County had a population of 17,704, of which 10,359 were classed as rural. Elkins, the county seat and largest town, had a population of 7,345.

The county is served by two railroad systems, the Baltimore & Ohio Railroad and the Western Maryland Railway.

All industries, except lumbering and coal mining, are centered around Elkins. Tanning, woodworking and finishing plants, and foundry and metal works are leading industrial enterprises in this city. Coal mining is carried on over the west-central part of the county. With the exception of manufactured products, most of the surplus produce goes to nearby West Virginia cities.

Climatic conditions differ considerably according to the elevation. The winters are long and rather severe, and the summers are cool, with hot spells of very short duration. Snowfall in the mountains is about twice as heavy and rainfall about 20 percent greater than that reported at the Elkins station of the Weather Bureau, in Tygart

River Valley. The Weather Bureau station at Pickens, in the western part of the county, reports a 4-month period free from killing frost, and the frost-free period reported at Elkins is about 2 weeks longer. On some of the highest elevations, light frosts have been reported during every summer month.

The agriculture consists largely of growing corn, hay, and small grains, and raising sheep and cattle. Some of the larger corn-producing valley farms specialize on fattening and finishing cattle. Of the 40,000 acres of land devoted to crops, more than 22,000 are utilized for hay, 5,270 for corn, 2,299 for oats for grain, and 1,041 for wheat. More than 144,000 acres are utilized as pasture, much of which is summer range for cattle that are wintered or finished in counties to the east.

The soils of Randolph County, on the basis of utilization, may be placed in three groups: Farming soils, pasture soils, and forest soils. The farming soils are confined largely to the valleys and valley ridges. Large farms devoted to grazing are located in the eastern and southern parts of the county, occupying soils of limestone origin, which produce excellent bluegrass. Approximately two-thirds of the area of the county is uncleared, the larger part being cut-over land supporting brush and second-growth timber. Only a few large forests of virgin timber remain. Owing to steep surface relief and extreme stoniness, little of the land now in timber is suitable for farming.

The soils are classed in 12 series, including 21 soil types and 1 miscellaneous classification—rough stony land. The upland soils are shallow, well drained, and, for the most part, gravelly or stony; the first and second bottoms are about equally divided between well-drained soils and those that are imperfectly or poorly drained.

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