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SOIL SURVEY

De Kalb County Alabama

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with

Contents

SOIL SURVEY OF DE KALB COUNTY, ALABAMA

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UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH ALABAMA DEPARTMENT OF AGRICULTURE AND INDUSTRIES, THE ALABAMA AGRICULTURAL EXPERIMENT STATION, AND THE TENNESSEE VALLEY AUTHORITY

DE KALB COUNTY occupies a fairly high plateau that is divided by a narrow limestone lowland. This lowland area extends in a northeast-southwest

Physiography

The county lies in both the Appalachian Plateau

made up of hilly to steep ridges. The sandstone plateaus have mountainous slopes and deeply cut gorges. In places the gorges and mountain scarps have vertical to overhanging sandstone walls. Lookout Mountain in general is rougher and has more rolling to hilly relief than Sand Mountain, but both of these sandstone plateaus have rough as well as fairly smooth areas (fig. 3).

basins along the western bluff that are drained locally into Little Wills Valley and a small area on the bluff south of Collinsville drained by tributaries of Black Creek. This creek eventually reaches the Coosa River through Little Wills and Big Wills Creeks. The deep gorges along Little River were cut when the river carried practically all of the runoff water from the

Valley. The river follows the general slope of the Appalachian Plateau toward the southwest.

Big Wills Creek and its tributaries drain the valleys south of the drainage divide located just north of Valley Head and Hammondville. North of the divide, East Fork Lookout Creek drains Railroad Valley. West Fork Lookout Creek drains the east-central valley. The two forks join to form Lookout Creek. Dry Creek drains both Sand and Dugout Valleys. Its course lies in Dugout Valley, but its branches reach into Sand Valley. Deer Head Cove is drained by two branches of Lookout Creek, by Crawfish Creek in the northwest,

formations exposed in De Kalb County will be discussed in detail.

The Pottsville formation is the most important in De Kalb County. It forms the capping on Lookout, Sand, and Fox Mountains and covers nearly four-fifths of the area. It is the only formation exposed on the sandstone plateaus, except in some of the deep gorges. In these gorges the streams have cut through the sand-

formation. The Pottsville formation consists, or consisted, of beds of sandstone alternating with beds of shale. The uniformity and thickness of the beds vary greatly. In some places the sandstone beds appear to be relatively thin and the shale beds thick; in others the sandstone beds appear to be several times as thick as the shale. Lenses of shale may occur in the sandstone, or lenses of sandstone in the shale. Little Mountain, or Lookout Mountain, south of Mentone has a thin capping of sandstone. This is underlain by a relatively thick bed of shale that rests on another sandstone layer. Similar conditions occur on Pea Ridge of Sand Mountain. The variations appear to be greater on Lookout Mountain than on Sand Mountain.

The sandstone members of the Pottsville formation are quite resistant to weathering. The rock is composed largely of fine- to medium-grained, thick-bedded or massive sandstone. In some places, however, it is a thin-bedded fairly hard rock commonly called flagstone; in others it is composed largely of conglomerates. In a few places the rock has rather loose structure and is composed of nearly unconsolidated sandy material that can be broken readily into single-grain consistence. Locally, interbedded layers or lenses of soft clay shale occur in the sandstone. Partly indurated rather shallow

are common in both ridges of Fort Payne chert (fig. 4) and in the middle ridges derived from the dolomitic

FIGURE 4.—Fort Payne chert in a quarry northeast of Fort Payne.

limestones. Fort Payne chert occurs on the east slope of the eastern ridge and the northwestern slope of the western ridge. The chert from dolomitic limestone occurs in the middle ridges of the southern part of the county and in Big Ridge in the northern part.

The Red Mountain formation underlies the Fort Payne chert. It corresponds to the Tellico sandstone of Tennessee, Georgia, and other areas. It outcrops fairly regularly on the northwestern slope of the eastern ridge and more or less irregularly on the southeastern slope of the western ridge. The name Red Mountain comes from the red soil that covers the exposed areas. The formation varies considerably in

cherty in others. The argillaceous rock weathers to a reddish shaly mass. The residue of the weathered rock forms the parent soil material of the Colbert and Talbott series. In places, however, these series are derived also from materials of other limestone formations. Much of the weathered residue is washed directly or indirectly into the streams and is spread over the flood plains during periods of overflow. The alluvium is derived largely from weathered limestone. It is the parent material of Etowah, Capshaw, Tupelo, Robertsville, Dunning, and Melvin soils of alluvial origin in the limestone valleys.

Bangor limestone gives rise to extensive areas of Rockland, limestone, steep. This rockland is a miscellaneous land type that occurs mostly on lower slopes of Lookout Mountain.

Hartsells sandstone occurs in such small exposed areas that no soil series can be correlated and mapped with it.

Chattanooga shale occurs in exposures that are so intermittent and narrow that correlation with soil series is impractical. The soils in areas where this shale is exposed are included in mapping units of the Tellico series.

Climate

The climate of De Kalb County is continental (table 1). It is humid, mild, and temperate, but there is a fairly wide range in temperature over a period of years. The summers usually are long and have moder-

TABLE 1.—*Normal temperature and precipitation at Valley Head, De Kalb County, Ala.*
[Elevation, 1,030 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1954)	Wettest year (1900)	Average snowfall
	°F	°F	°F	Inches	Inches	Inches	Inches
December	42.5	78	0	5.17	6.47	4.20	0.8
January	40.9	78	— 7	4.85	7.41	4.26	1.1
February	43.2	80	—18	4.84	4.19	7.72	.7
Winter	42.2	80	—18	14.86	18.07	16.18	2.6
March	50.7	90	4	5.65	4.10	6.59	.1
April	58.8	92	22	5.08	4.23	11.40	(3)
May	67.2	100	30	4.26	3.17	3.48	0
Spring	58.9	100	4	14.99	11.50	21.47	.1
June	74.8	104	36	4.29	1.37	12.47	0
July	77.3	106	49	5.01	.66	3.77	0
August	76.7	105	42	4.56	.41	4.29	0
Summer	76.3	106	36	13.86	2.44	20.53	0
September	72.3	104	30	2.55	.36	4.70	0
October	60.5	95	22	3.45	.92	7.28	(3)
November	49.4	82	10	3.16	2.63	4.29	.1
Fall	60.7	104	10	9.16	3.91	16.27	.1
Year	59.5	106	—18	52.87	35.92	74.45	2.8

[1] Average temperature based on a 70-year record, through

dry periods. This practice is not common, although many small fishponds have been built.

Until recently most of the wells were dug to depths of 10 to 50 feet or more. It is now estimated that more drilled wells are in use than open dug wells. When an old well becomes inadequate, it usually is replaced by a drilled well. Pipe casing, however, is installed in some old wells, which are drilled to a depth where the water supply is greater. Creeks or small drains supply most of the water for livestock.

Vegetation

The original cover of De Kalb County was largely forest and some underbrush and small patches of grass, lichen, shrubs, annual plants, and perennial plants. There is very little information about the composition of the original forest. Probably most areas could have been classed as mixed hardwoods and pine. In the limestone valleys, nearly level to rolling areas with limestone outcrops and very shallow soils over limestone had almost pure stands of redcedar. On the sandstone plateaus, areas of shallow soils over sandstone and those with sandstone outcrops supported nearly solid stands of Virginia pine *(Pinus virginiana)*.

Practically every kind of tree common to forested areas of the county today was cited as witness trees to established land corners. The following is a fairly complete list of names from compiled field notes of the United States Original Land Surveys: Beech, black oak, black gum, blackjack oak, chestnut, chestnut oak, chinquapin, dogwood, elm, hickory, lynn, maple, persimmon, pine, poplar, post oak, red oak, sassafras, sourwood, Spanish oak, sweetgum, sycamore, walnut, white oak, and willow. Post and black oaks were named most often as witness trees and probably were dominant. Other common trees were water oak, laurel oak, ironwood, birch, hawthorn, redbud, hackberry, sumac, honey or sweet locust, black locust, buckeye, and holly. The locust trees are not native to the area.

The trees now growing in the county are about the same species as those of the original forest. A higher percentage of pine is probably present because pine reseeds voluntarily on abandoned fields or on cutover areas, pasture, and burned-over forest. Virginia pine *(Pinus virginiana)*, commonly called scrub pine or spruce pine, loblolly pine *(P. taeda)*, and shortleaf pine *(P. echinata)* are the most common pines in the county. Virginia pine is largely on the sandstone plateaus where the soil is comparatively shallow to bedrock, but the other two species grow in the limestone valleys and on the sandstone plateaus in areas with relatively deep soil. Some of each kind, however, are in areas dominated by the other species.

Grape, muscadine, rattan, and ivies, together with blackberry, greenbrier, sawbrier, and other prickly

1,500 black locust, and 1,500 redcedar seedlings were planted in the county.

De Soto State Park contains 4,500 acres; about 100 acres of this total are not forested. During 1947 and 1948, 500,000 board-feet of timber (mainly *Pinus virginiana*) were marked for cutting in the park.

Wildlife

The settlers found an abundance of game and fish. Deer and turkey were common, as well as raccoon, opossum, squirrel, and rabbit. Quail, grouse, and other edible birds were plentiful. Bears, panthers, and wolves were destructive at times.

The game animals and birds most common at the present time are squirrel, rabbit, quail, and mourning dove. A game refuge has been established on the northern and eastern parts of Lookout Mountain, including the De Soto State Park area, which adjoins a game refuge in Georgia across the State line. It is hoped to reestablish deer and turkey in the large timbered areas of this region. The most common fur-bearing and predatory animals are raccoon, opossum, fox, bobcat, skunk, weasel, and probably a few coyotes. Fair to good fishing can be had at times in Little River and its branches on Lookout Mountain; in Big Wills and other creeks in the valleys; and in Town Creek and other streams on Sand Mountain. Most of the fishermen of De Kalb County, however, go to Guntersville Reservoir and other backwaters on the Tennessee River.

Early History

About the time the American colonies were becoming established, the Cherokee Nation of Indians claimed the land of Virginia and the Carolinas from the Atlantic to the Appalachian Mountains. As early as 1623 the Indians were driven from their homes along the Appomattox River in Virginia. From time to time they were driven westward until many crossed the mountains and settled in the valleys along the hills of what is now northwestern Georgia, northeastern Alabama, and eastern Tennessee.

Before the Revolutionary War, Big Will, an Indian chief who was part white, established Willstown (or Wills Town) near a stream now known as Big Wills Creek in the valley. The valley is also known as Big Wills. This settlement is supposed to have been made about 1770 on a site approximately 2 miles north of Lebanon or 5 or 6 miles southwest of Fort Payne. Some claim, however, that the site is about 2 miles north of Fort Payne. Willstown was one of the largest of the Cherokee settlements. At times during the Revolutionary War it was the headquarters for British agents

syllable. It is reported that newspapers, Bibles, and other publications were printed in the Cherokee language on presses set up in the Cherokee Nation. Before the settlers came, the Indians operated several cotton gins and gristmills which were turned by waterpower.

From colonial times, white settlers had encroached on Indian land, and new settlers had pushed farther inland. When they reached the region around De Kalb is not known definitely, but the date probably was some time after 1800.

The Indian history of this area is tied up with the history of the Cherokee Nation. In 1785 the Cherokees signed their first treaty with the newly formed United States Government. During the next 30 years new treaties were made from time to time, only to be broken by the settlers. In 1817 the Indians were forced to sign a treaty approved by President Thomas Jefferson, which provided for the removal of the Cherokees from the Great Smokies to the Indian Territory, now a part of Oklahoma. This was the forerunner of the Treaty of New Echota, signed December 29, 1835, which provided for the removal of the southern Cherokee Indians then concentrated mainly in northwestern Georgia, northeastern Alabama, and southeastern Tennessee. A few of the Indians, about 300 whose leaders had agreed to the treaty, migrated in 1836 to their new lands west of the Mississippi. The majority, about 18,000, whose leaders did not sign the treaty, refused to go. They were forcibly removed in 1838.

Organization and Population

De Kalb County was created by the Alabama State Legislature on January 9, 1836, a few days after the Treaty of New Echota was signed. It is one of three counties in Alabama formed from lands ceded by the Cherokee Indians under that treaty. It was named for Baron Johann De Kalb, a Bavarian officer who trained in the Army of France and accompanied General LaFayette to America. He was killed in South Carolina on August 16, 1780, in the Battle of Camden.

Local histories would indicate that from 1836 to 1842 the county seat was moved several times. Camden, a community about 2 miles southwest of Lebanon, was selected as the first county seat. It was named for Camden, S. C., where Baron De Kalb was killed. Fort Payne is the present county seat.

The people who settled De Kalb County came largely from Georgia and Tennessee and other counties already

Industries

The county is more than half in forest, and lumbering is one of its chief industries. Fort Payne is the main industrial center. According to the local Chamber of Commerce, 9 hosiery mills with 1,793 employees and 1 lumber fabrication company with 230 employees operate in Fort Payne. The lumber fabrication company specializes in building prefabricated houses and maintains sales in many parts of the country. Sawmills, planing mills, and lumberyards are located in Fort Payne and throughout the county. There is one small hosiery mill in Crossville. Various small mills are in operation in other towns in the county.

Thinly bedded sandstone for building rock has been quarried in several parts of the county. Suitable rock in any one area generally is small, and the supply in each quarry is soon exhausted. A few small coal mines have been operated on Lookout and Sand Mountains from time to time, but no regular mining is conducted. Sirup is made in small sorghum mills throughout the county, and the 1950 census states that 18,417 gallons were manufactured in 1949. Some limestone is quarried for road material. It is also suitable for agricultural use.

According to local information, about 40 cotton gins were operated during the ginning season of 1951 within the county. A few gins are located in neighboring counties, and it is probable that most farmers live within 5 miles of a cotton gin. All milk produced on farms for market is collected by motortruck and is processed outside the county.

Transportation

De Kalb County has connections with outside centers of population and markets by the Alabama Great Southern Railroad, which follows the eastern valley through the county. This railroad had its beginning about 1850 and is now a part of the Southern Railway System. The county has no scheduled air service. Several bus and motortruck lines connect with places outside the county.

There are several highways in the county. United States Highway No. 11 more or less parallels the railroad through the valley. State Highway No. 35 runs west from Fort Payne to Scottsboro. State Highway No. 68 runs west from Collinsville through Crossville to join State Highway No. 110, which traverses the entire length of Sand Mountain in De Kalb County and

an average distance of 2 miles to the trading center visited most often.

Community, Farm, and Home Facilities

The county has a consolidated public school system consisting of 9 senior high schools and 22 elementary and junior high schools. Fort Payne has 2 elementary schools and 2 junior high schools. The 9 senior high schools are located in Fort Payne, Valley Head, Collinsville, Crossville, Geraldine, Fyffe, Sylvania, and Ider. Most of the pupils are transported to and from school by county school buses.

De Kalb General Hospital was opened in August 1950. It is located in Fort Payne and serves the entire county. Small clinics are in some of the larger towns.

Churches are well distributed throughout the county. The De Kalb County public library is in Fort Payne. It is a circulating library and maintains branches at 18 schools and substations. Rural mail routes extend into nearly all parts of the county.

As reported by the 1950 Federal census, electricity was available on 5,976 farms, and 750 farms had telephones. In 1950, 60 farms had milking machines, 1,228 had electric water pumps, 370 had electric chick brooders, and 30 had electric power feed grinders. In the same year, 574 farm homes had electric hot-water heaters, 183 had home freezers, and 3,990 had electric washing machines.

Agriculture

History

The people of De Kalb County have depended largely on agriculture, directly or indirectly, since the area was opened to settlers. Their agriculture did not differ greatly from that of the Indians who had grown corn, beans, peas, squash, and some other vegetables. The Indians also grew some cotton for spinning and weaving and raised cattle and hogs on open ranges. The Indian methods and tools for tilling the soil were crude, but these were ample for their needs. Their products were divided largely on a tribal or communal basis, especially the cattle and hogs, and probably the flour and meal from their gristmills and the lint from their primitive cotton gins.

The early settlers raised the same kinds of vegetables and other crops as the Indians, although improved varieties were introduced from time to time. The chief improvement in agriculture was in the methods of clearing and tilling the soil. Larger areas were opened for cultivation and, in time, plows and other implements for breaking and working the soil were employed. Oxen and horses were the principal work stock.

Corn was a major source of income from the early days. As transportation facilities improved, other marketable or cash crops, especially cotton, were introduced.

Land Use

According to the Federal census, 79.4 percent, or 305,556 acres of the land in farms in 1950, [illegible]

farmland, by use in 1949, and the number of farms reporting, are given below:

Use:	*Acres*	*Farms reporting*
Cropland (total)	202,927	6,958
Harvested	173,524	6,640
Used only for pasture	13,180	5,272
Not harvested or pastured	16,223	1,729
Woodland (total)	153,999	5,184
Pastured	36,511	3,339
Not pastured	117,488	4,209
Other land pastured	24,474	3,222
Other land	14,156	6,292

Cropland used only for pasture includes rotation pasture and all other cropland used only for pasture. Cropland not harvested and not pastured includes idle cropland, land in soil-improvement crops only, land on which all crops failed, land seeded to crops for harvest after 1949, and cultivated summer fallow. Other land pastured includes rough and brush land and any other pastured land not classed either as woodland or as cropland. Other land includes house lots, barn lots, lanes, roads, ditches, and wasteland.

Number and Size of Farms

As reported by the Federal census, the number of farms in the county in 1950 was 7,055 and the average size of farms was 56.1 acres.

The farms of the county, classified in the 1950 Federal census by size, and the number and acreage in each classification, are given below:

Size of farms in acres:	*Number*	*Total acreage*
Under 10	383	1,988
10 to 69	4,957	184,133
70 to 179	1,511	146,874
180 to 499	184	45,995
500 and larger	20	16,566

The number and size of farms reported by the census are based on operational units and not on ownership. The trend in land ownership from small to large farms, or conversely, therefore, is not easily determined. However, there is apparently a trend toward larger units because of the increase in livestock raising, especially in the limestone valleys.

Types of Farms

The number of farms by type of farm, as compiled from the 1950 Federal census, are as follows:

Type of farm:	*Number*
Field crop other than vegetable and fruit-and-nut	4,415
Cash-grain	92
Cotton	4,328
Other field-crop	25
Vegetable	15
Fruit-and-nut	5
Dairy	52
Poultry	111
Livestock other than dairy and poultry	131
General	459
Primarily crop	172
Primarily livestock	45
Crop and livestock	242

Crops

De Kalb is one of the leading counties in the State in the production of corn and cotton. This leading position is the result of increased knowledge and use of better farm-management practices. These practices were developed mainly at the Sand Mountain Substation at Crossville for the relatively infertile but responsive soils of Sand and Lookout Mountains. A fairly large acreage of hay is grown. Oats, wheat, peas and beans for drying, potatoes, and sweetpotatoes are grown on a relatively small scale. Vegetables are produced for home use on nearly all farms, and for market on some.

From about 1900 until recently, apples and peaches were grown commercially in De Kalb County. Control of diseases and pests, however, has been too difficult and costly for the commercial grower and is prohibitive for the home orchardist. Strawberries and other small fruits are grown commercially on a few farms on the sandstone plateaus. The largest center at present is near Henagar.

The acreage of the principal crops and the number of bearing fruit and nut trees and grapevines, compiled from Federal census reports for the years stated, are given in table 2.

TABLE 2.—*Acreage of principal crops and number of fruit and nut trees and grapevines of bearing age in stated years*

Crops	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn harvested for grain	65,205	97,852	86,347
Oats threshed or combined	18	120	483
Wheat threshed	57	107	94
Cowpeas harvested for peas	(1)	1,849	107
Soybeans harvested for beans	(1)	312	66
Peanuts	(1)	402	37
All hay	12,556	25,941	15,550
Timothy or clover, alone or mixed	254	81	263
Alfalfa	1	49	1,452
Other cultivated grasses	837	909	397
Wild grasses	232	170	(1)

Livestock and Livestock Products

The livestock industry—the raising of cattle, hogs, and poultry—and the dairy industry are increasingly important to the economy of the county. Great improvement has been made in recent years in quality of beef and dairy cattle as well as in the efficiency of farm management.

Beef-cattle raising is confined largely to the limestone valleys. Dairy farms are on some of the sandstone plateaus and in the limestone valleys. Hog raising is common on the sandstone plateaus and in the limestone valleys, but more animals per farm are kept on the sandstone plateaus.

Poultry flocks are small. Specialized poultry farms are mostly on the sandstone plateaus. Some farms produce eggs for market, but the greater number supply eggs for hatcheries under contract. Other poultry farms specialize in raising broilers.

As reported by the 1950 Federal census, livestock and livestock products were a major source of income on 294 farms. In the same year dairy products were sold from 1,651 farms. On the day preceding the census enumeration 7,859 cows were milked on 5,585 farms; they produced 18,066 gallons of milk. Many farms in the county reported sale of livestock or livestock products. These sales included 6,059 cattle and calves sold alive and 319 butchered, and 18,007 hogs and pigs sold alive and 10,161 butchered. Also reported sold were 110 sheep and lambs, 433 horses and mules, 183,543 chickens, and 782,935 dozen eggs.

Table 3 gives the number of livestock and beehives on farms of the county for stated years, as compiled from Federal census reports.

TABLE 3.—*Number of livestock and beehives on farms in stated years*

Livestock	1930	1940	1950
	Number	*Number*	*Number*
Mules and mule colts	[1] 8,972	[1] 8,703	8,206
Horses and colts	[illegible]	[illegible]	[illegible]

Farm Power and Mechanical Equipment

Although the number of tractors has increased greatly, the number of horses and mules remained fairly constant during the 20-year period from 1930 to 1950. Horses and mules, however, are turned out to pasture more often and for longer periods than when they were the sole source of power.

The 1950 Federal census reports mechanical equipment on farms, as follows:

Mechanical equipment on farms:	Number	Farms reporting
Tractors	1,247	1,179
Motortrucks	1,565	1,459
Automobiles	2,088	1,980
Grain combines	43	43
Corn pickers	16	16
Pick-up hay balers	31	31

The farms are classified according to work power in 1950 as follows:

Farms classified by work power:	Number
No tractor, horses, or mules	1,387
No tractor and 1 horse or mule	839
No tractor and 2 or more horses, mules, or both	3,646
Tractor and horses, mules, or both	606
Tractor and no horses and mules	577

Farm Tenure and Labor

On the basis of the 1950 Federal census, full owners operated 3,666 farms, or 52 percent of the farms in the county; part owners 879, or 12.4 percent; and tenants 2,507, or 35.5 percent. Tenancy decreased from 41.7 percent in 1945. Managers operated only 3 farms.

Tenants on farms in 1950 were as follows:

Tenants on farms:	Number
Cash	71
Share-cash	12
Share	1,841
Croppers	409
Other and unspecified	174

The kinds of farm operators and the acreage operated by each were as follows:

Kinds of farm operators:	Acres
Full owners	214,509
Part owners	57,123
Managers	3,071
All tenants	120,853
Cash	3,364
Share-cash	486
Share	92,136
Croppers	16,165
Other and unspecified	8,702

In 1950 the number of farm operators residing on farm was 6,291; not residing on farm operated, 78; with other income of family in 1949 exceeding value of agricultural products sold, 1,563; and working off their farm, 1,707.

Farm Expenditures

census the expenditures and the number of farms making them were as follows:

Expenditure for:	Farms reporting
Machine hire, hired labor, or both	4,634
Machine hire	4,173
Hired labor	2,338
Feed for livestock and poultry	3,433
Livestock and poultry purchased	2,502
Seeds, bulbs, plants, and trees purchased	3,804
Gasoline and other petroleum fuel and oil	1,556
Tractor repairs	714
Other farm machinery repairs	3,229

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and sometimes they are much closer. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers and is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Slope was taken into consideration in the mapping of the various soils of the county. The slope classification used is as follows: Nearly level, undulating, rolling, hilly, and steep. In De Kalb County the nearly level soils do not have the phase name added. The slope classification and percentage range for the slope phases of the Apison, Crossville, Hartsells, Linker, Muskingum, and Pottsville soils are as follows:

Slope classes:	Percent		Percent
Nearly level	0–2	Hilly	10–20

The slope classification and percentage range for all other soils in the county are as follows:

Slope classes:	*Percent*		*Percent*
Nearly level	0–2	Hilly	12–25

they are identified by descriptive names, such as Stony colluvial land, Gullied land, and Rockland.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible

TABLE 4.—*Principal characteristics*

Series	Parent material	Slope	Position	Natural drainage	Surface soil	
					Color	Approximate thickness
		Percent				*Inches*
Abernathy	Recent colluvium and local alluvium originating from limestone.	0–5	Colluvial slopes.	Well drained to moderately well drained.	Dark brown	14
Allen	Old colluvium and local alluvium originating mainly from sandstone but contains materials from limestone and shale.	2–25	Colluvial slopes.	Well drained to somewhat excessively drained.	Yellowish brown and strong brown through yellowish red to reddish brown and red.	5–8
Apison	Residuum from weathering of interbedded sandstone and shale, sandy shale, and siltstone.	2–10	Upland	Well drained	Yellowish brown to brownish yellow.	5–9
Atkins	Recent general alluvium from uplands underlain mainly by acid sandstone and shale.	0–2	Bottom land.	Poorly drained	Dark gray to very dark gray in the upper part; gray to dark grayish brown in the lower part.	10
Barbourville [3]	Recent colluvium and local alluvium originating from acid sandstone and shale.	1–3	Colluvial slopes.	Well drained to moderately well drained.	Brown to yellowish brown	8
Capshaw	Old mixed general alluvium from uplands underlain mainly by limestone but in places by sandstone and shale.	0–5	Terraces	Moderately well drained	Light yellowish brown to yellowish brown.	8
Clarksville	Residuum from weathering of— Very cherty dolomitic limestone	5–45	Upland	Well drained to excessively drained.	Light gray, light brownish gray, or pale yellow to light yellowish brown.	5–7
Colbert	Clayey (argillaceous) limestone that contains shale beds in places.	2–12	Upland	Somewhat poorly drained to moderately well drained.	Olive brown to light yellowish brown or yellowish brown.	5
Cotaco [4]	Recent colluvium and local alluvium originating from acid sandstone and shale.	1–3	Colluvial slopes.	Same	Dark gray to grayish brown	10
Crossville	Residuum from weathering of— Fine-grained sandstone, conglomerate, and interbedded shale.	2–10	Upland	Well drained to moderately well drained.	Dark brown to dark reddish brown in the upper part; dark reddish brown in the lower part.	9–11
Dewey	High-grade limestone that contains some chert in places.	5–25	Upland	Well drained to somewhat excessively drained.	Brown to reddish brown	5
Dunning	Recent general alluvium from uplands underlain mainly by limestone.	0–2	Bottom land.	Poorly drained	Dark grayish brown to olive brown.	7
Dowellton	Residuum from weathering of highly clayey (argillaceous) limestone and calcareous clay shale.	0–2	Upland	Somewhat poorly drained to moderately well drained.	Brown to pale brown	5
Ennis	Recent general alluvium from uplands underlain mainly by chert or cherty limestone and cherty dolomite.	0–2	Bottom land.	Moderately well drained	Brown	10
Etowah	Old mixed general alluvium from uplands underlain mainly by limestone but in places by sandstone and shale.	2–5	Terraces	Well drained	Dark brown	7
Fullerton	Residuum from weathering of cherty dolomitic limestone.	5–25	Upland	Well drained to excessively drained.	Grayish brown or yellowish brown to yellowish red.	5–8
Greendale	Recent colluvium and local alluvium originating from chert or cherty limestone.	0–6	Colluvial slopes.	Well drained to moderately well drained.	Grayish brown	8
Hamblen [5]	Recent local alluvium and colluvium from uplands underlain by acid sandstone and shale and calcareous rocks.	0–2	Bottom land.	Somewhat poorly drained	Brown to dark grayish brown	20
Hartsells	Residuum from weathering of sandstone and conglomerate, with beds of acid shale in places.	2–10	Upland	Well drained	Grayish brown to brownish yellow, or pale brown to brownish yellow.	5–11
Hermitage	Old colluvium and local alluvium originating mainly from high-grade limestone.	2–12	Colluvial slopes.	Well drained to somewhat excessively drained.	Dark brown to dark reddish brown, or reddish brown.	5–8

See footnotes at end of table.

of the soil series

Subsoil				Soil depth [1]
Color	Consistence	Texture	Approximate thickness	
			Inches	
Brown to reddish brown [2]	Friable	Silty clay loam	14	Very deep.
Red or reddish brown	Friable	Clay loam or stony clay loam	6–23	Shallow to very deep.
Brownish yellow to yellowish brown in the upper part; mottled brown, yellowish brown, yellow, reddish yellow, and gray in the lower part.	Friable in the upper part; firm to friable in the lower part.	Silty clay or silty clay loam in the upper part; silty clay in the lower part.	24–27	Shallow to deep.
Grayish brown (when wet) faintly mottled with shades of yellow, brown, and gray; light brownish gray (when moist) distinctly mottled with brown and brownish yellow.	Sticky when wet; firm when moist.	Silty clay loam	20	Deep to very deep.
Grayish brown, brown, or yellowish brown [2]	Friable	Heavy loam to sandy clay loam	12	Shallow to very deep.
Yellowish brown to grayish brown in the upper part; yellowish brown to yellow in the lower part.	Friable	Silty clay loam to silty clay in the upper part; silty clay in the lower part.	20	Deep to very deep.
Pale yellow to light yellowish brown	Friable	Cherty silty clay loam to cherty clay.	21–23	Very deep.
Yellowish brown	Very firm, tight	Silty clay	10–13	Very shallow to deep.
Splotched or mottled with shades of grayish brown and yellow [2].	Friable	Loam or fine sandy clay loam	18	Shallow to very deep.
Dark brown	Friable	Heavy loam to sandy clay loam, or heavy rocky loam to sandy clay loam.	8– 9	Very shallow to moderately deep.
Reddish brown in the upper part; red in the lower part.	Friable in the upper part; firm in the lower part.	Silty clay loam in the upper part; silty clay in the lower part.	43	Very deep.
Light olive brown to olive gray faintly mottled with shades of gray and brown.	Firm, stiff; plastic when wet.	Clay	17	Shallow to very deep.
Faintly to distinctly mottled light brownish gray, olive yellow, and light olive brown in the upper part; pale olive or olive yellow faintly mottled with shades of gray and brown in the lower part.	Very firm; very plastic in the upper part when wet; plastic in the lower part when wet.	Clay	17	Shallow to moderately deep.
Yellowish brown [2]	Very friable	Silt loam or cherty silt loam	20	Deep to very deep.
Strong brown to yellowish red in the upper part; strong brown to reddish yellow in the lower part.	Friable in the upper part; firm to friable in the lower part.	Silty clay loam in the upper part; heavy silty clay loam or silty clay in the lower part.	31	Deep to very deep.
Yellowish brown grading into yellowish red and strong brown in the upper part; red or yellowish in the lower part.	Friable in the upper part; firm, stiff in the lower part.	Cherty silty clay loam, silty clay, or clay; cherty clay in the lower part.	21–34	Very deep.
Light yellowish brown in the upper part; in the lower part, grayish brown mottled with shades of brown, yellow, and gray [2].	Friable in the upper part; firm to friable in the lower part.	Cherty silt loam to cherty silty clay loam in the upper part; cherty silty clay in the lower part.	22	Very deep.
Mottled light yellowish brown and light gray [2]	Friable	Loam or sandy clay loam; grades into sandy clay as the depth increases.	20	Deep to very deep.
Yellowish brown or brownish yellow	Friable	Fine sandy loam to fine sandy clay loam, or fine sandy clay.	15–19	Shallow to deep.
Reddish brown, or red to dark red	Friable to firm	Heavy silty clay loam to silty clay	29–34	Shallow to very deep.

TABLE 4.—*Principal characteristics*

Series	Parent material	Slope	Position	Natural drainage	Surface soil	
					Color	Approximate thickness
		Percent				*Inches*
Huntington	Recent general alluvium from uplands underlain mainly by high-grade limestone; contains some materials originating from sandstone, shale, and other sedimentary rocks.	0– 2	Bottom land.	Well drained	Dark brown or dark yellowish brown to dark grayish brown.	7–32
Jefferson	Old colluvium and local alluvium originating mainly from acid sandstone.	2–12	Colluvial slopes.	Well drained to somewhat excessively drained.	Yellowish brown, or pale brown to brownish yellow.	7– 8
Johnsburg	Residuum from weathering of acid sandstone, conglomerate, and shale.	0– 3	Upland	Somewhat poorly drained	Very pale brown to light gray; dark grayish brown in the upper 3 inches.	9
Leadvale	Old colluvium and local alluvium originating mainly from shale.	2–12	Colluvial slopes.	Somewhat poorly drained to moderately well drained.	Brownish yellow	5– 6
Lindside	Recent general alluvium from uplands underlain mainly by high-grade limestone; contains some materials originating from sandstone, shale, and other sedimentary rocks.	0– 2	Bottom land.	Somewhat poorly drained	Dark brown	16
Lickdale	Residuum from weathering of— Acid sandstone, conglomerate, and shale	0– 2	Upland	Poorly drained to very poorly drained.	Very dark brown	8
Linker	Sandstone and conglomerate, with beds of acid shale in places.	2–10	Upland	Well drained	Yellowish brown	6
Litz	Acid and calcareous shales that contain thin beds of limestone.	5–45	Upland	Excessively drained	Very dark brown (highly organic), or brownish yellow.	1½– 5
Melvin	Recent general alluvium from uplands underlain mainly by high-grade limestone; contains some	0– 2	Bottom land.	Poorly drained	Dark yellowish brown to yellowish brown distinctly mottled with pale yellow	12

of the soil series—Continued

Subsoil				Soil depth [1]
Color	Consistence	Texture	Approximate thickness	
			Inches	
Dark yellowish brown or brown to reddish brown [2]	Very friable or friable	Silt loam, very fine sandy loam, light very fine sandy clay, or very fine sandy clay loam.	8–29	Very deep.
Brownish yellow or yellowish brown	Friable	Fine sandy clay	23–24	Shallow to very deep.
Pale yellow to light yellowish brown stained with dark-gray streaks in the upper part; faintly splotched to distinctly mottled gray, yellow, and brown in the lower part.	Friable	Silty clay or heavy silty clay loam	27	Moderately deep to deep.
Yellow to brownish yellow	Friable	Silty clay	9–10	Moderately deep to very deep.
Mottled dark brown, light brownish gray, and yellow [2].	Friable	Silt loam to silty clay loam	20	Very deep.
Dark gray faintly mottled with shades of yellow and brown; below this, mottled light gray, yellowish brown, and olive yellow.	Friable	Heavy very fine sandy clay to silty clay.	12	Deep to very deep.
Strong brown to yellowish red; the color becomes somewhat redder as the soil depth increases.	Friable	Fine sandy clay loam; the texture becomes somewhat finer as the soil depth increases.	17–20	Shallow to deep.
Brownish yellow [2]	Friable	Silt loam, or shaly silty clay loam to shaly clay.	5–10½	Very shallow to shallow.
Mottled grayish brown and light olive brown	Firm to friable; sticky and plastic when wet.	Silty clay loam to silty clay	18	Very deep.
Reddish yellow to yellowish red	Friable	Cherty silty clay loam to cherty silty clay, or silty clay loam to silty clay.	20–22	Deep to very deep.
Yellowish red in the upper part; reddish yellow in the lower part.	Friable	Silty clay	31–37	Shallow to very deep.
Yellowish brown [2]	Friable	Fine sandy loam, or stony fine sandy loam grading with increasing depth into stony light fine sandy clay loam.	7–10	Very shallow to deep.
Mottled pale yellow, brownish yellow, yellowish brown, and gray [2].	Friable	Heavy silty clay loam to silty clay	20	Very deep.
Grayish brown to yellowish brown	Friable	Cherty silt loam to cherty silty clay loam.	14–17	Deep to very deep.
Brownish yellow mottled with gray and brown [2]	Friable	Fine sandy clay loam	11	Shallow to very deep.
Strong brown faintly splotched with gray and yellow [2].	Friable	Heavy silt loam or silty clay loam	23	Shallow to very deep.
Pale yellow, pale brown, or yellow mottled with gray and brown in the lower part. [2]	Friable	Very fine sandy clay to shaly silty clay or shaly clay.	4– 7	Very shallow to shallow.
Light gray mottled with pale brown, brownish yellow, and reddish yellow.	Friable	Silty clay loam grading with increasing depth into silty clay.	24	Very deep.

TABLE 4.—*Principal characteristics*

Series	Parent material	Slope	Position	Natural drainage	Surface soil	
					Color	Approximate thickness
		Percent				*Inches*
Staser[6]	Recent local alluvium and colluvium from uplands underlain by acid sandstone and shale and calcareous rocks.	0– 5	Bottom land.	Well drained	Grayish brown to reddish gray.	8
	Residuum from weathering of—					
Talbott	Clayey (argillaceous) limestone	2–25	Upland	Well drained to excessively drained.	Reddish brown to yellowish red.	5
Tellico	Calcareous sandstone and interbedded shale.	5–45	Upland	Well drained to somewhat excessively drained.	Dark reddish brown, reddish brown, or dark red.	5–10
Tupelo	Old mixed general alluvium from uplands underlain mainly by clayey (argillaceous) limestone.	0– 2	Terraces	Somewhat poorly drained to poorly drained.	Dark brown to brown or yellowish brown.	7

[1] Soil depth as used here is the depth to significantly different material, such as bedrock or a bed of gravel. Descriptive terms refer to the following classes: Very shallow, 0 to 8 inches; shallow, 8 to 25 inches; moderately deep, 25 to 35 inches; deep, 35 to 60 inches; and very deep, 60 inches or more.

[2] Subsurface.

[3] The soils of the Barbourville series are mapped in this county only in complex with the Cotaco series.

of the soil series—Continued

Subsoil				Soil depth [1]
Color	Consistence	Texture	Approximate thickness	
			Inches	
Brown to reddish brown [2]	Friable	Loam; grades into sandy clay loam or fine sandy clay loam as the depth increases.	10	Very deep.
Yellowish red	Firm	Silty clay	16–20	Very shallow to very deep.
Dark red	Friable	Sandy clay	5–10	Very shallow to very deep.
Reddish yellow to brownish yellow mottled with shades of yellow, gray, and brown.	Very firm, tight	Silty clay	18	Deep to very deep.

[4] The soils of the Cotaco series are mapped in this county only in complex with the Barbourville series.

[5] In general, soils of the Hamblen series occur on bottom lands [illegible] drainage heads, and near the base of slopes in limestone valleys.

[6] In general, soils of the Staser series occur on bottom lands, but in this county they occur in slight depressions in uplands, around drainage heads and along foot slopes and drainageways in limestone valleys.

TABLE 5.—*Soil series, classified by soil orders and great soil groups, and factors that have produced differences in morphology*

ZONAL

Great soil group and series	Parent material	Relief	Degree of profile development	
			As indicated by number of significant genetic layers	As indicated by contrast in horizon
Red-Yellow Podzolic:				
Red members:				
	Residuum from weathering of—			
Dewey	High-grade limestone that contains chert in places.	Rolling to hilly	Strong	Medium.
Fullerton	Cherty dolomitic limestone	Rolling to hilly	Strong	Strong.
Linker	Sandstone and conglomerate, with shale beds in places.	Undulating to rolling	Strong	Strong.
Sequoia	Shale associated with limestone	Rolling	Strong	Strong.
Talbott	Clayey (argillaceous) limestone	Undulating to hilly	Strong	Strong.
Tellico	Calcareous sandstone and interbedded shale	Rolling to steep	Medium	Medium.
	Old colluvium and local alluvium mainly from—			
Allen	Sandstone but contains materials from limestone and shale.	Undulating to hilly	Strong	Strong.
Minvale	Cherty dolomitic limestone	Undulating to rolling	Strong	Strong.
Etowah	Old mixed general alluvium from uplands underlain mainly by limestone but in places by sandstone and shale.	Undulating	Strong	Medium.
Yellow members:				
	Residuum from the weathering of—			
Apison	Interbedded sandstone and shale, sandy shale, and siltstone.	Undulating to rolling	Strong	Strong.
Clarksville	Very cherty dolomitic limestone	Rolling to steep	Medium	Medium.
Hartsells	Sandstone and conglomerate, with beds of	Undulating to rolling	Medium	Medium.

TABLE 5.—*Soil series, classified by soil orders and great soil groups, and factors that have produced differences in morphology*—Continued

INTRAZONAL—Continued

Great soil group and series	Parent material	Relief	Degree of profile development	
			As indicated by number of significant genetic layers	As indicated by contrast in horizon
Lickdale	Residuum from weathering of acid sandstone, conglomerate, and shale.	Level or nearly level	Weak	Strong.
Low-Humic Gley:				
	Recent general alluvium from uplands underlain mainly by—			
Atkins	Acid sandstone and shale	Level or nearly level	Weak	Strong.
Melvin	High-grade limestone but contains some material from sandstone, shale, and other sedimentary rocks.	Level or nearly level	Weak	Strong.

AZONAL

Lithosols:				
	Residuum from weathering of—			
Litz	Acid and calcareous shales that contain thin beds of limestone.	Rolling to steep	Weak	Weak.
Muskingum	Sandstone mainly; contains materials from shale and siltstone in places.	Rolling to hilly	Weak	Weak.
Pottsville	Acid shale mainly	Hilly	Weak	Weak.
Alluvial soils:				
	Recent colluvium and local alluvium mainly from—			
Abernathy	Limestone	Level or nearly level to gently sloping.	Very Weak	Very Weak.
Barbourville	Acid sandstone and shale	Nearly level to very gently sloping.	Very Weak	Very Weak.
Cotaco	Acid sandstone and shale	Same	Weak	Medium.
Greendale	Chert or cherty limestone	Level or nearly level to rolling.	Weak	Weak.
Ooltewah	Limestone	Level or nearly level	Weak	Medium.
	Recent general alluvium from uplands underlain mainly by—			
Ennis	Chert or cherty limestone and cherty dolomite.	Level or nearly level	Very weak	Very weak.
Huntington	High-grade limestone containing materials originating from sandstone, shale, and other sedimentary rocks.	Level or nearly level	Very weak	Very weak.
Lindside	High-grade limestone containing materials	Level or nearly level	Weak	Medium.

TABLE 6.—*Approximate acreage and proportionate extent of soils mapped*

Soil	Acres	Percent	Soil	Acres	Percent
Abernathy silt loam	1,000	0.2	Johnsburg loam	1,500	0.3
Allen clay loam:			Leadvale silt loam:		
Severely eroded hilly phase	1,000	.2	Eroded rolling phase	500	.1
Severely eroded rolling phase	1,000	.2	Eroded undulating phase	500	.1
Allen loam:			Lickdale loam	1,000	.2
Eroded hilly phase	1,500	.3	Lindside silt loam	2,000	.4
Eroded rolling phase	1,000	.2	Linker fine sandy loam:		
Eroded undulating phase	1,500	.3	Eroded rolling phase	3,000	.6
Hilly phase	1,000	.2	Eroded undulating phase	1,000	.2
Allen stony clay loam, severely eroded hilly phase	1,000	.2	Litz shaly silty clay loam:		
Allen stony loam:			Eroded hilly phase	1,000	.2
Eroded rolling phase	1,000	.2	Eroded rolling phase	500	.1
Hilly phase	1,000	.2	Eroded steep phase	500	.1
Apison loam:			Litz silt loam:		

ABERNATHY SERIES

The soil of the well drained to moderately well drained Abernathy series is characterized by its dark-brown surface soil and brown to reddish-brown subsurface layer. It occurs on colluvial lands in the limestone valleys. The parent material has been washed from soils derived largely from limestone residue. The

are so small that they are worked with larger areas of adjoining soils. Corn is the chief crop. Other crops are soybeans for hay, alfalfa, sorghum, and leafy vegetables. Areas on which water seldom stands during the growing season are used successfully for home gardens if they are otherwise suitably located. Many farmers plant potatoes commercially on the fall

tain along the southeastern edge of Railroad or Little Wills Valley. A few areas are in Deer Head Cove at the foot of Fox and Sand Mountains.

The loose friable surface soil of the Allen soils is more susceptible to shallow and deep gully erosion than to sheet erosion. However, where the firmer subsoil is exposed, sheet erosion may become very active. The Allen soils are eroded extensively because they were among the first to be used for cropland. Although they occupy mainly rolling and hilly positions, they were farmed without adequate conservation practices (fig. 5). Except for the severely eroded phases, the soils of the Allen series are generally medium to strongly acid, contain a moderate supply of organic matter, and have medium fertility. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

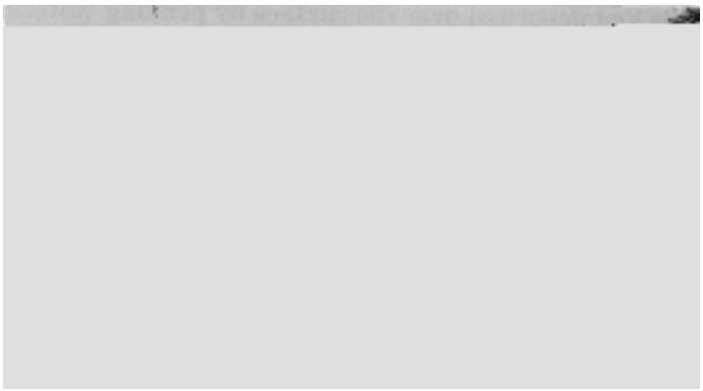


FIGURE 5.—Much of the acreage of the Allen soils has been severely eroded and abandoned. This area is being recleared for cultivation.

In general the Allen soils are not so fertile as the Hermitage, Dewey, Etowah, and other finer textured soils of the valleys. Under management practices commonly used, they are medium to low in productivity. They have a very wide to narrow range of suitability.

Allen loam, eroded undulating phase (2 to 5 percent slopes) (Af).—This is a well-drained moderately deep to very deep soil. It occupies colluvial and alluvial fans, foot slopes, benches and, in places, relatively broad nearly level tops of colluvial foothills. The soil developed under forest that consisted largely of mixed deciduous hardwoods and pines and, in places, scattered redcedars.

Runoff is slow to medium and internal drainage is medium. Most areas have lost 50 to 75 percent of the virgin surface soil through erosion. In some places the present plow layer consists of original surface soil, and in others of a mixture of original surface layer and

Underlying material—

30 to 44 inches, red friable sandy clay loam, splotched with reddish yellow; slightly compact in place; moderate fine to medium angular and subangular blocky structure having fairly well developed cleavage lines; outsides of the structure units darker than insides.

Depth to bedrock ranges from 2½ to 8 feet. In virgin areas the upper 3 inches are a dark-brown to dark grayish-brown very friable fine sandy loam. This layer contains a considerable quantity of decayed organic matter and many fine roots. The thickness of the cultivated layer ranges from 5 to 8 inches.

The color and texture of this soil vary considerably. Near the upper border of the foothills, the color in the subsoil is generally lighter red and the texture throughout the profile is more sandy. Farther down the slope the color is darker red or reddish brown and the texture is finer. The sandy covering, however, is very unevenly distributed over cropland because erosion has not been uniform. Some lower lying spots are considerably more sandy than those near the top of slopes. The texture of the surface soil is prevailingly loam, but it varies from fine sandy loam to sandy clay loam on the sharper breaks.

As mapped, this soil includes small acreages of Allen fine sandy loam, undulating phase, and Allen stony loam, eroded undulating phase.

Use and suitability (IIe–3).—Allen loam, eroded undulating phase, is well suited to nearly all crops. Most of the acreage is in row crops, chiefly corn and cotton. Several areas are in improved pasture.

The workability of the soil is generally very good, but stones interfere with tillage in some areas. Tilth is good except in severely eroded spots. Moisture absorption is moderately high on areas having a fairly deep sandy covering, but it is relatively low on nearly bald spots. The hazard of erosion is moderate. On the stronger slopes and sharper breaks where the surface soil is commonly thin, the soil can be improved if erosion is controlled. Areas that are underlain by shale or heavy clay need special care if the friable surface soil has washed away. Such areas are more common along the foot slopes of Lookout Mountain than along those of Sand Mountain.

The response of this soil to good management is medium to very good. Furthermore, the soil can be kept in excellent condition for crop production. It may be less fertile than some of the silt loams and silty clay loams on the uplands, but this disadvantage is offset by its easy workability and good response to the use of cover crops and mineral fertilizers.

Allen loam, eroded rolling phase (5 to 12 percent slopes) (Ae).—In profile characteristics, this soil is similar to Allen loam, eroded undulating phase. However, erosion has removed more of original surface soil.

reddish-brown friable clay loam, 16 to 21 inches thick. The depth of the soil to bedrock ranges from 2 to 7 feet.

As mapped, this soil includes small areas of Allen fine sandy loam, rolling phase, and Allen loam, rolling phase, still in virgin forest. Severely eroded and gullied spots also are included and are indicated on the soil map by symbol.

Use and suitability (IIIe–3).—Allen loam, eroded rolling phase, is used chiefly for corn and cotton. Minor crops such as soybeans, field peas, and peanuts are

Use and suitability (IVe–1).—The very small acreage of this soil is in forest, to which it is well suited. Pine is the principal cover in much of the cutover forest.

This soil has only fair workability. The hazard of erosion is high. Response to good management practices is medium to very good.

Allen loam, eroded hilly phase (12 to 25 percent slopes) (Ad).—Before being cleared and opened to cultivation, this soil was identical to Allen loam, hilly phase. The present plow layer consists of remnants of

About three-fourths of the soil has lost 25 to 75 percent of the original surface soil through erosion. The present eroded surface soil ranges from 6 to 8 inches in thickness. It consists of yellowish-red to reddish-brown friable stony loam. The subsoil is red to reddish-brown friable stony clay loam, 16 to 21 inches thick. Depths to bedrock are from 2 to 7 feet. In many fairly stony areas the surface soil has a relatively fine texture and is brown to reddish brown.

Use and suitability (IVe–4).—This inextensive soil is used chiefly for pasture. Although very little is in good improved pasture, more than 50 percent has been enclosed for common range pasture. Some abandoned fields are in pasture, whereas other areas cleared or partly cleared for pasture have never been used for crops. Probably less than 35 percent of this soil is in crops. Corn is the most common crop. A small part of the soil is in forest.

Workability is fair, and except in severely eroded spots, tilth is good. The hazard of further erosion is moderate. Moisture absorption is good under native forest, but it generally is low to very low on cropland. In cleared pastureland moisture absorption is fair to moderately high and depends largely on the character of the grass cover. Workability, tilth, and moisture-absorbing qualities can be improved by using better conservation practices. The removal of surface stones improves the ease of tillage. Response to good management is medium to good. This soil should be valuable for improved pasture if runoff is controlled and other management is good.

Allen stony loam, hilly phase (12 to 25 percent slopes) (Al).—This soil has more stone fragments strewn over the surface and mixed through the soil than Allen loam, hilly phase. It differs from Allen stony loam, eroded rolling phase, in that it is virtually uneroded, has stronger slopes, and has more stones that are more than 12 inches in diameter. In some areas many of the stones are more than 24 inches in diameter. Allen stony loam, hilly phase, is inextensive and is closely associated with other soils of the Allen series. It occupies hilly areas on foot slopes of Sand and Lookout Mountains. The parent material originated to some extent from shale in areas near the border of steeper and rougher land.

The soil had rapid runoff and medium internal drainage. Its native cover was probably deciduous hardwoods and some pines. The present forest varies from mainly hardwoods in some places to mainly pines in others. All areas have been cut over from time to time, and where the cutting has been heavy, pine tends to dominate.

Use and suitability (VIe–2).—The small aggregate area of this soil is mostly in forest, to which it is best suited. The soil has poor workability. The erosion hazard is high.

This soil has a medium to very good response to good management. Although best suited to trees, some parts may be suitable for pasture if cleared.

Allen clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Ac).—This soil occupies positions similar to those of Allen loam, eroded rolling phase, but it is severely eroded and has a predominantly finer textured plow layer. The plow layer consists largely of subsoil material, because nearly all the original surface soil has been removed by erosion. Shallow gullies occur in places. Runoff is rapid and internal drainage is medium.

The plow layer and subsoil are red to reddish-brown friable clay loam. The subsoil ranges in thickness from 8 to 15 inches. Below the subsoil is an accumulation of unconsolidated soil material of colluvial and alluvial origin. The depth of the soil to bedrock is from 1½ to 6 feet.

The soil is strongly acid, very low in organic matter, and low in fertility. It is moderately permeable. The moisture-holding capacity is moderate to low.

Use and suitability (IVe–1).—This soil has a small total acreage. All areas were once used mainly for row crops, but under present practices they are idle or in unimproved pasture. Volunteer grasses and other plants furnish scant grazing for livestock. Some areas have reverted to forest, mainly pine.

Except when restored under good conservation and tillage practices, workability and tilth are poor. Under ordinary care the soil is so highly erodible that little organic matter can accumulate in the plow layer, and good tilth cannot develop. Under good conservation practices, including the use of heavy machinery to smooth out the rough areas, these defects can be corrected. The quantity of moisture absorbed is not enough for crops, even under moderately dry conditions. The moisture-absorbing qualities can be improved by control of runoff.

Some of the soil has been reclaimed by terracing and by leveling or smoothing out the rough or gullied places. Most of the areas can be used best for improved pasture. Sericea lespedeza alone generally makes the best pasture, but this crop requires 1 to 2 years to become established. Some farmers, however, seed fescue or other grasses with the sericea lespedeza, and a few use other grass mixtures. Although the reclaimed soil can be used for improved pasture, occasionally the pasture can be followed by 1 to 3 years of row crops, usually corn or cotton, if good management, including contour tillage, is maintained. The response of this severely eroded rolling phase to good management is only medium.

Allen clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Ab).—This soil consists of areas that have lost nearly all or all the original loam surface soil and, in places, part of the subsoil through erosion. Some small areas occur that have retained a considerable part of the original surface soil. Small gullies are common, especially in idle areas. This soil has rapid runoff and medium internal drainage.

The present plow layer is composed almost entirely of subsoil material. It consists of red to reddish-brown friable clay loam. The subsoil also consists of red to reddish-brown friable clay loam that is 6 to 14 inches thick. Bedrock occurs at depths of 1½ to 6 feet.

The soil is strongly acid, very low in organic matter, and low in fertility. It is moderately permeable and has a moderate to low moisture-holding capacity.

Use and suitability (IVe–1).—Under present farm practices, most of the relatively small acreage of this soil is idle or has reverted to forest. The cultivated areas are used mainly for row crops, principally corn. Very few areas have been improved for permanent pasture; a few have been fenced for common range pasture consisting of volunteer grasses and other plants of low grazing value.

Allen clay loam, severely eroded hilly phase, has poor workability. The hazard of further erosion is high. Conservation measures are very difficult to apply, and reclamation is difficult and expensive. Moisture absorption is low because of the severe erosion, and the soil does not receive enough moisture for plant growth, except during wet seasons.

The soil, nevertheless, has many qualities that make it moderately responsive to good management. Management practices include the control of runoff and the use of winter cover crops if row crops are to be grown. Row crops are not suitable, but they may be planted after several years of pasture to clean up weeds by cultivation. At the present time, improved pasture or forest are the best uses for this soil. Sericea lespedeza is one of the best plants for improved pasture.

Allen stony clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Ah).—This soil consists of areas (originally Allen stony loam, hilly phase) that were cleared for cultivation and have lost nearly all or all of the surface soil and, in places, part of the subsoil through severe erosion. In many of the most severely eroded areas the stones are larger than elsewhere; very few are less than 12 inches in diameter. There are some fairly deep to deep gullies in most places. As mapped, the soil includes some less severely eroded areas. Runparent material has weathered from (1) interbedded sandstone, (2) shale, (3) thin beds of sandstone alternating with thin layers of lenses of shale, and (4) relatively thick beds of sandy shale. The resulting parent material is seldom uniform over very large areas. The deep sandy shale, however, usually produces more uniform parent material, but its texture will vary somewhat according to the proportion of sand and clay included. In places the subsoil rests almost directly on nearly unweathered gray clay shale.

The more common underlying material is partly weathered, very thinly bedded or stratified, varicolored layers of sandstone, siltstone, and shale or indurated shale. The stratified layers may form a bed several feet thick that rests directly on clay shale. In places the bed may be relatively thin and rest on one or more layers of sandstone underlain by shale. The thinly bedded, or stratified, layers of sandstone, siltstone, and indurated shale may break in weathering into small fragments that range up to 1½ inches in length and ¼ inch in thickness. Quantities of these fragments make a channery or gravelly soil. The fragments may be numerous in some places or entirely absent in others.

Variations in texture, content of platy fragments, depth to bedrock, type of bedrock, and color are com-

Profile description:

Surface soil—
0 to 8 inches, yellowish-brown to brownish-yellow friable loam to very fine sandy loam; pale yellow when dry; very weak fine blocky structure.

Subsoil—
8 to 22 inches, brownish-yellow to yellowish-brown friable silty clay to heavy silty clay loam; yellow when dry, plastic and sticky when wet; moderate medium blocky structure.
22 to 36 inches, mottled brownish-yellow, yellowish-brown, yellow, reddish-yellow, and gray firm to friable silty clay; plastic when wet; strong medium blocky structure.

Parent material—
36 inches +, soft rock material weathered from sandstone, shale, and siltstone.

In virgin areas the upper 3-inch layer of the surface soil is a very dark grayish-brown, very friable loam. It contains a fairly high [illegible]

In most areas the present plow layer consists of remnants of the original surface soil mixed with subsoil material brought up by the plow. It is yellowish-brown to brownish-yellow friable loam. The subsoil is similar to that of Apison loam, undulating phase, but depths to bedrock are generally less, or from 1½ to 3 feet.

Use and suitability (IIIe–5).—The large total acreage of this soil is mostly in crops. About half is used for corn, one-fourth for cotton, and the rest for minor crops and improved pasture. The yields are somewhat lower than on Hartsells fine sandy loam, eroded undulating phase, under comparable management, but pasture grasses and legumes do as well or better than on the Hartsells soil.

This soil has good workability, fair to good tilth, and fair to good water absorption. It is moderately susceptible to further erosion, but the relief is favor-

soon as the soil is cleared. Some of the strongly rolling, more shaly areas can be conserved best by a cover of forest. This soil responds only moderately well to good management.

Anison loam, eroded rolling phase (5 to 10 percent

capacity is high. Productivity of the soil is low, and the range of suitability is narrow.

Atkins silt loam (0 to 2 percent slopes) (Au).—This soil is closely associated with Pope and Philo soils on the flood plains of the sandstone plateaus. It is bordered

sponds very well to good management practices that This included soil has characteristics that resemble

tops are undulating and have milder slopes—some less than 2 percent. These undulating areas are small and often very cherty, but they may be used in about the same way as the rolling areas.

Runoff and internal drainage are medium. The surface soil is rapidly permeable. The moisture-holding capacity is moderate. This moderately extensive soil is mostly on the central ridge, which consists largely of chert derived from dolomitic limestone. Some areas are on the eastern and the western ridges that were derived from Fort Payne chert.

Profile description:

Surface soil—
0 to 7 inches, light-gray very friable to friable cherty silt loam; weak fine crumb and single-grain structure.

Subsoil—
7 to 30 inches, pale-yellow to light yellowish-brown friable cherty silty clay loam to cherty clay; sticky when wet, hard when dry; moderate fine blocky structure.

Parent material—
30 inches +, yellowish-brown to white almost solid mass of chert fragments; clay fills the cracks and other small spaces.

In some areas there is 1 to 3 inches of [illegible]

Use and suitability (IIIe–2).—This soil has been cleared, and most of the small total acreage is used for annual row crops. Corn and cotton are the chief crops, although some minor crops are planted. Cover crops are not generally grown, but they are needed to supply organic matter. Very little of this soil has been used for improved pasture, but under recent pasture programs sericea lespedeza is proving very satisfactory.

This soil has fair workability in areas relatively free from coarse chert. Areas that have large and more numerous chert fragments are more difficult to work. The chert interferes with the use of mowers, combines, and harvesters. Many of the fragments are hard, angular, and sharp and damage plows and other soil-working implements.

The tilth is fairly good to poor, depending on the quantity and size of the chert fragments on the surface and in the soil. The soil is moderately erodible, but many shallow gullies will develop on the stronger slopes if conservation practices are not adequate. Moisture-absorbing qualities are good, except in areas where much of the friable surface soil has been lost. The soil is somewhat droughty for crops because the presence

Runoff is rapid and internal drainage is medium. Permeability is moderately rapid in the plow layer and moderate in the subsoil. The moisture-holding capacity is moderate to low.

The present plow layer is a mixture of original surface soil and subsoil material brought up by the plow. It is a light brownish-gray to pale-yellow, friable, cherty silt loam. The subsoil consists of pale-brown to light yellowish-brown friable cherty silty clay loam or cherty clay and is about 21 inches thick. In some small areas the soil has been severely eroded and has lost nearly all or all of its original surface soil and, in

it from the Clarksville soil. This subsoil is fairly continuous and uniform. For the most part it ranges from the dominant yellow of the Clarksville soil to the dominant red of the Fullerton soil. The two soils have very similar surface layers and are suitable for similar uses.

Use and suitability (VIe–1).—Most of the large total area of Clarksville cherty silt loam, steep phase, has never been cleared. Much of the forest has been cut over from time to time, and it probably now has more pine than the original forest. Some areas have been cleared and fenced for common range pasture, but the grazing capacity is low.

material are tighter and stiffer and, when wet, more plastic and sticky than those that developed from parent material modified by colluvial or alluvial material.

The Colbert soils developed under a forest consisting largely of deciduous hardwoods, scattered pines, and, in places, redcedars. The hardwoods were several varieties of oak and hickory and sweetgum, blackgum, maple, beech, persimmon, elm, ash, hackberry, and tulip-poplar. The undergrowth consisted of brush, vines, and briers. Some areas that are shallow to limestone bedrock had nearly solid stands of redcedar.

Colbert soils are medium to strongly acid and contain a low supply of organic matter. They have moderate to low productivity and a medium to narrow range of suitability. They are used principally for crops, although some areas are in pasture.

Colbert silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Ck).—This is a somewhat poorly drained to moderately well drained, moderately fine textured soil of the limestone valleys. The color of the dry, rain-packed plowed surface ranges from white to very pale brown. Runoff is medium and internal drainage is slow.

In many virgin areas the friable surface soil was not deep enough to form an entire plow layer. After the

Use and suitability (IIIs–1).—Practically all areas of Colbert silty clay loam, eroded undulating phase, have been used many years for crops, mainly corn and cotton. Small patches of minor crops have also been grown. Oats and other grains have been popular at times. The use of the soil for improved pasture is increasing.

Workability is poor, and tilth has been impaired by erosion. The optimum moisture range for cultivation is very narrow. The soil is sticky or puddles too easily to be worked when wet, and it is too hard when it is dry. It is moderately erodible, but serious loss of the soil can be avoided and considerable moisture can be saved by proper conservation practices. In areas covered with the loamy overwash, workability is easy, and tilth and moisture absorption are good. Conservation measures are necessary, however, to retain the loamy surface layer.

The response of this soil to good management is only medium. Improvement in yields can be obtained on selected areas, however, if a winter cover crop is included in the rotation or other methods are used to increase the supply of organic matter in the soil.

This soil is better suited to hay and pasture than to general field crops. Fescue and other grasses or white-clover and legumes can be grown in most areas, and

areas, even where the land has been well terraced. Some parts of this soil have been fenced for common range pasture, but the native or voluntary grasses and legumes furnish scant grazing. A few areas are idle or are reseeding to forest, principally pine.

Erosion has impaired workability, tilth, and moisture-absorbing qualities more severely than for Colbert silty clay loam, eroded undulating phase. Adequate soil

of slopes, around drainage heads, in swales, and in depressions. They are closely associated with the soils from which their material was washed and in many places border Atkins, Philo, and Pope soils of first bottoms. The areas generally are small, but they commonly include both the Cotaco and Barbourville soils.

Cotaco loam has slow runoff and slow to medium internal drainage. Generally, it can be improved by

moisture-absorbing qualities. Their response to proper management is very good. Areas containing material washed from well-fertilized soils may produce excellent crops with little or no additional fertilizer. In most areas, however, the fertilizer requirement is about the same as for Hartsells, Limbo, or Apison soils.

Cotaco-Barbourville loams usually are so closely associated that each area of this complex can be farmed as if it contained only Cotaco loam. Cotaco loam generally needs some artificial drainage, whereas Barbourville loam is sufficiently well drained, under natural conditions, for crops such as corn, hay, and sorghum, and possibly for cotton. Occasionally, operators till only the better drained Barbourville loam and allow the wetter Cotaco loam to lie idle. If Cotaco loam is provided with an outlet for excessive moisture, the entire area can be used as a unit. The extent of drainage depends on the use for which the soil is intended. The removal of excess moisture in both the surface soil and subsoil

where the depth to bedrock is greater than 2½ feet, the lower part of the subsoil is more nearly like the subsoil of the Hartsells series in color, texture, and consistence.

In some areas many sandstone fragments occur on the surface and in the soil. The fragments are less than

areas, bedrock usually lies at depths of 2 feet or less. All areas are subject to seepage, which usually emerges as wet-weather springs.

The soils of the Crossville series are medium to strongly acid. They contain a moderate supply of organic matter and are low to medium in fertility. The surface soil is rapidly permeable, and the subsoil is moderately permeable. The moisture-holding capacity ranges from low to high.

These soils have low to medium productivity and a medium to wide range of suitability. They are used principally for crops and pastures. Some areas are

Use and suitability (IIIe–5).—A large part of this soil has been cleared and is used for general farm crops and pasture (fig. 7).

FIGURE 7.—Watermelon plants under frost caps on Crossville loam, undulating phase.

The soil has very good workability over a wide range of moisture content. Soft seepy spots, however, are so common during wet periods that they may interfere with tillage of a whole area. The soil has granular mellow tilth and good moisture-absorbing qualities in all areas except those that are very shallow to bedrock. The hazard of erosion is slight to moderate. The stronger slopes, however, require protection from erosion when used for row crops. Small losses of soil on areas shallow to bedrock can become serious in time.

For the most part, the soil is better suited to corn than to cotton. Farmers who have only a small acreage of this soil seldom use it for cotton because this crop tends to grow larger stalks and to produce less lint than on Hartsells, Linker, and Apison soils. Cotton can be grown with fair success [illegible]

outcrops occur in places. The soil is shallow to very shallow to bedrock.

Runoff is slow to medium and internal drainage is medium. The moisture-holding capacity is moderate. The native vegetation is chiefly deciduous hardwoods and Virginia pine. Mosses and lichens grow in places.

The surface soil is about 15 inches thick. In the upper 5 inches, it is dark-brown to dark reddish-brown, friable, mellow, rocky loam. In the lower 10 inches, it is dark reddish-brown, friable, heavy, rocky loam. The exposed rock fragments in virgin areas are usually partly embedded in the surface soil. On cleared or pastured areas, many rock fragments are strewn loosely over the surface. The subsoil consists of dark-brown, friable, heavy, rocky loam to sandy clay loam and is about 8 inches thick.

Use and suitability (IVe–4).—Only a small part of this soil has been cleared for crops, and probably less than 25 percent has been partly improved for pasture. A fairly large part has been fenced for common range pasture. Some well-improved pastures, however, have been established.

Workability is only fair. The soil is too stony to till. Many areas, however, have been partly cleared of rock fragments, and some bedrock ledges have been blasted to make the soil tillable. The hazard of erosion is slight to moderate. The soil responds very well to good management practices. Its best use is for pasture; Ladino clover and fescue are suitable pasture plants. Other mixtures that include whiteclover are fairly satisfactory. In some places this soil is best suited to forest.

Crossville rocky loam, rolling phase, 5 to 10 percent slopes) (Co).—This soil resembles Crossville rocky loam, undulating phase, in most characteristics, but it occurs on stronger slopes. Runoff and internal drainage are medium, but small seepy places are common. The moisture-holding capacity is moderate to low.

Locally, dolomitic limestone, shale, and colluvial wash have contributed to the parent material. In De Kalb creased the problems of moisture conservation. The hazard of further erosion is moderate.

water oaks, hickory, persimmon, ash, elm, hackberry, and gum. Most of the relatively small total extent of this soil is in Big Wills Valley.

Profile description:

Surface soil—

0 to 5 inches (plow layer), brown to pale-brown friable silty clay loam to clay; light brownish gray when dry; weak fine angular blocky to medium angular blocky structure.

Subsoil—

5 to 15 inches (claypan), very firm clay faintly to distinctly mottled light brownish gray, olive yellow, and light olive brown; very plastic when wet; moderate fine blocky structure.

15 to 22 inches, pale olive or olive yellow [illegible]

surplus runoff from Rockland, limestone, steep. The parent material is alluvial and consists of limestone residuum washed from rocky limestone slopes; from Rockland, limestone, steep; or from Colbert soils.

The soil is slightly alkaline to slightly acid. It is high in supply of organic matter and is also high in fertility. The surface soil is slowly permeable, and the subsoil is very slowly permeable. The moisture-holding capacity is high.

Productivity of the soil is medium, and the range of suitability is narrow. The soil is used mostly for pasture and forest.

Dunning silty clay, (0 to 2 percent slopes) (Dc).—This

ENNIS SERIES

The soils of the Ennis series are somewhat similar to soils of the Huntington series. They are, however, somewhat less well drained and paler brown, and they usually have a lower percentage of clay in their parent material. This material is alluvium washed largely from soils underlain mainly by chert or cherty limestone and cherty dolomite. The soils formed mainly from material washed directly or indirectly from the central ridge. The central ridge consists of cherty material derived from the Chepultepec and Copper Ridge dolomites. Very little of the parent material

The depth of the soil to bedrock is 4 feet or more. The parent alluvium ranges in texture from a more or less well-separated silt loam to a coarse silt loam. Some areas are fairly cherty in spots but nearly free from chert in others. Most areas are underlain by beds of fine to coarse chert gravel at depths ranging from about 30 inches to more than 48 inches. The color of the surface soil ranges from brown to light brownish gray, and that of the subsoil ranges from yellowish brown to reddish brown. The lower part of the subsurface layer and the underlying material are more or less splotched or mottled. This soil includes some Greendale

spreads out into lower lying and more poorly drained soils.

This soil is easily worked, and the hazard of erosion is slight. Its response to good management is very good.

ETOWAH SERIES

The soil of the Etowah series occurs on high stream terraces in limestone valleys. It is characterized by a dark-brown very friable surface soil and a strong-brown through yellowish-red to reddish-yellow friable to firm subsoil. The alluvial parent material of the soil

Use and suitability (IIe–1).—Etowah silt loam, eroded undulating phase, is used for all crops commonly grown in the county. Corn and cotton are most extensively grown. For the most part, the soil is considered too desirable for crops to be used for improved permanent pasture. In recent years, however, many small areas have been improved for pasture with excellent results. Fescue and Ladino clover are usually grown. Winter legumes are commonly used in rotation with row crops with good results. A few small blufflike breaks can be used best for permanent pasture, especially if they are associated with other soils well suited

are used chiefly for forest, crops, and pasture. Some areas are idle.

Fullerton cherty silt loam, rolling phase (5 to 12 percent slopes) (Fd).—This light-colored, well-drained soil is characterized by its chert content. The chert fragments vary in size from place to place, but very coarse fragments occur in only a few areas. Runoff and internal drainage are medium. The moisture-holding capacity is low. Areas of this fairly extensive soil are mostly small and are widely distributed throughout the chert ridges.

Profile description:

Surface soil—
0 to 8 inches, grayish-brown friable cherty silt loam; weak fine crumb structure.

Subsoil—
8 to 28 inches, yellowish-brown friable cherty silty clay loam to cherty clay, grading with depth to yellowish-red and strong-brown friable cherty silty clay or cherty clay; very pale brown to pink when dry; sticky and plastic when wet, hard when dry; moderate medium subangular blocky structure.
28 to 42 inches, red or yellowish-red, firm, stiff cherty clay; reddish yellow when dry; moderate to strong medium blocky structure; structure units show distinct cleavage lines and coatings; angular chert fragments are abundant.

Parent material—
42 inches +, variegated cherty residuum weathered from cherty dolomitic limestone.

Depth of the soil to bedrock ranges from 16 to 40 feet.

Use and suitability (IIIe–2).—Most areas of this soil are in forest. The trees have been cut from time to time. The soil is used increasingly for sericea lespedeza pasture. Areas are cleared and worked to fairly good seedbed for this crop. Some farmers sow crimson clover for the first grazing crop.

This soil has good workability. Erodibility is moderate. The response to good management is very good.

Fullerton cherty silt loam, eroded rolling phase (5 to 12 percent slopes) (Fb).—This soil is similar to Fullerton cherty silt loam, rolling phase, in profile characteristics, but it has been cleared and cropped. As a result, The soil is suited to winter legumes for grazing and for green manure. These crops tend to reduce erosion. This soil should not be used principally for row crops. If additional grazing is needed, it can be used advantageously for improved sericea lespedeza pasture. For winter and early spring grazing, crimson clover has proved satisfactory. Response of this soil to good management practices is very good.

Fullerton cherty silt loam, hilly phase (12 to 25 percent slopes) (Fc).—This soil is closely associated with Clarksville and Litz soils and with other members of the Fullerton series. It is similar to Fullerton cherty silt loam, rolling phase, but has stronger slopes and shallower depth to bedrock. Because of the stronger slopes, runoff and erosion are increased and water absorption is decreased. The parent material is rather uniform in most areas. However, where the soil is closely associated with Litz soils, which are mainly from shale, the parent material varies more and has a more complex composition. On Pudding Ridge in Deer Head Cove, this hilly phase and the hilly and steep phases of Litz soils are associated so closely that their delineation on the soil map is arbitrary in some places. This hilly phase and the Clarksville hilly phases are likewise closely associated on some of the chert ridges.

Runoff is rapid on this hilly soil. Internal drainage is medium. Narrow ridge crests and small benches with slopes of less than 12 percent are included, as well as steep breaks with slopes greater than 25 percent.

Use and suitability (IVe–2).—Most areas of this fairly extensive soil have never been cleared, but timber has been cut in some places. A few areas, especially on Pudding Ridge, have some nearly solid stands of redcedar. The present forest probably contains more pine than the original forest.

Workability is only fair because of strong slopes and the presence of large chert fragments in the soil. Tilth is poor on most areas, but it is fairly good where the soil is comparatively free from coarse chert. The soil is difficult to conserve, although the chert fragments

and the surface soil. Tilth ranges from fairly good to poor. Moisture absorption is good. Although moisture-holding capacity is high to moderate, those areas having much coarse chert may become droughty where they adjoin fairly deep drains. Erosion is slight to moderate.

This soil is moderately suited to winter legumes in most areas, but it is poorly suited in level places or slight depressions if the water table is high. The soil is fairly well suited to improved pasture. It should not be overdrained. For pasture grasses and white clover, the only drainage necessary is the removal of excess surface water to prevent standing water from choking out the plants. The response of this soil to proper management is good.

[redacted]

GULLIED LAND

[redacted]

for timber and the expense of soil reclamation, most of Gullied land on steep slopes or on those areas shallow to bedrock should be left in forest. Most areas will seed voluntarily to pine, but some may require the planting of seedlings.

HAMBLEN SERIES

The soil of the Hamblen series is light colored and somewhat poorly drained. It has formed from recent local alluvium and colluvium deposited in limestone valleys. It contains a fairly high percentage of sand derived directly or indirectly from the Pottsville formation and the Red Mountain or Tellico sandstone formation.

[redacted]

color but differs mainly in source of parent material. The parent material of the Hamblen series has been

[redacted]

heavy sandy loam to sandy clay or silty clay. In some places the subsurface layer in the loam or fine sandy loam areas is very similar to the subsoil of Ooltewah silt loam.

Use and suitability (IIw–1).—Most of this soil has been drained by open ditches and is used annually for row crops, hay, or pasture. Corn is the chief crop. The total acreage in soybeans for hay is second to that in corn. Smaller areas are used for sweet sorghum, field peas, annual lespedeza, and potatoes. If suitably located, fairly well drained areas are planted to home gardens. Most of the undrained areas are in pasture or are idle.

The soil is easily worked. Erosion control is no problem. The response to good management is medium.

HARTSELLS SERIES

[redacted]

county. It consists of light-colored, well-developed, moderately coarse textured loamy soils. These soils were developed on material weathered from sandstone and conglomerate, and in places from acid shale. The texture of the sandstone ranges from fine grained to moderately coarse grained; the consistence ranges from hard to relatively soft. The conglomerate and most of the sandstone is rather massive or thick [redacted]

about 5 feet on the more deeply covered ridges or plateaus. The common range for the regular phases is 2 to 5 feet, and for the shallow phases, from 1 to 2½ feet. Depths to bedrock, however, are seldom, if ever, uniform over any large area. Areas commonly having bedrock at a depth of 26 inches or less are classified with the shallow phases, even though their average depth to bedrock is greater. Areas that are consistently deeper than 26 inches to bedrock are classified in the regular phase, even though bedrock occurs in places at less than 26 inches or appears as outcrops. Rock outcrops are indicated on the soil map by symbol.

According to local reports the unconsolidated soil material is several feet deep in some swales or at the base of some slopes where the weathered material has been deposited partly by colluvial or alluvial action. Strictly residual material probably is nowhere more than 5 feet deep.

[redacted]

agriculture in the county. They occupy approximately 40 percent of the land area. They are inherently low in plant nutrients, and under common management have low productivity. The Hartsells soils are very responsive to moderately responsive to good management. They can be managed so as to produce in abundance practically all the general farm crops grown in this region. In addition, they are well suited to spe-

Subsoil—

11 to 30 inches, yellowish-brown friable fine sandy loam to friable fine sandy clay loam; weak fine blocky structure.

Parent material—

30 to 44 inches, yellowish-brown friable fine sandy clay loam; grades into brownish-yellow loose or very friable fine sandy loam or loamy fine sand in the lower part.

44 to 48 inches, partly weathered sandstone; splotched pale brown and strong brown in places.

Parent rock—

48 inches +, sandstone.

The top dark layer of the surface soil ranges from 1

level, practically uneroded areas of less than 2 percent slope are included with this soil.

Two common gradations in Hartsells fine sandy loam, eroded undulating phase, are as follows: (1) Areas that grade into Apison soil, and (2) areas that grade into Crossville soil.

The first gradation is more extensive. It is fairly common on Lookout and Sand Mountains. It resembles the Apison soil in color of the surface soil and subsoil and is more nearly like the Hartsells soil in texture and consistence. Small thin platy fragments similar to

landowners, follow recommended methods closely. However, a greater use of cover crops, especially winter legumes for grazing and green-manure crops, is desirable. Some areas are suitable for straight-row cultivation, but most of them require some adjustment between straight-row cultivation and contour tillage. In general, the changes in recent years indicate that more operators are applying fertilizers in quantities near or equal to those recommended. A few farmers occasionally apply more fertilizer than the amounts recommended and obtain fair returns for the additional quantity used, especially in areas on Sand and Lookout Mountains.

Hartsells fine sandy loam, rolling phase (5 to 10 percent slopes) (Hf).—This soil is similar to Hartsells fine sandy loam, undulating phase, in profile characteristics, but it has stronger slopes. It is less uniform in texture and generally somewhat shallower to bedrock. It commonly occupies fairly wide slopes, but in places it is on narrow or sharply rounded ridgetops. Although the relief is dominantly rolling, in many areas narrow ridges and small benches that have slopes of less than 5 percent are included. Some included slopes are narrow and sharply breaking and are stronger than 10 percent.

Runoff is mostly medium, but is slow on the included milder slopes and medium to rapid on the included stronger slopes. Internal drainage is rapid, and the moisture-holding capacity is moderate. The original forest cover on most areas was deciduous hardwoods and some scattered pines, but in places pines may have been dominant.

Use and suitability (IIIe–3).—Cutover forest covers most of the large acreage of this soil. Some areas are mainly in pine trees. Other areas are in cleared or partly cleared pasture, and a few have been cleared recently for crops. Additional areas are cleared annually for improved pasture or crops. Permanent pasture on gently sloping areas usually consists of Ladino clover-fescue or other grass mixtures; on stronger slopes sericea lespedeza alone or overseeded with rescuegrass is dominant.

This soil is easy to work and is moderately erodible. Its response to good management practices is very good.

Hartsells fine sandy loam, eroded rolling phase (5 to 10 percent slopes) (Hb).—This soil occurs on sandstone plateaus in positions similar to those occupied by Hartsells fine sandy loam, rolling phase, but it differs from that soil mainly in having lost a considerable amount of surface soil through erosion. In general, half to nearly all the virgin surface soil has been lost, and in places the plow layer contains friable subsoil material brought up during tillage. This soil is closely associated with Hartsells fine sandy loam, eroded undulating phase.

Runoff is medium, and internal drainage is rapid. The moisture-holding capacity is moderate. The native vegetation was principally deciduous hardwoods, but some pine was in the stand. The areas of this very extensive soil are widely distributed over Sand and Lookout Mountains. Most of them are on the central and southern parts of Sand Mountain.

The present plow layer is grayish-brown to yellowish-brown friable fine sandy loam. The subsoil is yellowish-brown friable fine sandy loam to fine sandy clay loam. It is from 16 to 19 inches thick. Beneath the subsoil is weathered or partly weathered rock, mainly sandstone. Bedrock occurs at depths of 2 to 4 feet. In many areas an almost horizontal sandstone stratum lies just beneath the surface or forms outcrops, many of which are indicated on the soil map by symbol. In some areas this stratum is fairly continuous, but in others it is intermittent. On an average, however, depth to bedrock is greater than for Hartsells fine sandy loam, eroded rolling shallow phase.

Some areas are more or less gravelly or channery, especially where they are closely associated with Apison soils. The channery fragments, mostly less than 1½ inches long and about ¼ inch thick, do not interfere with tillage to any great extent. Some included areas near Crossville are browner than usual for this soil. They are small in extent, nearly level, and very slightly eroded.

Use and suitability (IIIe–3).—Practically all areas of Hartsells fine sandy loam, eroded rolling phase, have been cleared for crops. This soil is used most commonly for corn and cotton and other row crops. Under a high level of management, some areas are nearly as productive as Hartsells fine sandy loam, undulating phase, but the cost of production is greater.

Workability is good, but, because of stronger slopes, it is not so favorable as that of Hartsells fine sandy loam, eroded undulating phase. The hazard of further erosion is moderate. Tilth is good in most places, but it is poor on small included severely eroded areas and in areas becoming severely eroded. Moisture-absorbing qualities are good to very good in the less eroded soil. In those areas where runoff is controlled and erosion is checked, the present plow layer can develop into a good surface soil. The moisture-holding capacity is moderate.

This soil responds very well to good management. Most areas can be protected against erosion by terraces and contour tillage. Close-growing crops, especially perennial crops for grazing, should be grown as frequently as possible. If row crops must be grown continuously, cover crops, especially winter legumes for green manure, should be planted as often as practical. Some areas are best suited to permanent pasture. Sericea lespedeza planted alone or overseeded with rescuegrass produces satisfactory herbage for improved pasture. This lespedeza requires a year or more to become established, but on well-fertilized and well-prepared areas grazing should be available the second year.

Hartsells fine sandy loam, undulating shallow phase (2 to 5 percent slopes) (Hk).—This soil is like Hartsells fine sandy loam, undulating phase, in parent material, most profile characteristics, and relief, but it is generally shallower to bedrock. The common range to bedrock is 1 to 2½ feet. In most places the depth to bedrock is considerably more uniform in this soil than in Hartsells fine sandy loam, rolling shallow phase. The positions occupied by this undulating shallow soil are narrow ridges and divides in the sandstone plateaus. A few areas are on fairly wide tablelands. This soil is associated chiefly with other members of the Hartsells series and with Crossville and Muskingum soils.

Runoff is slow, internal drainage is rapid, and the moisture-holding capacity is moderately low. The soil developed under a forest consisting largely of deciduous hardwoods and pines. It is probable that Virginia pine

was dominant in some of the original forest, especially areas that are closely associated with Crossville soils. This fairly extensive soil occurs in areas of 2 acres to about 25 acres. These areas are widely distributed, but most of them are in the large wooded tracts of the eastern and northern parts of Lookout Mountain and the central and north-central parts of Sand Mountain.

Profile description:

Surface soil—
0 to 7 inches, pale-brown friable fine sandy loam; very pale brown when dry.

Subsoil—
7 to 24 inches, brownish-yellow to yellowish-brown friable fine sandy clay to friable fine sandy clay loam; color fairly uniform in the upper part but

Runoff is slow; internal drainage, rapid. The moisture-supplying capacity is moderately low. This Hartsells soil is extensive and occurs in scattered areas over Lookout, Sand, and Fox Mountains. Most of the areas are less than 20 acres in size, but some range from 20 to 50 acres.

The present plow layer is pale-brown to brownish-yellow friable fine sandy loam. Where a large part of the original surface soil has been eroded, the plow layer contains subsoil material brought up by tillage. The 15-inch subsoil is brownish-yellow to yellowish-brown friable fine sandy clay to fine sandy clay loam. Beneath the subsoil is a thin layer of soft weathered sandstone. The depth to bedrock ranges from 1 to 2½ feet.

cially small relatively level ridgetops and small benches.

Runoff is medium, and internal drainage is rapid. The soil developed under forest of deciduous hardwoods and pines. In some of the most shallow areas the trees were probably mainly Virginia pine. This extensive soil occurs mostly on Lookout and Sand Mountains.

are transitional between this Hartsells and the Crossville soil. When the soil is wet, the color is very nearly the same as that of the Crossville soil.

Included is a soil that is transitional from this soil to Apison loam, eroded rolling phase. It is characterized by a few to very many small platy fragments that

Lookout and Sand Mountains usually contains various quantities of material from sandstone. In places it consists largely of shale. Some of the sandstone fragments present in the parent material are more than 12 inches in diameter.

The Hermitage soils are medium to strongly acid and medium in supply of organic matter. Fertility ranges from low to high. Permeability is commonly moderate in the surface layer and moderately slow in the subsoil. The moisture-holding capacity ranges from moderate to low. The soils of this series are high to low in productivity and have a wide to narrow range of use

This soil has good to very good moisture-absorbing qualities. It is moderately erodible. Except in the more severely eroded areas, this soil is very easy to work. Tilth is excellent where the present plow layer consists mostly of the original friable surface soil. It is poor where the plow layer is mainly subsoil material.

Any further loss of the friable surface soil will impair moisture absorption, tilth, and ease of workability. Measures therefore should be taken to conserve the soil before erosion becomes serious.

Most of the eroded areas can be reclaimed successfully by use of well-constructed terraces and by

heavy silty clay loam to silty clay. In the upper part the subsoil is similar to the plow layer in color, texture, and consistence, but it contains streaks and splotches of dark-brown organic stains. In the lower part it consists of red to dark-red friable silty clay. The subsoil has a total thickness of about 16 inches. It grades into old colluvial or local alluvial material composed largely of silt and clay that originated mainly from high-grade limestone. The depth of this soil to bedrock ranges from 2 to 7 feet.

Use and suitability (IIIe–1).—Most of this inextensive soil is idle or in range pasture. A small part is planted annually to general farm crops, mainly corn, [redacted]

and is subject to periodic overflow. Although the slopes range from 0 to 2 percent, they are usually somewhat stronger along the main channels, lateral drains, and swales where the surface dips rather sharply toward a lower level. This soil is associated with Dewey and Talbott soils of the uplands, the Hermitage and Abernathy soils of the colluvial lands, the Etowah soil of the terrace lands, and the Lindside and Melvin soils and Huntington fine sandy loam of the bottom lands. In places it is so closely associated with Abernathy silt loam and Huntington fine sandy loam that one soil grades into the other.

In a few areas along the larger streams the general [redacted]

Huntington fine sandy loam (0 to 2 percent slopes) (Ho).—This very friable to friable moderately coarse textured soil is closely associated with Huntington silt loam. The two soils are similar in parent material, drainage, and relief, but Huntington fine sandy loam is somewhat grayer in color and coarser in texture. It is commonly associated with Tellico soils of the uplands and with Allen, Muse, and Minvale soils of the colluvial lands. The relief is level or nearly level. Short sharp breaks leading to channels or lower lying areas occur in places. The breaks have stronger slopes, but the total drop seldom exceeds 4 to 6 feet and usually is less.

Runoff is very slow, and internal drainage is medium to rapid. Most areas are subject to overflow during winter or during heavy rains in other seasons. Usually little or no damage results from winter floods, but floods occurring late in summer or in fall are more destructive, especially to corn and hay crops. The natural vegetation was mainly deciduous hardwoods, briers, and vines. There were some scattered pines and redcedars.

Profile description:

Surface soil—
0 to 7 inches, dark grayish-brown to dark-brown very friable fine sandy loam to very fine sandy loam; light yellowish brown to pale brown when dry; weak fine crumb structure.

Subsurface—
7 to 15 inches, brown or reddish-brown friable very fine sandy loam or light very fine sandy clay; light yellowish brown to light brown when dry; slightly sticky when wet; weak medium granular structure.
15 to 36 inches, brown to reddish-brown friable very fine sandy clay loam or heavy very fine sandy loam; color rather uniform but becomes somewhat gray with increasing depth; dry material is pale brown to brown.

Underlying material—
36 inches +, very friable alluvial material showing some gray mottles.

The soil varies mainly in the texture and the depth of the recently accumulated alluvium. In many areas, particularly in Big Wills Valley, the entire soil profile consists of recently accumulated alluvium. In these areas, the color of the subsurface layer is more uniform than in areas of this soil formed on the old alluvium. In areas where the upper part of Huntington fine sandy loam is recent alluvium and the lower part is old alluvium, the old soil generally is finer textured and less well drained.

The texture and color of the subsurface [illegible]

brown very friable loamy fine sand about 12 inches thick. The subsurface layer is brownish-yellow to yellowish-brown very friable loamy fine sand, 24 inches or more thick. In most places the subsurface layer is lighter colored and more sandy in the lower part. The depth to bedrock for this included soil is 5 to 16 feet.

In most places the included Bruno sand consists of light-brown to yellowish-brown loose sand from the surface downward for many feet. Bedrock underlies the soil at 5 to 16 feet.

In most places the gravelly outwash is a mixture of waterworn gravel and angular chert gravel. In some places it consists largely of waterworn gravel. In others it is mainly fine angular chert fragments. The largest areas of Bruno loamy fine sand and gravelly outwash are along Big Wills Creek just south of State Highway No. 35 and extend northward for several miles.

Use and suitability (IIw–2).—Practically all the fairly large acreage of Huntington fine sandy loam has been cleared and used for crops and pasture. About half is used for improved pasture. In the past, most of the soil was used for corn and hay.

This soil has excellent workability and has very good tilth and moisture-absorbing qualities. It is medium to high in fertility, and permeability is moderately rapid. The moisture-holding capacity is moderate to high in most areas. It is moderately low in the more sandy areas, however, especially in the included areas of Bruno loamy fine sand and Bruno sand, and in some of the fine sandy loam areas along the narrow bottoms leading from Sand Valley to Big Wills Creek. The response of this soil to good management is very good.

In the past, crops were planted on this soil without the addition of mineral fertilizers, but in more recent years the use of such fertilizers has become common. The quantity of fertilizer applied, however, is seldom as large as that used on the higher lying soils of the limestone valleys.

JEFFERSON SERIES

The Jefferson series consists of light-colored soils that formed over old colluvium and local alluvium. This material tumbled or washed from the bluffs of Sand and Lookout Mountains. The parent material originated mostly from sandstone, but to some extent from [illegible]

bility in the surface layer is moderately rapid, and in

Jefferson loam, eroded rolling phase (5 to 12 percent

small in extent and is closely associated with Hartsells, Apison, and Muskingum soils and, in places, with Lickdale and Crossville soils.

Profile description:

Surface soil—
0 to 9 inches, very pale-brown to light-gray friable loam to silt loam.

Subsoil—
9 to 24 inches, pale-yellow to light yellowish-brown friable loam to very fine sandy clay loam; stained with strong-brown streaks caused by breaking down of dark-brown to very dark-brown, small, round concretions.
24 to 36 inches, faintly splotched to distinctly mottled gray, yellow, and brown friable silty clay or heavy silty clay loam; sticky and plastic when wet.

Parent material—
36 inches +, residual products of weathered acid sandstone, conglomerate, and shale.

In virgin areas the surface soil to a depth of about 3 inches is dark grayish brown and contains a good supply of organic matter. The depth to bedrock ranges from 2½ to 5 feet. In some places a compact cemented layer occurs at 24 to 30 inches. This layer is not continuous over very large areas.

Use and suitability (IIIw–1).—Johnsburg loam is used mainly for corn, soybeans, sorghum, and fall truck crops. Some of the better drained or higher lying areas are used for cotton; the more poorly drained areas are seldom used for this crop. The soil is very well suited to Ladino clover and fescue, and more areas could be used for improved pasture if necessary.

Artificial drains are needed on most of this soil if it is to be used satisfactorily for crops. The soil re-

in the subsoil. The moisture-holding capacity is moderate, but the soil tends to be somewhat droughty during the growing season. The small areas of this inextensive soil are distributed over limestone valleys, mainly Dugout and Sand Valleys.

Profile description:

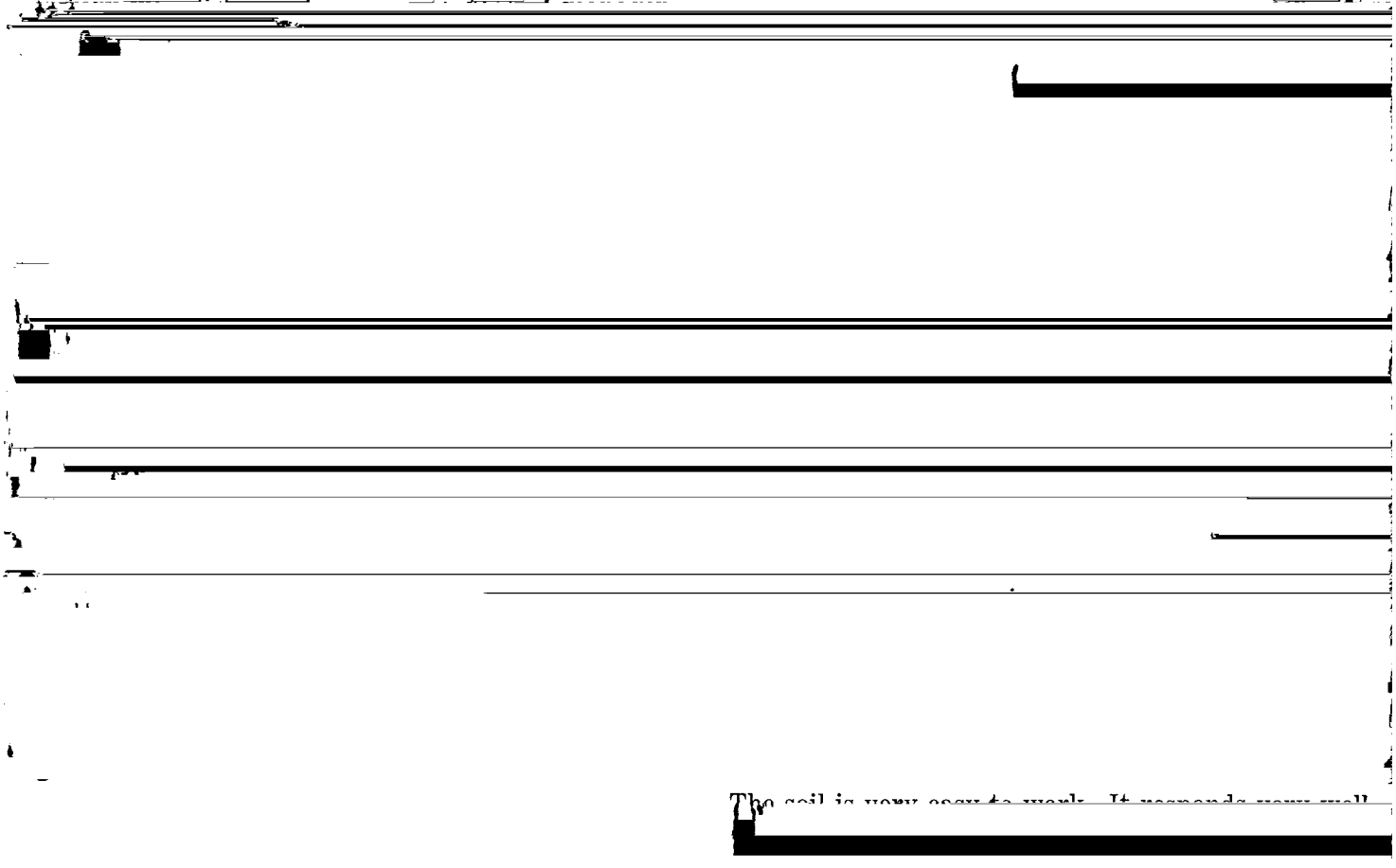
Surface soil—
0 to 6 inches, brownish-yellow friable heavy silt loam to silty clay loam; very pale brown or pale yellow when dry; plastic when wet.

Subsoil—
6 to 16 inches, yellow to brownish-yellow friable silty clay; plastic when wet; moderate fine angular to medium angular blocky structure.

Underlying material—
16 to 36 inches, mottled brownish-yellow, red, and gray silty clay to shaly silty clay or shaly clay; plastic when wet; moderate fine to medium angular blocky structure.

The underlying material varies greatly from place to place, because of the relatively thin formations and the fairly steep dip, especially in Dugout Valley, of the exposed formations. The thickness of the colluvium and alluvium and the depth to bedrock also varies. The depth to bedrock—usually shale, limestone, or cherty limestone—varies from 2½ to 8 feet.

Use and suitability (IIIw–1).—Practically all areas of Leadvale silt loam, eroded undulating phase, have been cleared and cultivated. They have been used largely for row crops, chiefly cotton and corn, but many areas are now being used for improved pasture along with adjoining rolling and hilly areas of other soils. Winter legumes are suited if runoff is adequately



The soil has good workability. The response to good management practices is medium to very good. Im-

poorly drained for row crops or good pasture, but when drained, it is fairly easy to work and has excellent

Subsurface—

16 to 36 inches, mottled dark-brown, light brownish-gray, and yellow friable silt loam to silty clay loam; very pale brown, with many faint, fine, light yellowish-brown mottles, when dry; sticky when wet.

Underlying material—

36 inches +, friable alluvium consisting of sand, silt, and clay.

The depth of the soil to bedrock is 5 feet or more. The layers of the profile differ somewhat in thickness. The alluvial parent materials of this soil were derived from various geologic formations and from the soils developed over them. As a result, most of the material varies considerably in color and texture. In places the materials are largely from weathered limestone, cherty limestone, chert, gray shale, red shale, or sandstone. More commonly the materials are composed of mixtures from two or more of these sources.

As mapped, this soil includes several areas of Hamblen fine sandy loam and very fine sandy loam. The Hamblen soils are similar to the Lindside in color, drainage, and positions occupied, but their parent alluvium contains more fine and very fine sand derived from sandstone. They also have the same use suitability. In places the Lindside and Hamblen soils are so intricately associated that their separation on the soil map is not practical.

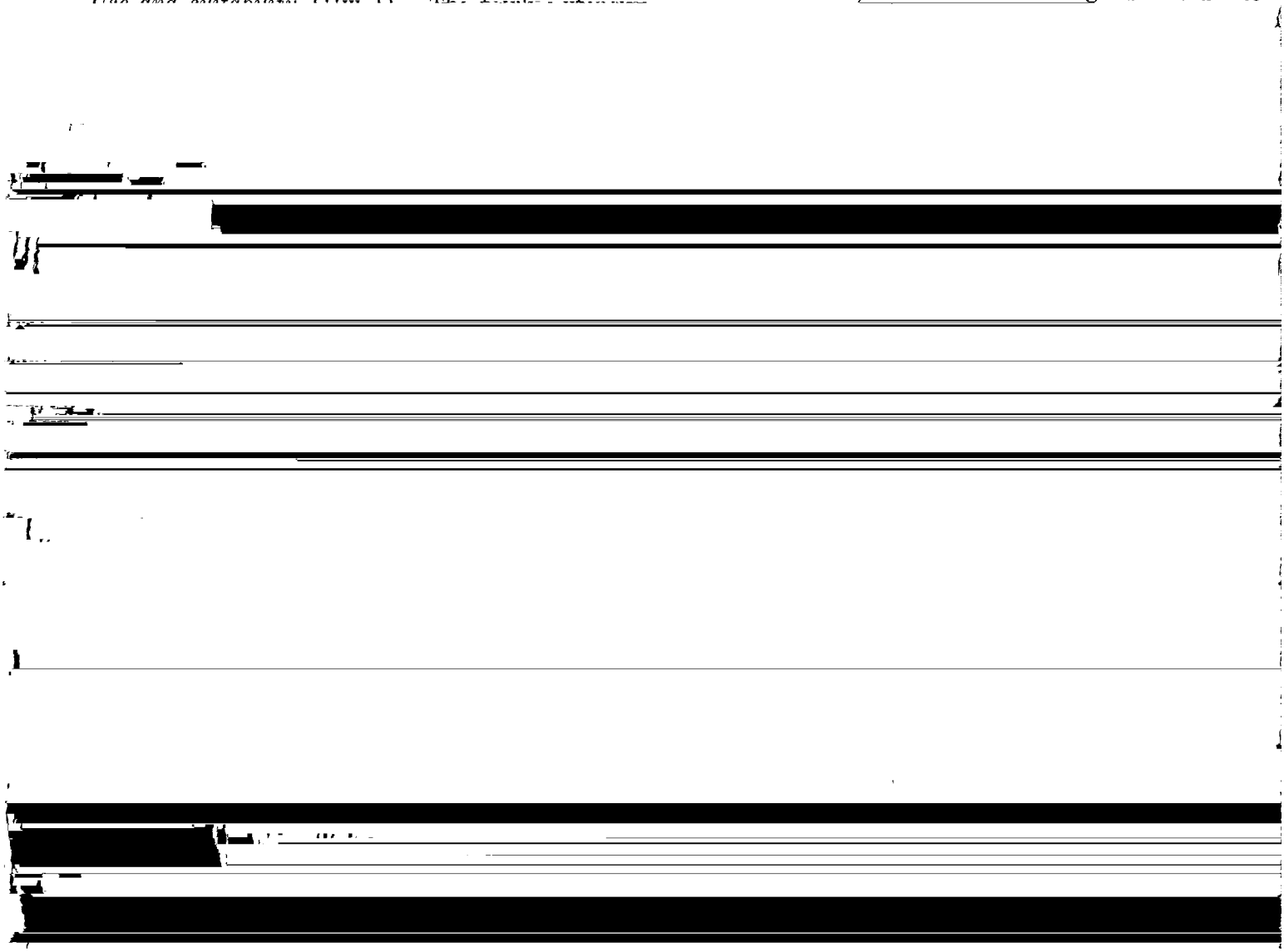
Use and suitability. (Use 1) The [illegible]

County boundary south of Collinsville, where two nearly parallel bluffs occur in places. The rock formation of the outer bluff is tilted upward toward the northwest. The surface of the southeasterly slopes lies nearly parallel to the dip of the bedrock. The surface of the dipping bedrock is hard and relatively smooth and provides excellent internal drainage. The depth to bedrock is less on these slopes than it commonly is in other Linker soil areas. Most of the areas having slopes of 10 to 15 percent are on the outer bluffs, where the slope of the surface nearly parallels that of the bedrock. In other areas the upper slope is generally about 10 percent.

Soils of the Linker series are medium to strongly acid and have a low supply of organic matter and low fertility. Permeability is rapid in the surface soil and moderately rapid in the subsoil. These soils are low to medium in productivity and have a wide to very wide range of suitability.

Linker fine sandy loam, eroded undulating phase (2 to 5 percent slopes) (Lf).—This soil occupies gently rounded fairly narrow ridgetops. It occasionally occurs in other places, especially in long prongs between deep gorgelike drains. The relief on some of the ridgetops is nearly level.

Runoff is slow, and internal drainage is medium to



red to reddish-brown somewhat finer textured subsoil, and generally a somewhat greater depth to bedrock.

Use and suitability (IIe–3).— Practically all the inextensive area of Linker fine sandy loam, eroded undulating phase, has been improved for crops. Most of it is used annually for row crops, chiefly corn and cotton. The soil has very good to excellent workability. Tilth is excellent, and the moisture-absorbing qualities are very good. The hazard of further erosion is slight to moderate, but most areas of the soil will develop thin or bald spots unless good conservation measures are practiced.

If the required plant nutrients and organic matter have been supplied and moisture and soil have been conserved, this soil is well suited to winter legumes. The more severely eroded areas are better suited to cotton than to corn, unless erosion has been controlled and a better surface soil has been developed. The soil responds very well to good management. It is very similar to Hartsells fine sandy loam, eroded undu-

A few are idle or in unimproved range pasture. The volunteer grasses have little grazing value.

This soil has good workability. Erosion, however, has impaired its tilth and moisture-absorbing qualities. Unless good conservation practices are used, only a small part of the moisture that falls on the surface will be absorbed. The soil generally is better suited to cotton than to corn, but under practices that conserve moisture and soil, the difference in suitability is not very great. The response of the soil to good management is excellent. The included areas of stronger slopes, however, are not suitable for cultivation unless runoff and erosion are controlled.

LITZ SERIES

The Litz series consists of immature soils that are shallow to very shallow to bedrock. These soils were derived largely from material weathered from shale. They are associated mainly with the shales that under-

prongs of shale formation extend at somewhat lower levels at nearly right angles to the main ridge. The shale formation occurs especially in places on the eastern ridge and on the northern part of Pudding Ridge in Deer Head Cove. The soil is generally deeper to bedrock than the hilly and steep phases of Litz silt loam, and therefore is less typical of the series.

Runoff and internal drainage are medium. The natural vegetation consists of species of oak and hickory, beech, yellow-poplar, common persimmon, sweetgum, black tupelo, black walnut, black locust, and some birch, shortleaf, loblolly, and Virginia pines, and redcedar.

Profile description:

Surface soil—
0 to 1½ inches, very dark-brown, very friable, highly organic silt loam; the organic matter is brownish gray and consists of both well decomposed and partly decomposed leaves, bark, and twigs; the organic material is loosely combined with the light-gray mineral soil.

Subsurface—
1½ to 12 inches, brownish-yellow friable silt loam, shaly silty clay loam, or shaly clay; pale yellow to very pale brown when dry, slightly plastic when wet; material breaks in angular platy or blocky fragments ½ to 2 inches in diameter.

Parent material—
12 inches +, mainly unweathered gray shale fragments mixed with pale-yellow, brownish-yellow, and yellowish-red partly weathered shale fragments.

The depth to bedrock is 1 to 2 feet. Generally the surface is fairly free of rock fragments. In some places, however, it is covered with gray fine-grained sandstones, in others with more or less porous red sandstones, and in others with light-colored chert fragments.

Use and suitability (IVe–3).—The areas of this soil are small and fairly inaccessible. They are under natural forest cover, but the trees have been cut from time to time. Pine is probably more prevalent than in the original forest.

The soil has good workability but it is highly erodible. It is subject to sheet erosion. In addition, gullies

ding Ridge in Deer Head Cove, and on some other slopes, few to many chert fragments cover the surface. This chert was derived from the overlying chert formations, especially the Fort Payne chert. The areas deeply covered with chert are included with Clarksville soils, and in places the boundary between this Litz soil and Clarksville soil is arbitrarily drawn on the map.

Use and suitability (VIe–3).—Most areas of this inextensive soil have never been cleared. They have an almost native forest cover, although they have been cut over from time to time. Some areas have reseeded, largely to pine.

The soil has fair workability. The moisture-absorbing qualities, however, are fairly good. The soil is used mainly for timber and other forest products. It is doubtful if any other use would be better suited, because this erosive soil needs the protection of a forest cover. It is possible, however, that more pine and other useful commercial trees could be established under good forestry and fire-control practices.

Litz silt loam, steep phase (25 to 45 percent slopes) (Ln).—This is the most extensive Litz soil in the county. It occupies steep slopes that are broken and rough in places. The surface is more broken than on Litz silt loam, hilly phase. Some slopes are very steep, but the shale formations do not form perpendicular or overhanging bluffs like those of sandstone or limestone. The natural vegetation is mainly deciduous hardwoods mixed with scattered pines and redcedars. Runoff is very rapid, and internal drainage is medium.

Use and suitability (VIIe–3).—Most of this soil has never been cleared. The native forest has been cut over from time to time. Some areas may have reseeded to a higher percentage of pine than was in the virgin stands.

The soil has poor workability, and it is highly susceptible to erosion. It is best suited to forest. The kinds of trees and quality of the timber can be improved by good forestry practices, including better fire control.

Litz shaly silty clay loam, eroded [illegible]

careful management. A large supply of organic matter should be incorporated into the soil to rebuild its productivity. Under good management, some success has been obtained by using the soil for close-growing and deep-rooted hay or pasture crops, such as sericea lespedeza. Other pasture has been fairly satisfactory on areas that retain some of the original surface and subsurface materials. Such areas are properly seeded and otherwise well managed. At the present time, improved pasture of sericea lespedeza is the best use for most of this soil. Areas not suitably located for pasture are best used for pine forest.

Litz shaly silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Lg).—This soil has lost nearly all the original silt loam surface soil in about half of its area. The rest has lost all the surface soil and, in places, part of the subsurface layer or some of the shaly parent material. Some areas are badly gullied. Erosion has been more severe than on Litz shaly silty clay loam, eroded rolling phase. This eroded hilly phase has rapid runoff and medium internal drainage.

The present plow layer is a brownish-yellow friable shaly silty clay loam or shaly clay that is similar to the underlying subsurface material. The depth of the soil to bedrock is ½ to 1½ feet.

Use and suitability (VIe–3).—In the past this inextensive soil has been planted chiefly to row crops, for which it is poorly suited. Nearly half of it is now idle, and the rest is used principally for corn and cotton. Some areas have reverted to forest, but very few, if any, forests have been developed by planting seedlings.

The soil can be worked fairly easily. The hazard of further erosion is high. The soil is fairly droughty, and droughtiness increases as more loose soil is eroded. The response to good management is only medium. Aside from forest, sericea lespedeza pasture is the only suitable use for this soil.

Litz shaly silty clay loam, eroded steep phase (25 to 45 percent slopes) (Lk).—This soil differs from Litz silt loam, steep phase, in having been cleared and exposed to severe erosion. Nearly all or all the thin surface soil and, in most places, part of the subsurface layer have been lost. Runoff is very rapid, and internal drainage is medium. The moisture-holding capacity is very low.

The present plow layer is mainly partly weathered shale derived from the subsurface layer and parent material. It is brownish-yellow, friable shaly silty clay loam or shaly clay. The subsurface layer is similar to the plow layer.

Use and suitability (VIIe–3).—About half of the very small acreage of this soil is used annually for crops. The rest is idle or is returning to forest—mainly redcedar and pine—by voluntary reseeding.

Chiefly because of the very poor workability and very high erodibility of this soil, satisfactory production is difficult to maintain. The soil can be used best for forest.

MELVIN SERIES

The soil of the Melvin series is poorly drained. It occurs on the flood plains of streams in the limestone valleys. The parent material is general alluvium that washed from uplands underlain chiefly by high-grade limestone. It is modified to various degrees, however, by materials from sandstone, cherty limestone, dolomitic limestone, chert, gray shale, and red shale. This soil has medium productivity and a narrow range of suitability.

The Melvin soil is slightly acid. It has a moderate supply of organic matter and is medium in fertility. The surface soil is moderately permeable, and the subsoil is slowly permeable. The moisture-holding capacity is high.

Melvin silt loam (0 to 2 percent slopes) (Ma).—This soil occurs in level or nearly level first bottoms and is periodically overflowed by streams. It is closely associated with Lindside and Huntington soils of the first bottoms and with Robertsville soils of the low stream terraces. The Melvin soil occupies the most poorly drained positions on the flood plains in the limestone valleys. It is more poorly drained than the associated Lindside soils. Its parent alluvium is generally similar to that of the Huntington and Lindside soils. The alluvium varies from place to place because it came from different rocks.

Runoff and internal drainage are very slow. If outlets can be provided, the drainage can be improved artificially. The natural vegetation is mainly deciduous hardwoods but includes scattered pines and redcedars. The hardwoods are dominantly water-tolerant trees, chiefly water, post, and laurel oaks, hickories, elms, ash, persimmon, and gums.

Profile description:

Surface soil—
0 to 12 inches, dark yellowish-brown to yellowish-brown friable heavy silt loam distinctly mottled with pale yellow, light brownish gray, yellowish red, and reddish yellow; when dry, the material is light gray and has many distinct medium mottles of yellowish and brownish shades; sticky and plastic when wet.

Subsoil—
12 to 30 inches, mottled grayish-brown and light olive-brown firm to friable silty clay loam to silty clay; when dry, the material is pale brown and has common, faint, medium light-gray and brownish-yellow mottles; sticky and plastic when wet; hard when dry.

Underlying material—
30 inches +, mottled alluvium originating principally from high-grade limestone and to a minor extent from sandstone and shale.

Bedrock occurs at depths of 5 feet or more. Most areas of the soil consist of recent alluvium, at least on the surface, although in some areas the alluvium is old. Usually the old alluvium is grayer, firmer and tighter, and more acid than the recent alluvium. Furthermore, it ranges in texture from silt loam and very fine sandy loam to a silty clay loam. Fine sand and very fine sand in various quantities occur in places, especially in Sand Valley, along streams flowing from Sand Valley, and in Little Wills and Railroad Valleys.

Use and suitability (IVw–1).—Melvin silt loam is too poorly drained to use for general crops. However, many areas or parts of areas can be drained for corn, soybeans, and annual lespedeza or other hay crops. Nearly all areas can be improved for pasture. One of the best mixtures for pasture consists of Ladino clover and Kentucky fescue, although other mixtures have been successful.

The soil has poor workability, except where its drainage has been improved. Workability is good in those areas that have been sufficiently well drained for crops. Tilth is also good, and moisture-absorbing qualities are good to excellent. This soil is not subject to ordinary

erosion, but floods may cause some stream erosion. Flooding, which usually occurs in winter and early in spring, deposits new alluvial material in most areas. Floods seldom injure the crops during the growing season, however. Excess surface water should be removed, but adequate outlets are difficult to install on the lower lying, semiponded areas. Response to good management is very good if the practices include adequate drainage for the crops commonly grown.

MINVALE SERIES

The Minvale series consists of well-drained soils on the foot slopes of the chert ridges. These soils have a light-colored surface soil and a reddish-colored subsoil. They are closely associated with Fullerton, Clarksville, Hermitage, Pace, and Greendale soils. They resemble the Fullerton soils very closely in source of parent material and in color of the profile. Formerly the Minvale soils were included in the Fullerton series.

Subsoil—
5 to 27 inches, reddish-yellow to yellowish-red friable cherty silty clay loam to cherty silty clay; reddish yellow when dry, sticky when wet; moderate medium angular blocky structure.
Underlying material—
27 to 37 inches, yellowish-red to red, firm to friable, cherty silty clay loam to cherty clay; sticky when wet.

Bedrock occurs at depths of 5 to 20 feet. In forested areas the surface soil is about 10 inches thick. The top 3 inches is very dark grayish brown and contains a fairly high supply of organic matter.

Use and suitability (IIe–2).—Almost all of this inextensive soil has been cleared. Most of it is used for cotton, corn, hay, and pasture. Potatoes, sweetpotatoes, truck crops, vegetables for home gardens, berries, apples, and peaches are also grown.

The workability of this soil is good. Chert fragments on and in the soil, however, hinder cultivation. The sharp cutting edges of the chert injure plows and other tillage implements. The larger fragments inter-

original surface soil in most areas. In a small acreage nearly all, or all, of the surface soil and, in places, part of the subsoil have been lost.

The present plow layer of this eroded rolling phase

gray when dry; contains a few small chert fragments; weak fine crumb structure.

Subsoil—

5 to 27 inches, reddish-yellow to yellowish-red friable

local alluvium originated principally from shale but contain various quantities of materials from sandstone, limestone, cherty limestone, and chert.

Muse soils are mainly along the northwestern edge of Dugout Valley and the southeastern side of Big Wills Valley. Sandstone fragments are more common on the areas in Big Wills Valley and along its eastern border than in Dugout Valley. Chert overwash is more common in Dugout Valley than elsewhere.

The soils of the Muse series have medium to low productivity and a very wide to narrow range of suitability. They are medium to strongly acid.

Muse silt loam, eroded undulating phase (2 to 5 percent slopes) (Mh).—This well-drained soil occupies foot slopes, mainly on the shaly sides of chert ridges. It is associated with other Muse soils and with Litz, Sequoia, and Tellico soils. This soil has slow to medium runoff. Internal drainage generally is medium, but in some nearly level areas it is slow. The supply of organic [redacted] is low to medium, and fertility is medium [redacted]

stone, gray shales, limestone, cherty limestone, and chert. The included Alcoa soil has a dark reddish-gray to dark reddish-brown friable silt loam to silty clay loam surface soil, about 5 inches thick. The subsoil is a red to yellowish-red friable silty clay about 37 inches thick. The Alcoa soil differs from the Muse soil chiefly in having a redder surface soil and subsoil.

Use and suitability (IIe–2).—All the relatively small area of Muse silt loam, eroded undulating phase, has been cleared of forest. This soil is very desirable for agriculture, and nearly all of it is used each year for general farm crops. Corn and cotton are the chief crops. Smaller acreages of soybeans, sorghum, annual lespedeza, and sericea lespedeza are grown. Occasionally, some areas are used for small grains, chiefly oats.

The workability of the soil generally is very good, but in small areas it may be impaired by erosion or by sandstone and chert fragments. The hazard of further erosion is slight to moderate. Many of the less sloping [redacted] have been protected by ditches made from [redacted]

sequently, the problems of conserving moisture and of building up and maintaining the soil are more difficult. Under suitable management the soil can be conserved and kept fairly workable and productive.

The soil responds very well to good management. Under good management it is suited to winter legumes for grazing or for plowing under as green manure. It is well suited to improved sericea lespedeza pasture. If cropland is not available, row crops can be rotated with close-growing crops, mainly those to be used for grazing and hay. The milder slopes can be used fre-

soils to bedrock varies considerably. Outcrops of the sandstone bedrock occur in places.

The original forest was chiefly mixed hardwoods and pines. Virginia pine is now common on most of the shallow stony areas. The trees in some areas are dominantly deciduous hardwoods, among which are various oaks and hickories, yellow-poplar, sweetgum, elm, and maple. Shrubs, vines, and briers are common undergrowth.

The phases of the fine sandy loam type are fairly free of stones on the surface, and in the surface soil

common crops are corn and cotton. Watermelons are occasionally grown as a cash crop.

The soil has fair workability, but areas that are fairly stony or have occasional outcrops of bedrock are less favorable. Tilth is good. Moisture absorption is good to moderately good, depending on the slopes and the friability and porosity of the surface soil. The response of this soil to good management is only medium. The soil is best used for forest or for improved pasture. Lespedeza is the most suitable pasture plant for this soil.

Muskingum fine sandy loam, eroded hilly phase (10 to 20 percent slopes) (Ml).—This soil is similar to Muskingum fine sandy loam, hilly phase, in all characteristics except erosion. After this soil had been cleared

This soil has medium runoff and moderate internal drainage. Seepage occurs in places during wet periods, especially during winter and early in spring. A mixture of deciduous hardwoods and pine is the most common forest cover. In some places, however, the trees are mainly deciduous hardwoods. In others they are mainly pine, chiefly Virginia pine, which grows on very shallow stony soil. This extensive soil occurs in nearly all parts of the sandstone plateaus.

Profile description:

Surface soil—
0 to 3 inches, dark grayish-brown very friable stony loam; contains considerable organic material from decayed leaves and other decayed vegetation.
3 to 8 inches, grayish-brown very friable stony fine

meability is moderately rapid in the surface soil and moderate in the subsoil. These soils have a moderate moisture-holding capacity. They are medium to low in productivity and have a wide to very wide range of suitability.

Pace cherty silt loam, eroded undulating phase (2 to 5 percent slopes) (Pb).—This soil occupies foot slopes, benches, and fans near the base of stronger slopes.

It has slow to medium runoff and medium to slow internal drainage. A mottled zone, usually at depths of 14 to 20 inches, indicates that the soil has a high water table during wet seasons. This water table is caused mainly by seepage from higher ground and by the rather firm or tight and, in places, cemented pan

leguminous cover crops. The green manures maintain and increase the supply of organic matter and also furnish part of the nitrogen required.

Under similar management practices, this soil produces corn and cotton about as well as Hartsells fine sandy loam, undulating phase, and Apison loam, eroded undulating phase, of the sandstone plateaus. The soil is associated very closely with Minvale silt loam, eroded undulating phase, and has similar use suitability. It warms somewhat more slowly in spring than the Minvale or Hartsells soils. Practically all general farm crops grown in this locality can be produced on this soil. The level of management is not so high as for soils on the sandstone plateaus, but better management

damages the soil. Where possible, row crops should be rotated with pasture or other close-growing perennial crops. Some farmers keep the soil in improved pasture, principally sericea lespedeza, for several years and then grow row crops for a few years.

The workability of the soil is good, and tilth is fairly good. The hazard of further erosion is moderate. Conservability is good, but moisture-absorbing qualities have been impaired by the loss of surface soil. Some improvement in the soil can be made by following good conservation practices. Although fertility is low, the soil responds very well to proper management.

PHILO SERIES

The soil of the Philo series occurs on first bottoms and is very closely associated with the Pope and Atkins

Underlying material—

15 to 36 inches, mottled yellow, brown, and gray friable very fine sandy clay to silty clay; mottles are many, prominent, and medium in size; material sticky when wet; weakly stratified in the lower part.

The depth of the soil to bedrock ranges from 2 to 7 feet. In forested or virgin areas the surface soil is dark grayish-brown to grayish-brown friable loam to a depth of about 3 inches. It contains a good supply of organic matter derived from decayed vegetation. In areas where the lower part of the profile is largely old alluvium, the consistence is firmer than usual for this soil, and the texture is generally sandy clay to clay. Most areas, however, especially those near cultivated land, have enough recently deposited material to form a plow layer.

As mapped, Philo loam includes a few small areas

[redacted]

well drained than the Pope soil. The parent alluvium of these three series is similar and was laid down by the same floodwaters. The Philo soil, however, usually is somewhat coarser in texture than the Atkins, but the difference between the texture of the Philo soil and that of the Pope soil is not so distinctive. In adjoining areas the Philo soil generally has a slightly finer texture

fine sand, Philo loamy fine sand, Pope fine sand, and Pope loamy fine sand. Both the included Philo soils are more friable and sandy than Philo loam. The included Pope soils are brown, loose or very friable sandy soils of the bottom lands.

Use and suitability (IIw–1).—About 15 percent of the fairly inextensive area of Philo loam has been

Permeability is moderately rapid in the surface soil and rapid in the subsurface layer. The moisture-holding capacity is moderate. This soil has medium to high productivity and a very wide range of suitability.

Pope loam (0 to 2 percent slopes) (Pe).—This light-colored soil is subject to periodic overflow. It consists of recent general alluvium derived from uplands underlain mainly by acid sandstone and shale. The alluvial material washed from Hartsells, Muskingum, Apison, and other soils. It is similar to that of the Philo and Atkins soils. The slopes generally range from 0 to 2 percent, but short sharp breaks along the main channel or along old channels and swales within an area are stronger. Runoff is slow, and internal drainage is medium. The natural cover is practically the same as that of the associated Philo loam.

Profile description:

Surface soil—
0 to 10 inches, brown friable loam; light gray when dry; weak fine crumb structure.
Subsurface—
10 to 33 inches, strong-brown, friable, heavy silt loam or silty clay loam faintly splotched with gray and yellow; yellowish brown when dry.
Underlying material—
33 to 44 inches, brownish-yellow friable heavy silt loam; yellow to pale brown or very pale brown when dry; sticky when wet.

Bedrock underlies the soil at 2 to 7 feet. Color varies considerably, especially in the more recently accumulated alluvium. Texture also varies. It ranges from fine sandy loam to silty clay but is prevailingly loam.

Use and suitability (IIw–2).—About three-fifths of this inextensive soil has been cleared and is used for crops or pasture. Corn is the main crop; other crops are soybeans, sorghum, and hay. The crops are damaged when the streams overflow. Losses from flooding vary considerably in different flood plains. The use of the soil for crops therefore is governed by the extent of stream overflow.

This soil is very easy to work. It has excellent tilth and very good moisture-absorbing qualities. Although fertility is low, the soil responds very well to good management, particularly proper fertilization. Inasmuch as the soil has a moderate to low supply of organic matter, most areas will benefit by an occasional rotation with a grazing crop. Grazing crops or cover crops are needed to build up the supply of organic matter. This soil is subject to very little or no erosion unless it is exposed to strong stream currents during flood periods. In general it is advisable not to open long continuous areas for crops without leaving narrow strips of brush or trees to check the speed of high floodwater.

POTTSVILLE SERIES

The Pottsville series consists of very shallow to shallow soils of uplands on the sandstone plateaus. These soils have formed largely from weathered products of acid shale. They developed under a forest of mixed hardwoods and pines.

The parent rock consists chiefly of sandy shale and clay shale. Throughout its depth, the sandy shale is more or less mottled or streaked with colors ranging from pale yellow to strong brown. The less weathered parts of the clay shale usually are gray or dark gray, streaked with yellow, brown, and strong brown. Some of the clay shale is carbonaceous and nearly black and contains one or more mineable coal seams in places.

The sandy and clay shales contain layers of sandstone, siltstone, and indurated shale, or thin to moderately thick beds of sandstone. The bedded and interbedded rocks vary greatly in thickness and composition. The interbedded sandstone layers generally are thin and consist of dark-gray very fine grained rock having a ripply surface. The total thickness of some sandstone layers, however, may be more than 30 feet. In places the sandstone layers are moderately massive in bedding, loose in structure, and pinkish in color.

Soils of the Pottsville series are medium to strongly acid and low in supply of organic matter. Fertility is very low. Moisture-holding capacity is low. These soils have very low productivity and a narrow range of suitability.

Pottsville loam, hilly phase (10 to 20 percent slopes) (Pf).—This excessively drained soil occupies hilly and very strongly sloping areas. Some small gently sloping or rolling areas and some steep areas are included because they are too intricately associated with this soil to be outlined separately on the soil map. Pottsville loam, hilly phase, has formed from residual products derived principally from weathered acid shale.

Runoff is rapid and internal drainage is medium. The surface soil is moderately permeable, and the subsurface layer is slowly permeable. The areas of this fairly extensive soil are distributed over Lookout and Sand Mountains.

Profile description:

Surface soil—
0 to 3 inches, dark grayish-brown friable loam; contains some organic matter from decayed vegetation; very pale brown when dry.
3 to 8 inches, light-gray to pale-brown friable loam; grades into silty clay or shaly silty clay with increasing depth; light gray or very pale brown when dry.
Subsurface—
8 to 15 inches, pale-yellow, pale-brown, or yellow friable very fine sandy clay to shaly silty clay or shaly clay; mottled with gray and brown in the lower part.
Parent material—
15 to 18 inches, mottled pale-yellow, gray, yellowish-brown, yellowish-red, and strong-brown soft weathered shale.
Underlying rock—
18 inches +, gray shale or interstratified thin beds of sandstone, siltstone, and hard shale of different colors.

The depth of the soil to bedrock ranges from ½ to 1½ feet. The thickness of the surface soil varies somewhat, but in general the sandy parent material has given rise to the deeper profiles. Many small platy fragments occur on the surface or in the surface soil in most places.

Use and suitability (VIe–3).—Nearly all of this soil is in forest of deciduous hardwoods and pines. Hardwoods dominate in some areas, and nearly solid stands occur in others. Practically all wooded areas have been cut over from time to time. It is probable that the forest now contains more pines than were in the original stand. Many areas are in woodland pasture; some areas have been partly cleared or partly improved.

The soil has fair workability. It is highly erodible when cleared and put in cultivation. It makes little response to good management practices. Selected areas

destructive on this soil, even under the best management, because the depth to bedrock is very shallow to shallow. The soil is well suited to trees and can be used best for timber production.

Pottsville shaly loam, eroded hilly phase (10 to 20

vegetation includes willow, water, and post oaks, hickories, gum, maples, yellow-poplar, elm, and ash. A few scattered pine, redcedar, and holly trees are in the stand.

Profile description:

Elsewhere large blocks or sandstone boulders are embedded in colluvium originating from limestone and shale. They vary in number and are associated with outcrops on many of the mountain slopes. On the slopes they occur below Rockland, sandstone, steep, and above the colluvial slopes that border valley floors. In some places, however, limestone outcrops extend to the valley floor, and in others they border Stony colluvial land, steep. Most commonly, on the lower side, they

stone formation. Large boulders and huge blocks of sandstone have rolled onto the shale and limestone. Material weathered from sandstone surrounds the boulders and gives rise to most of the present surface soil. In places, this colluvial material includes small areas of Stony colluvial land, steep, particularly where it has a red color.

Runoff is very rapid. Internal drainage is medium in moderately deep to deep sandy areas, but it is slow

common in areas where the soil is deeper. A mixed growth of persimmons, various oaks, hickories, and other hardwoods occurs in places.

Use and suitability (VIIe–2).—On more than 50 percent of its area, this land type is mostly exposed bedrock. It is unsuitable for crops but can be used for woodland pasture where grasses and other plants grow during wet periods. It is of very little value for forest, because storms blow down many of the trees before they attain maturity. Better trees grow on this land type where the soil is comparatively deep or where their roots can follow cracks or crevices in the rocks.

SEQUATCHIE SERIES

The Sequatchie series consists of very deep well-drained soils on terrace lands in the limestone valleys. The parent material of these soils was old mixed general alluvium washed from uplands underlain mainly by sandstone and shale but in places by limestone. The Sequatchie soils have been modified by recent overwash material in places. Some areas [illegible] pines and redcedars grew in places. Most of this soil is in Big Wills Valley; widely separated areas are in the other valleys.

Profile description:

Surface soil—
0 to 9 inches, dark-brown very friable fine sandy loam; light yellowish brown when dry; weak fine crumb structure; some chert and sandstone fragments and waterworn gravel on and in the layer.

Subsoil—
9 to 16 inches, yellowish-red friable loam to silty clay loam, faintly variegated with lighter and darker shades; reddish yellow to strong brown when dry; weak fine to medium angular blocky structure.

Underlying material—
16 to 36 inches, yellowish-red friable heavy sandy clay loam; slightly lighter in color as depth increases; reddish yellow when dry; contains some waterworn gravel less than 1 inch in diameter and many chert and sandstone fragments mostly less than 2 inches in diameter.

Depth of the soil to bedrock is 5 feet or more. Some gravelly areas occur. The gravel does not interfere with cultivation to any extent but may cause some

suited to winter legumes. It will benefit from the use of green manure.

This soil is very easy to work. The erosion hazard is slight. The soil makes very great response to good management.

SEQUOIA SERIES

The soil of this series has been subjected to severe erosion and, as a result, is somewhat excessively drained. It occupies low ridges and mild slopes in the limestone valleys. It has formed on residual material derived chiefly from shale and associated limestone. The soil developed under a native cover consisting principally of deciduous hardwoods, with which pines and a few redcedars were mixed.

The soil of this series is medium to strongly acid, very low in supply of organic matter, and low in fertility. It has low productivity and a narrow range of suitability.

[redacted]

seldom cultivated, though most of them support a few shrubs or other small vegetation. Many small areas of cropland are surrounded or partly surrounded by idle severely eroded areas of this soil or other soils.

This soil has poor workability. The optimum moisture range for tillage is narrow, and the soil will puddle if it is too wet or clod if too dry. The soil tends to be droughty, and a dry spell during the growing season will greatly reduce yields. The response to good management practices is only medium. Some improvement can be expected from erosion control and moisture conservation. The growing of deep-rooted crops will help break the firm subsoil and the underlying shaly material.

Most of this soil has been farmed under management that tended to increase erosion rather than control it. In recent years some landowners and operators are developing the rolling land into improved pasture consisting mainly of sericea lespedeza. Lespedeza is one [redacted]

Profile description:

Surface soil—

0 to 8 inches, grayish-brown to reddish-gray very friable loam; weak fine crumb structure.

Subsurface—

8 to 18 inches, brown to reddish-brown friable loam grading with increasing depth to friable sandy clay loam or fine sandy clay loam.

lated soil material dominantly is very shallow to shallow. It has very little or no textural profile development.

In some areas the soil material is moderately deep to deep (25 to 60 inches), especially where it fills holes, cracks, and rock crevices. Its depth to bedrock in areas between outcropping ledges depends somewhat on the dip of the geologic formation, slope, and distance between the ledges. Where rock outcrops occur in

Stony rolling land, Talbott and Colbert soil materials (Sf).—This land type differs from Stony smooth land, Talbott and Colbert soil materials, in having stronger slopes, more limestone outcrop, more limestone and chert fragments, and less soil material over bedrock. The general slope range is 7 to 15 percent.

A few small intricately associated areas have slopes of 15 to 25 percent. Except for milder relief, most of these inclusions differ very little from Rockland, limestone, steep. This miscellaneous land type is closely associated with Stony smooth land, Talbott and Colbert soil materials, on the more gentle slopes, and with Rockland, limestone, steep, near the stronger bluffs.

Runoff is rapid. Internal drainage is dominantly

stone. Large boulders and blocks of sandstone and pockets of partly weathered shale occur in the colluvium. Many large sandstone boulders and huge sandstone blocks protrude. The pockets of shale are observable only in deep gullies and road cuts.

This land type has rapid to very rapid runoff and medium internal drainage. It is slightly acid to strongly acid. It has a moderate supply of organic matter and medium fertility. Permeability is moderately rapid, and the moisture-holding capacity is moderate. The natural vegetation is mainly mixed deciduous hardwoods and pines.

Use and suitability (VIIe–2).—Practically all of this extensive land type is in native forest that has been

Profile description:

Surface soil—
0 to 5 inches (plow layer), reddish-brown to yellowish-red firm silty clay loam to silty clay; weak fine granular structure.

Subsoil—
5 to 25 inches, yellowish-red firm silty clay; reddish yellow when dry, plastic when wet; moderate medium subangular blocky structure.

Parent material—
25 to 37 inches, yellowish-red, firm, tough silty clay or clay splotched with shades of yellow and reddish yellow; reddish yellow when dry, and displays a moderate number of distinct to faint fine mottles of red and yellow; very plastic when wet.

In forested areas the surface soil is grayish-brown very friable silt loam in the upper part and yellowish-brown friable silty clay loam in the lower part. It is about 5 inches thick and is very pale brown when dry. The depth to bedrock is 2 to 6 feet. Some areas have an overwash of sandy alluvium ranging from a thin smear to a thickness of about 15 inches. Most areas are free from chert fragments, but some eberty areas are mainly in forest. Also included are about 50 acres of cropland that is covered with a thin alluvial overwash; these areas contain waterworn gravel and small chert fragments in places.

Use and suitability (IVe–5).—Most of the fairly large acreage of Talbott silty clay loam, eroded rolling phase, has been planted to general farm crops, mainly row crops, for a number of years. Cotton and corn are the principal crops. Although cotton was chiefly grown, large areas are now being developed for improved pasture grown in rotation with corn and hay.

This soil makes medium response to good management. It has fair workability. The hazard of further erosion is high. It is difficult to convert the firm silty clay subsoil material into a good plow layer if the original surface soil is lost. Measures therefore should be taken to control erosion.

Under good management most areas, particularly those with gradients less than 8 percent, can be maintained as desirable cropland. Areas with slopes be[redacted]

only a very few areas have gradients stronger than 16 percent.

Runoff is very rapid, and the hazard of further erosion is very high. Internal drainage is slow. This soil is medium to strongly acid, low in supply of organic matter, and low in fertility. It is slowly permeable and its moisture-holding capacity is low. This soil is associated with Rockland, limestone, steep, Stony rolling land, Talbott and Colbert soil materials, and with other soils on mountain bluffs and along the chert ridges.

The present plow layer consists almost entirely of subsoil material and is yellowish-red firm silty clay. The depth to bedrock ranges from 6 inches to 3 feet. Deep gullies have formed in places.

Use and suitability (VIe–3).—Nearly all the relatively small total area of this soil has been used for crops, but because of severe erosion, very little is now cropped. It is used principally for unimproved pasture. Some areas have returned to forest, mainly pines mixed with some hardwoods. Redcedars are fairly common along deep gullies, fences, and outcrops of limestone.

Severe erosion and hilly relief make this soil hard to work. Tilth and moisture absorption have been impaired by erosion, although some suitably located areas can be used for improved pasture. The response to good management is medium. Under present conditions the best use for this soil is for trees, particularly pine and redcedar.

supply of organic matter is generally low, and fertility is low to medium. The soils of this series have medium to low productivity and a medium to very narrow range of suitability.

Tellico loam, steep phase (25 to 45 percent slopes) (Th).—In general this soil is the most representative of the Tellico series in De Kalb County because it is largely in forest and has been changed very little by erosion. It is shallower to bedrock in most places than Tellico clay loam, eroded rolling phase. Although most areas of this soil are on steep slopes, some are on narrow ridgetops. Under forest the slopes are moderately smooth, but in places they have been deeply gullied.

Runoff is very rapid, and the erosion hazard is very high. Internal drainage is medium. The content of organic matter is medium and fertility is medium. Permeability is moderate to rapid in the surface soil and moderate to slow in the subsoil. The moisture-holding capacity is moderate.

The original forest cover was principally mixed hardwoods and scattered redcedars. The present woodland probably has more pine and redcedar than the original forest because the cutover areas reseed to pine and redcedar more rapidly than to hardwoods. In some small areas redcedars are practically the only trees.

Profile description:

Surface soil—
0 to 10 inches, dark reddish-brown to dark-brown fri-

in diameter. Chert fragments are fairly common on the surface, particularly on the slopes of the western ridge. Many slopes are practically free from sandstone and chert fragments.

Use and suitability (VIIe–3).—Forest covers most of this fairly extensive soil and is its best use. Most areas have been cut over from time to time, although logging is difficult in places. Some areas are fenced and are used for woodland pasture (fig. 9).

TELLICO SERIES

The soils of the Tellico series are well drained to somewhat excessively drained and occur on ridges in the limestone valleys. They have dark-red friable subsoils. Their parent material consists of residual products derived mainly from calcareous sandstone and interbedded shale of the Red Mountain formation (Tellico sandstone formation). This formation underlies the Fort Payne chert, and its main exposures are on the northwestern slopes of the eastern ridge and the southeastern slopes of the western ridge. The formation is nearly continuous in the two ridges, but material sloughed from the Fort Payne chert has covered it in many places, particularly along the western ridge. Geologic erosion has removed material unevenly in other places, and the formation appears in a broken chain of exposures.

On the upper side of the eastern ridge, the Tellico

Tellico clay loam, eroded rolling phase (5 to 12 percent slopes) (Te).—This soil occurs on low knobs and on foot slopes, particularly on the southeastern boundary of Big Wills Valley, and on slopes bordering Dugout Valley on the northwest. It differs from the hilly and steep phases of the Tellico series in this county mainly in relief.

Runoff is rapid, and the soil is highly susceptible to further erosion. Internal drainage is medium. Soil fertility is medium; permeability is moderate to slow, and the moisture-holding capacity is moderate. The native vegetation was principally deciduous hardwoods, pines, and redcedars. Vines, briers, and brush formed the ground cover.

Profile description:

Surface soil—
0 to 5 inches (plow layer), dark reddish-brown or

adequate control of runoff and erosion. Many of the desirable qualities that have been lost or reduced by erosion may be restored under better management.

This soil is suited to most of the general farm crops. It is not suited to row crops, particularly on the more strongly rolling areas. If these crops must be grown, cultivation should be on the contour. The soil is suited to a rotation of row crops and pasture, and to winter legumes used for grazing and for plowing under for green manure.

In De Kalb County little of this soil is planted to truck crops for market. In parts of Tennessee a similar soil is used commonly for garden vegetables because it warms early in spring and permits the crops to be planted and harvested earlier than on soils that warm more slowly. In recent years some fairly large areas in De Kalb County have been successfully developed

The soil is low in fertility. It is moderately to slowly permeable and has a low water-holding capacity.

The plow layer is dark-red to dark reddish-brown friable clay loam, and the subsoil is dark-red friable sandy clay about 5 inches thick. The depth to bedrock ranges from ½ to 4 feet. The texture of the plow layer is predominantly clay loam, but it ranges from fine sandy loam through silty clay loam to silty clay.

Use and suitability (VIIe–3).—All areas of this inextensive soil have at some time been under cultivation or in pasture, but only a few are now used annually for crops. Cotton and corn are the chief crops. Some areas are in unimproved pasture. Many are idle and are voluntarily reseeding to pines, redcedars, and scattered hardwoods.

The steep slopes and, in places, sandstone or chert fragments make the workability of this soil very poor. Erosion has impaired the tilth. It has also increased runoff, and little of the rainfall is absorbed and retained by the soil. The soil will be difficult to restore to a good condition.

Very little of the soil is suited to row crops. Selected areas can be used for improved pasture of sericea lespedeza. Kudzu can be grown for periodic pasture. The response to good management is medium. Most areas should be left in forest.

TUPELO SERIES

The soil of the Tupelo series occurs on terrace lands. It has developed under a cover of water-tolerant deciduous hardwoods and is characterized by a mottled, very firm or tight subsoil. Its parent material consists of old mixed general alluvium derived from uplands underlain mainly by clayey (argillaceous) limestone. In places the alluvium is modified by materials from chert or sandstone.

The Tupelo soil is strongly acid. It has a low supply of organic matter and is low in fertility. The surface soil is moderately permeable, and the subsoil is slowly permeable. The moisture-holding capacity is moderate.

Profile description:

Surface soil—

0 to 7 inches, dark-brown to brown or yellowish-brown friable heavy silt loam to silty clay loam; very pale brown when dry; plastic when wet, hard when dry.

Subsoil—

7 to 25 inches (claypan), reddish-yellow to brownish-yellow very firm or tight silty clay, mottled with shades of yellow, gray, and brown; mottles distinct, many, and of medium size; material sticky when wet.

Underlying material—

25 to 34 inches, dominantly gray, firm, stiff, tight clay or heavy silty clay, mottled with brown and light gray.

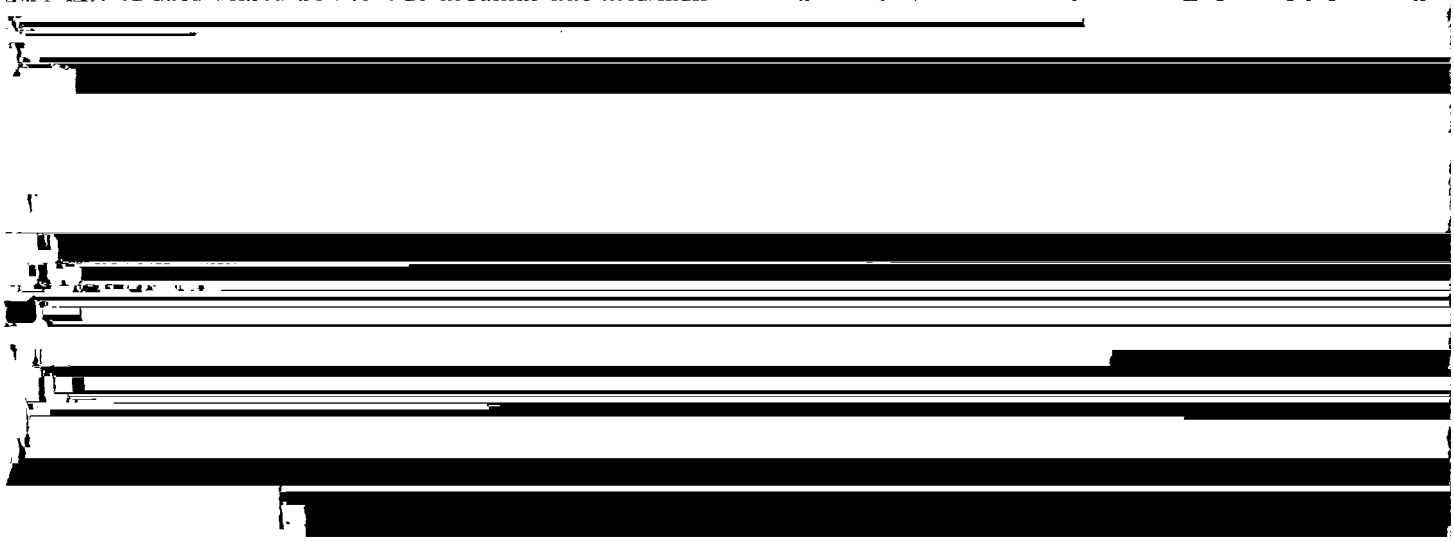
The depth of the soil to bedrock ranges from 3 to 7 feet. The color of the surface soil in the south-central part of Big Wills Valley is more brown than elsewhere. Small, round, soft to moderately hard concretions are very numerous in the soil in some places and nearly absent in others. The concretions are of buckshot size. Their distribution varies within short distances, although in some areas they are fairly uniformly scattered throughout the profile. In places the concretions occur near the surface; in others they are principally in the subsoil. Some angular chert fragments are in the underlying material in places.

As mapped, Tupelo silt loam includes a small acreage of Taft silt loam. This inclusion is similar to the Tupelo soil in positions occupied, color, and drainage, but it has a more friable subsoil.

Use and suitability (IIIs–1).—Most of Tupelo silt loam has been cleared and at some time used for row crops. Many areas are now in improved pasture.

Workability is good, if the soil is neither too wet nor too dry. Tilth is good to excellent. Under natural drainage, however, the soil dries too slowly in spring or after heavy rains to permit tillage operations. Moisture absorption is good, except where the surface soil has been washed away. The quantity of moisture absorbed depends on the depth of the friable surface soil, because moisture is absorbed slowly by the tight subsoil.

Most areas of this soil lie well above ordinary stream



Use and Management of Soils

This section consists of two parts. The first explains how the soils of the county are placed in 25 capability units according to their relative suitability for farming and other uses. The second part gives estimated average acre yields that may be expected under ordinary management, and also under the best management the farmer could feasibly use on the soils of his farm.

Land-Capability Classification

The soils have been grouped to show their suitability for crops, grazing, forestry, and wildlife. This grouping is based on the uses that can be made of each soil, its management needs, and the risks of soil erosion or of other kinds of damage when the soil is used. This kind of grouping is called land-capability classification. Since it is a practical grouping based on needs and responses, it can bring together in one group the soils that were formed from different parent materials or in different ways. Soils that have similar management needs, risks of damage, and general capabilities make up a capability unit, which can also be called a management group of soils. In De Kalb County the soils have been grouped into 25 capability units.

Capability units are grouped into eight general land-capability classes, based on a rough summing up of their suitability for use, the risks of erosion or other damage, and the resulting degrees of management needs of the different soils. Within the eight general

ing the native cover or a partly controlled succession of plants. The choices in management are fewer, production is less, or risk of erosion is greater than on the soils in class VI.

Class VIII, not used in this county, consists of soils so severely limited that they produce little useful vegetation. They may provide attractive scenery or furnish shelter for wildlife. Some make up parts of watersheds in which runoff should be controlled.

SUBCLASSES: Each of the eight general classes contains soils that have limitations and management problems of about the same degree. The soils within a class may be of different kinds, however, and therefore the kinds of limitations are different. The dominant kind of limitation is indicated by one of four subclasses. The four subclasses indicate: Risk of erosion, if cover is not maintained, designated by the symbol (e); excess water either on or in the soil (w); shallow, droughty, or unusually infertile soil (s); or unusually hazardous climate (c). Usually not all of the subclasses will occur in an area the size of a county.

Land-capability units within each class and subclass are numbered consecutively, as IIe–1, IIe–2, and so on. Within class I there is usually no need to distinguish subclasses based on kinds of limiting factors, and units are distinguished by the class number and a numeral, such as I–1.

Capability classes, subclasses, and units that occur in De Kalb County are given in the following list. Next is a brief description of each of the capability units.

Class I.—Deep, well-drained, nearly level, productive soils. Suit-

erately well drained soils that have slowly permeable plastic subsoils.

Class IV.—Soils severely limited or subject to high risk of damage if used for tilled crops. They can be cultivated with special management.
- IVe: Strongly sloping (hilly) soils that are otherwise favorable for cultivation:
  - IVe–1: Hilly soils with medium internal drainage that are commonly deep over limestone.
  - IVe–2: Hilly soils with medium internal drainage that are deep over cherty limestone.
  - IVe–3: Rolling soils with excessive or somewhat excessive drainage, mostly shallow or very shallow over shale or sandstone.
  - IVe–4: Undulating or rolling stony or mucky soils.
  - IVe–5: Rolling eroded soils, mostly shallow to bedrock.
- IVw: Poorly drained soils that are difficult to manage for crops:
  - IVw–1: Poorly drained loams or clays; some are subject to overflow.

Class VI.—Soils not suitable for cultivation because of steep slopes or stoniness.
- VIe: Steep or stony soils:
  - VIe–1: Hilly and steep cherty soils.
  - VIe–2: Undulating or hilly stony soils.
  - VIe–3: Predominantly hilly soils, shallow or very shallow to bedrock.

Class VII.—Soils with serious hazards or limitations when used for pasture or woodland.
- VIIe: Severely eroded, rocky, or very shallow soils:
  - VIIe–1: Severely gullied land.
  - VIIe–2: Rocky and stony land types.
  - VIIe–3: Steep soils predominantly shallow or very shallow to shale bedrock.

Table 7 contains a list of the soils in each capability unit, with suggestions for suitable crops, cropping systems, and the main needs for management and conservation of each unit.

Capability unit I–1

In capability unit I–1 are well-drained friable loam and silt loam soils consisting of local alluvium. These soils are nearly level to gently sloping and are deep to bedrock. They are fertile and are medium to slightly acid. They have a large capacity for holding moisture available to plants and are permeable to roots to a depth of several feet. The soils of capability unit I–1 are subject to temporary ponding during periods of heavy rainfall but are not subject to flooding by streams. These soils are productive and are easily worked and conserved. They are suited to intensive cultivation and to many kinds of crops.

Capability unit IIe–1

Capability unit IIe–1 consists of undulating, well-drained, friable silt loam and silty clay loam soils developed on stream terraces and colluvial slopes. The soil material originated chiefly from high-grade limestone. The soils of this capability unit have moderately high fertility and are medium acid. They have a moderately large capacity for holding moisture available to plants and are permeable to roots to a depth of several feet. The more sloping parts are subject to erosion, and the plow layer in most places consists of a mixture of the original surface soil and subsoil materials. servation. They are suited to intensive use and to practically all crops commonly grown in the county.

Capability unit IIe–2

Capability unit IIe–2 consists of gently sloping, well-drained silt loam and cherty silt loam soils on colluvial slopes. The soil material originated chiefly from cherty limestone and shale. Fertility is moderate and somewhat lower than that for the soils of IIe–1. The reaction is medium to strongly acid. The soils have a moderate capacity for holding moisture available to plants and are permeable to roots for several feet. Runoff is a moderate hazard on the more sloping parts, and some of the original surface soil has been lost through erosion. The cherty soil in this unit contains numerous fragments that interfere with cultivation.

The soils of capability unit IIe–2 are moderately productive and are easily worked except where quantities of chert are present. They require moderate measures for their proper conservation and are quite well suited to intensive use under good management. They are suited to practically all crops commonly grown in the county.

Capability unit IIe–3

Capability unit IIe–3 consists of undulating well-drained loam and fine sandy loam soils. The parent material of these soils originated chiefly from acid sandstone. The subsoils are more friable and more permeable than those of the soils of capability units IIe–1 and IIe–2. The soils of capability unit IIe–3 have low fertility and are medium to strongly acid. They have a moderate capacity for holding moisture available to plants and are very permeable to roots. Bedrock occurs at depths ranging from 2½ to 8 feet. Runoff is a moderate hazard on the stronger slopes. A large part of the original surface soil has been lost through erosion.

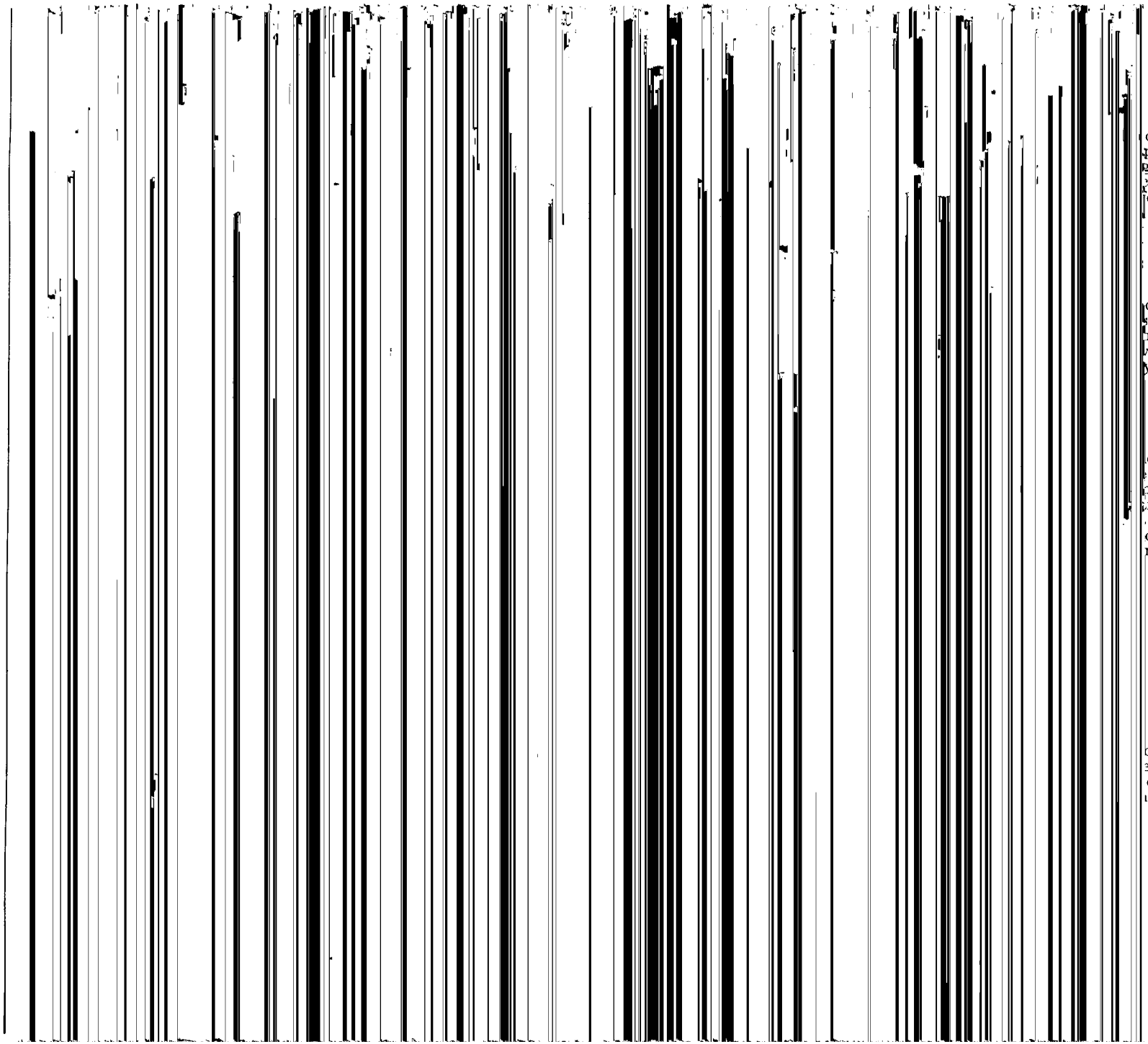
Although naturally low in fertility, these soils respond well to heavy fertilization. They are very easy to work and require moderate measures for their proper conservation. They are fairly well suited to intensive use under good management and to many kinds of crops.

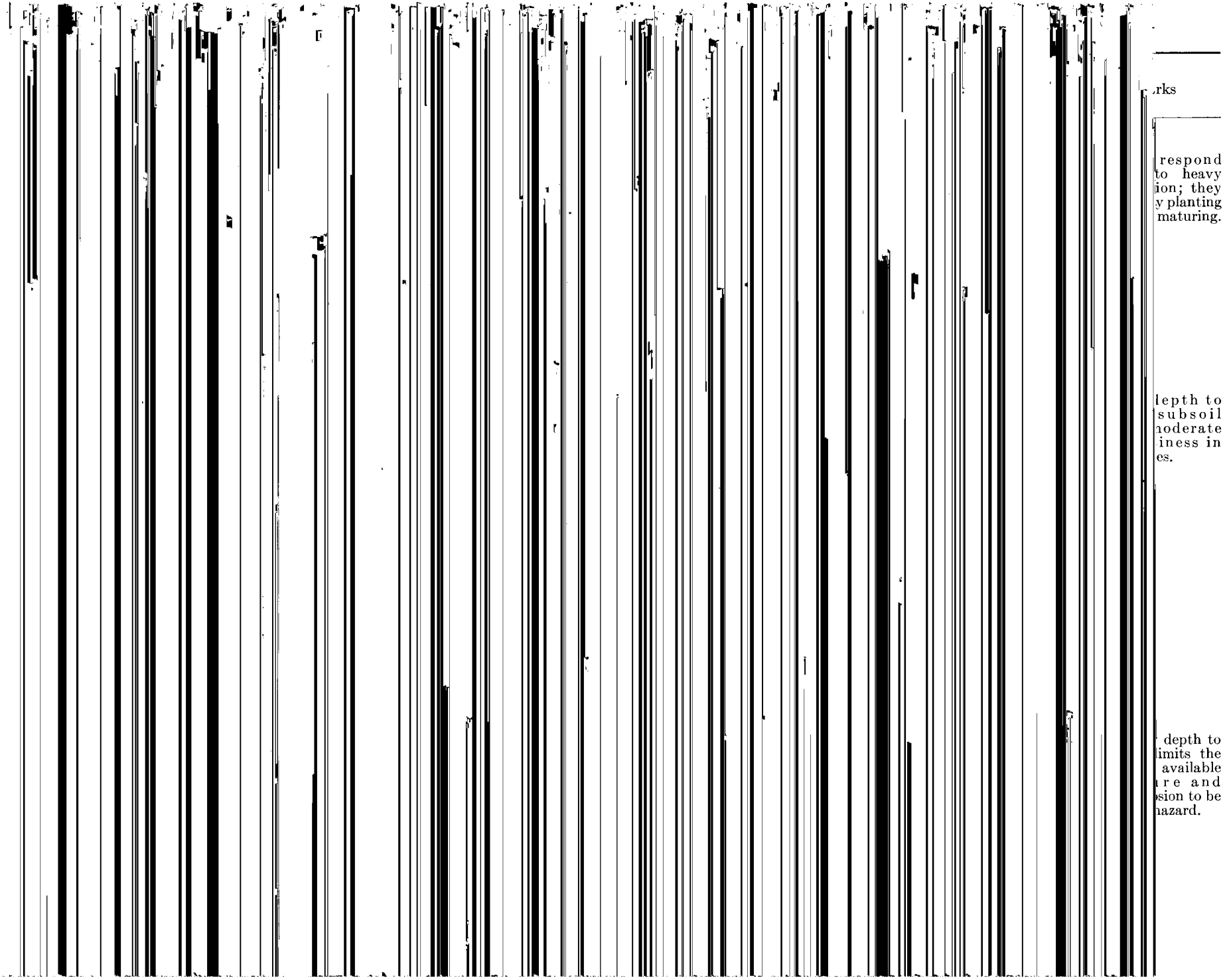
Capability unit IIw–1

In capability unit IIw–1 are nearly level to gently sloping loam and silt loam soils consisting of local and general alluvium. These soils generally range from somewhat poorly drained to moderately well drained. A small area, however, is well drained. The Philo and Lindside soils are subject to flooding by streams; the other soils in the unit are temporarily ponded during periods of heavy rainfall. The fertility of the soils of this capability unit is low to moderate, and the reaction is medium to strongly acid. All of the soils have a large capacity for holding moisture available to plants and are permeable to roots to depths of 2 to 10 feet or more. Excess ground water is a moderate hazard in most of these soils. They hold enough moisture for pasture grasses and legumes, however, and are especially favor-

ments, and
ounty, Ala.

pplementary ater-control practices	Remarks
exacting	Soils favored by good moisture relations, good tilth, deep root zone, and low slope gradient; much acreage subject to temporary ponding.
r crops to follow w crops; on onger slopes, ntour tillage and ssibly terraces.	Responsive to good management practices and very productive; high productivity not difficult to maintain under high level of management.
r crops to follow w crops; on onger slopes, ntour tillage and ssibly terraces.	Very good response can be expected from good management.
r crops to follow w crops; on onger slopes, ntour tillage and ssibly terraces.	Soils very responsive, especially to adequate fertilization; may be somewhat less suited to some legumes and grasses than soils of capability unit IIe–1; they favor early planting and early maturing.





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soybeans, grain, cotton, legumes (exing alfalfa) grasses for nd pasture.	1. Row crop, small grain, and hay or pasture. 2. Row crop followed by 2 to 4 years of hay or pasture.	Moderately high for all plant nutrients, lime, and organic matter.	Good tilth not difficult to maintain; tillage and other field operations restricted somewhat by retarded removal of excess soil moisture; contour cultivation important on more sloping parts.	Terracing may be beneficial on the more sloping areas; ditch or tile drainage will improve much of the acreage for some crops.	The soils respond well to good management practices, especially fertilization, and the less sloping areas are not difficult to maintain in a productive state.
ns, grain sorn, corn, and ral legumes grasses for hay pasture.	1. Row crop, small grain, and hay or pasture. 2. Row crop followed by 2 to 4 years of hay or pasture.	Moderately high for all plant nutrients, lime, and organic matter.	Good tilth difficult to maintain, especially for the Colbert soil; tillage operations notably limited by slow removal of excess water.	Some care required to restrain erosion on the Colbert soil; ditches may be beneficial for the Tupelo soil.	Moisture available to plants notably restricted by dry periods, especially on the Colbert soil.
and legumes ay and pas- small grain, orn.	1. Row crop, small grain, and several years of hay and pasture. 2. Pasture, and occasionally corn or a small grain. 3. Permanent pasture.	Moderately high for all plant nutrients, lime, and organic matter.	Practice a minimum of tillage; all field operations on the contour; good tilth difficult to maintain in the more eroded areas.	Runoff a very great hazard; diversion ditches and stripcropping may be beneficial.	The soils respond well to fertilization but they should be maintained under a close-growing cover as much of the time as possible.
and legumes ay and pas- small grains, orn.	1. Row crop, small grain, and several years of hay and pasture. 2. Pasture, and occasionally corn or a small grain. 3. Permanent pasture.	Fertilizer requirements very high for all plant nutrients, lime, and organic matter.	Practice a minimum of tillage; all field operations on the contour; good tilth not difficult to maintain but chert interferes materially with cultivation.	Runoff a great hazard; diversion ditches and stripcropping may be beneficial.	Heavier fertilization required and high-quality grazing vegetation more difficult to maintain than on soils of capability unit IVe–1.

upplementary
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ientary ontrol ices	Remarks
ditches peneficial; not prac- cause of w soil	The very limited supply of available moisture greatly restricts yields; much acreage can best be used for permanent pasture.
ditches peneficial; not prac- cause of ock, and oil depth.	Usefulness for cultivation greatly restricted by stone, rock outcrops, and shallow soil depth.
ditches peneficial; generally ical.	Usefulness for cultivation greatly restricted by poor tilth, low capacity for available water, general shallowness to bedrock, and strong slope.
drainage; inage not for the on soil,	Poor drainage restricts the range of suitability and productivity.

cherty cherty . steep cherty loam, eroded e. cherty loam, eroded e. y stony	Forest; permanent pasture on the more favorable sites.	Continuous forest or pasture.	Very high for all plant nutrients for permanent pasture.	Tillage very difficult and impractical.	Maintain effective vegetative cover.	Strong slopes make cultivation impractical.
loam, e. y clay verely y phase. h land, nd Col- aterials. g land, nd Col- aterials.	Legumes and grasses for pasture; forest.	Permanent pasture or forest.	High for all plant nutrients for permanent pasture on suitable areas.	Not suitable for tillage.	Maintain effective vegetative cover.	Some areas of the stony land types too stony or shallow for pasture.
y hilly ow or o bed- n, hilly ty clay rolling l hilly n fine n: ase---- l hilly						
stony loam, e. loam, e. shaly ed hilly y clay, eroded e. loam, eroded e.	Forest; pasture on the more favorable sites.	Forest or permanent pasture.	For pasture, high for all plant nutrients.	Very exacting because of strong slope and shallow depth.	Maintain effective vegetative cover.	Much of the acreage can best be used for forest.
and: --------	Forest or other hardy permanent vegetation.	Forest or other hardy permanent vegetation.	Impractical--------	Impractical except in areas that can be worked with heavy machinery.	Diversion ditches in places.	Smoothing for cultivation of some areas may be feasible though very expensive.

TABLE 7.—*Suitable crops, suggested cropping systems, fertilizer and tillage requirements, and supplementary water-control practices, by capability units, for soils of De Kalb County, Ala.*—Continued

Capability unit and soil	Suitable crops	Suggested cropping systems	Fertilizer requirements	Tillage requirements	Supplementary water-control practices	Remarks
VIIe–2 Rocky and stony land types: Rockland limestone, steep. Rockland, sandstone, steep. Rockland, sandstone, rolling. Stony colluvial land, steep.	Forest	Forest	Impractical	Impractical	None	Low productivity even for forest.
VIIe–3 Steep soils predominantly shallow or very shallow to shale bedrock: Litz silt loam, steep phase. Litz shaly silty clay loam, eroded steep phase. Tellico loam, steep phase. Tellico clay loam, severely eroded steep phase.	Forest, chiefly pine	Forest	Impractical	None	Diversion ditches in places.	The most favorable sites can be used for pasture under careful management.

The soils of this capability unit are productive and are easily worked. Cultivation, however, is commonly retarded because they dry slowly. These soils are easily conserved and are suited to intensive cultivation. Not all the crops of the area can be grown on them, however.

Capability unit IIw–2

Capability unit IIw–2 consists of nearly level well-drained soils on first bottoms. They range in texture from fine sandy loam to silt loam, but the quantity of chert in one of the Ennis soils interferes with tillage. They have moderate to high fertility and range from strongly to slightly acid. The soils of this unit have a moderate to high capacity for holding moisture available to plants and are permeable to roots to a depth of several feet. Practically all of the acreage is subject to overflow, and scouring may be a hazard in places.

These soils are productive and easily worked and conserved. They are suited to intensive use, but not all crops of the area can be grown, because of the danger from floods.

Capability unit IIIe–1

Capability unit IIIe–1 consists of rolling, well-drained, silty clay loam soils. The parent material originated chiefly from high-grade limestone. These soils are deep to bedrock. Their fertility is moderately high, and their reaction is medium to strongly acid. Much of the original surface soil, and in places all of it, has been lost through erosion. As a result the plow layer has become more clayey and the tilth and moisture relations are less favorable. The subsoil, though a firm silty clay loam to silty clay, is permeable to roots. The moisture-holding capacity of these soils ranges from moderate to low, according to the amount of surface soil material lost by erosion.

The soils of this unit are particularly subject to erosion. The more eroded parts are droughty and have decidedly unfavorable tilth. These soils are productive under good management, but they are a little more difficult to work and conserve than soils of group IIe–1. They are suited to moderately intensive use and to many kinds of crops.

Capability unit IIIe–2

Capability unit IIIe–2 consists of rolling, well-drained, silt loam and cherty silt loam soils. The parent material of all, except for the Muse soil, originated from cherty limestone. All of the soils are deep to bedrock. Their fertility is generally low, and their reaction is medium to strongly acid. Most of these soils have chert fragments in the plow layer that interfere with cultivation, and some have lost a large amount of the original surface soil through erosion. The plow layers, however, have fairly good tilth. The soils of this capability unit are permeable to roots and have moderate capacity for holding moisture available to plants. Erosion is a hazard to all soils in the unit.

These soils are moderate to low in productivity and are a little more difficult to work than soils of capability unit IIe–1. Under good management they are suited to moderately intensive use and to many different crops.

Capability unit IIIe–3

Capability unit IIIe–3 consists of rolling well-drained fine sandy loam and loam soils. The parent material of these soils originated chiefly from acid sandstone. Depth to bedrock is moderate to deep. Fertility is generally low, and the reaction is medium to strongly acid. The moisture available to plants is moderate. The soils of this capability unit have predominantly sandy clay loam subsoils that are very permeable to roots. Although these soils have somewhat less depth to bedrock than soils of capability units IIIe–1 and IIIe–2, they have comparatively good moisture relations because of their greater permeability to roots. Erosion is a hazard to all of these soils.

These soils are moderate to low in productivity. Their sandiness makes them easy to cultivate, but their moderately strong slope hinders field operations and causes problems in conservation. These soils are suited to many kinds of crops.

Capability unit IIIe–4

Capability unit IIIe–4 includes an undulating moderately well drained silty clay loam soil. The parent material of this soil originated from clayey limestone. The depth to bedrock is moderate in most places but is shallow in some. A few rock outcrops occur. The soil of this capability unit has moderate fertility and is medium to strongly acid. Its tilth is fairly good, except where erosion has exposed the clayey subsoil. In these eroded areas, tilth is poor and the soil becomes hard when dry. In all places the subsoil is plastic clay and is slowly permeable to roots and water. The capacity for holding moisture available to plants is moderate in the soil of this unit. It is lower than for soils of units IIe–1 and IIIe–1. The more eroded patches are droughty. Erosion is a hazard, especially on the more sloping areas.

The soil of this capability unit is moderately productive. It is difficult to work and presents some conservation problems. It is suitable for moderately intensive use. The crops to which it is well suited are somewhat restricted.

Capability unit IIIe–5

Capability unit IIIe–5 consists of undulating and rolling well-drained fine sandy loam and loam soils. The parent material of these soils originated chiefly from acid sandstone and sandstone interbedded with shale. The depth to bedrock ranges from shallow to moderately deep. Fertility is low, and the reaction is medium to strongly acid. The plow layer has good tilth; it is friable and very permeable to roots. The capacity of these soils for holding moisture available to plants is low to moderate. Because the more sloping parts are subject to erosion and are generally shallow to bedrock, all of the soils are easily damaged by losses of soil material.

The soils of this unit are low in productivity. Because of their general shallowness and moderately strong slopes, they are not easy to work and conserve. They are not suited to intensive use. The number of crops well suited to them is somewhat limited.

Capability unit IIIw–1

Capability unit IIIw–1 consists of undulating and

Capability unit IVe–2

Capability unit IVe–2 consists of hilly soils with

for holding moisture available to plants is generally low, both in the plow layer and in the subsoil. The response to good management is medium. The soils of this unit, however, are not suited to intensive use, and the crops well suited to them are limited. Much of the acreage should be in permanent pasture or forest.

Capability unit IVw–1

Capability unit IVw–1 consists of poorly drained soils. These soils are nearly level, and their plow layers have loamy to clayey textures. They range rather widely in reaction, content of organic matter, and fertility. The Melvin, Dunning, and Atkins soils are commonly subject to overflow, and the Robertsville and Lickdale have perched water tables. The Dowellton soil occupies smooth upland positions, and its poor drainage is caused chiefly by very slow runoff and permeability.

These soils are restricted in use for crops mainly by excess moisture. The feasibility of improving their drainage varies greatly. Artificial drainage is probably feasible for some areas of the Robertsville, Atkins, and Melvin soils, but little can be done to improve the drainage of the Dowellton soil. Permanent pasture or forest is the best use for areas that cannot be artificially drained.

Capability unit VIe–1

Capability unit VIe–1 consists of hilly and steep cherty soils not suited to cultivation. The hilly and some of the steep areas are severely eroded and consequently have a cherty silty clay loam plow layer. All of the soils are very deep to bedrock and contain loose stones that interfere with cultivation. All are medium to strongly acid, and low to very low in organic matter and fertility. Runoff is rapid to very rapid. Because of the strong slopes the erosion hazard on cultivated areas is high to very high. Under careful management, including proper seeding and fertilization, much of the acreage will support good pasture.

Capability unit VIe–2

Capability unit VIe–2 consists of undulating to hilly soils that [redacted]

but the Talbott soils have friable surface and subsurface layers and are underlain by sandstone or shale. All are low to very low in fertility and have a low capacity for holding moisture available to plants. Under careful management they will produce pasture with a moderate carrying capacity. The best use for most of the acreage, however, is for forest.

Capability unit VIIe–1

Capability unit VIIe–1 includes areas that consist largely of an intricate pattern of gullies too deep to be crossed easily by ordinary farm machinery. The areas are low in fertility and have a low capacity for holding moisture available to plants. Their restoration for cultivation or pasture would require much effort and expense. Most areas can be handled best by establishing kudzu or other hardy close-growing crops or by planting pines.

Capability unit VIIe–2

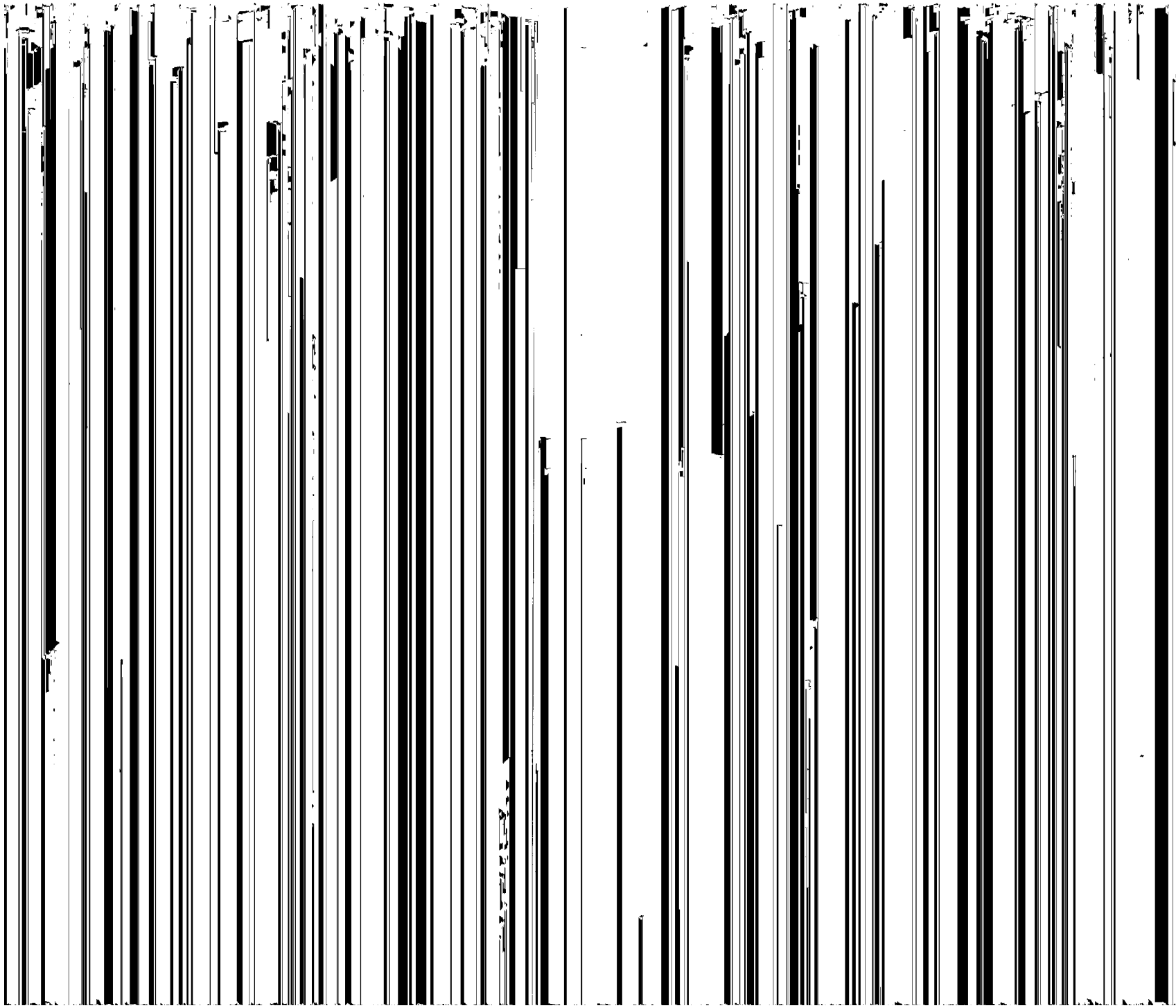
Capability unit VIIe–2 consists of land types that are very largely of rock and stone. They have little soil material. These land types have little or no value for crops or pasture and a low value for trees.

Capability unit VIIe–3

Capability unit VII–3 consists of steep soils predominantly shallow or very shallow to shale bedrock. These soils are all low to medium in fertility. In most areas, they have a low to very low capacity for holding moisture available to plants. The steep slope and shallow depth make them poorly suited, even for pasture, although some of the more favorable sites may be used for grazing under careful management. Much of the acreage will produce trees and should be used for forest.

Estimated Yields

[redacted]



management

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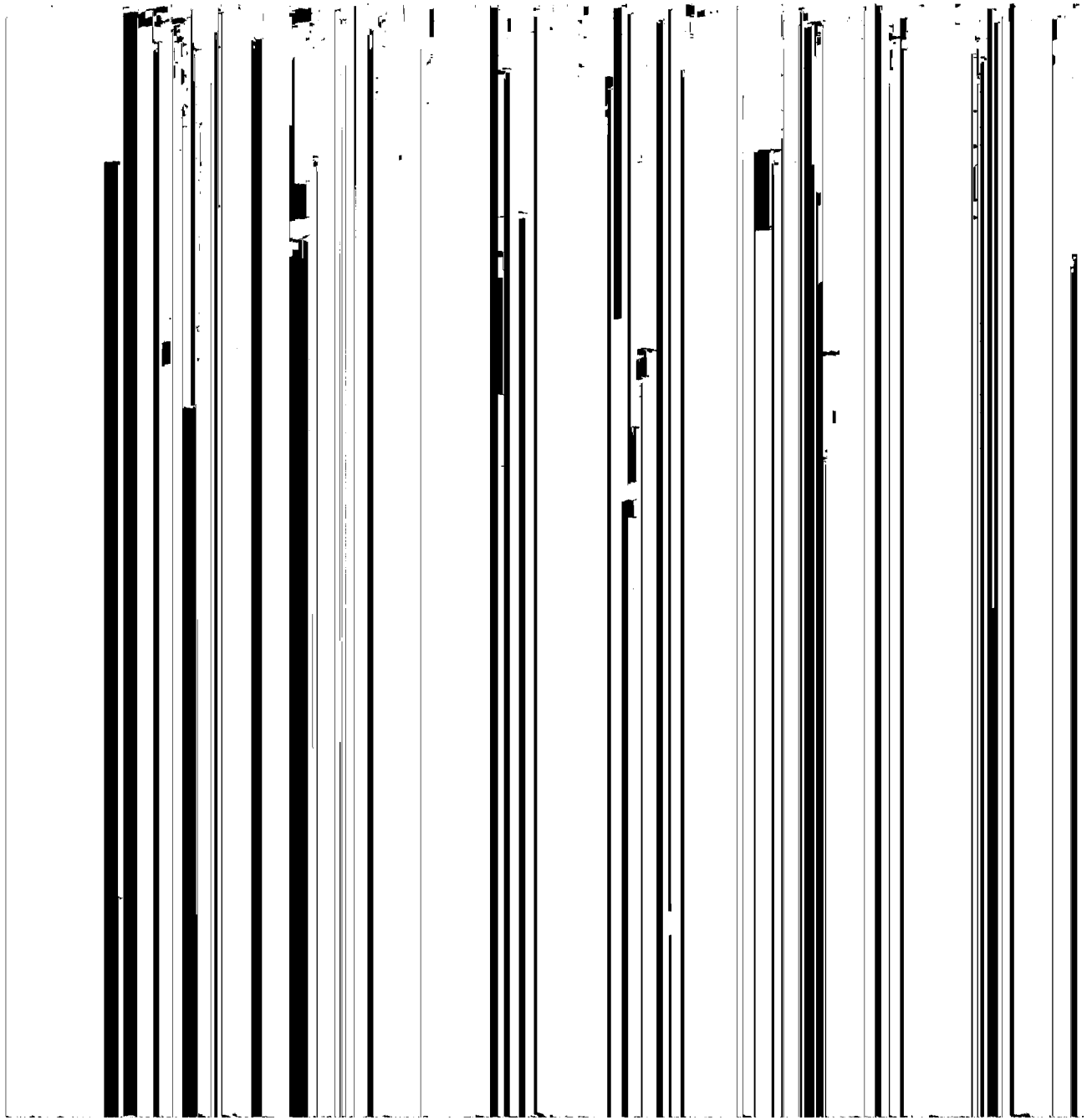
	B
	Cow-acre-days [1]
0	[3] 240
0	160
0	150
5	120
0	110
5	100
5	75
0	110
5	100
0	65
0	175
5	170
0	160
5	140
0	200
0	195
0	90
5	80
0	70
0	65
-	---
-	---
0	120
0	100
0	170
0	180
5	140
0	125
0	70
0	170
0	140
5	145
0	200
0	210
5	200
0	[3] 200
5	1 5
0	140
0	130
0	115

llerton cherty silty clay loam, severely roded hilly phase [5]	VIe-1								1.8	.2	.6					25	110
endale cherty silt loam	IIw-1	27	60	12	23	2.7	3.6	2.0	2.8	.9	1.7	85	135	270	490	100	200
llied land [5]	VIIe-1		30		18				1.8	.2	.7				330	20	135
mblen loam, local alluvium phase [6]	IIw-1	30	60		20			2.3	3.1	1.2	1.8	110	180		480	25	190
rtsells fine sandy loam:																	
Undulating phase	IIe-3	30	60	15	22	2.5	3.5	2.0	3.0	.8	1.5	125	200	450	625	70	150
Eroded undulating phase	IIe-3	28	60	15	22	2.5	3.5	2.0	3.0	.8	1.5	125	200	435	625	68	150
Rolling phase	IIIe-3	25	50	[4] 12	[4] 20	2.0	2.9	1.8	2.3	.7	1.3	100	180	380	560	65	140
Eroded rolling phase	IIIe-3	24	48	[4] 12	[4] 20	[7] 1.8	[7] 2.8	1.7	2.7	.7	1.2	100	180	350	550	60	135
Undulating shallow phase	IIIe-5	23	46	11	18			1.4	2.3	.7	1.2	100	170	360	500	65	135
Eroded undulating shallow phase	IIIe-5	22	45	10	17			1.4	2.3	.6	1.1	100	170	350	490	60	130
Rolling shallow phase	IIIe-5	20	42	[4] 9	[4] 16			1.1	1.9	.5	1.0			325	420	50	130
Eroded rolling shallow phase	IIIe-5	18	40	[4] 9	[4] 16			1.0	1.6	.5	1.0			310	400	50	130
rmitage silty clay loam:																	
Eroded undulating phase	IIe-1	30	58	18	25	2.6	3.5	1.9	2.9	.9	1.6	100	200	400	560	95	195
Eroded rolling phase	IIIe-1	30	55	[4] 17	[4] 24	[7] 2.0	[7] 2.8	1.7	2.3	.7	1.5	75	115	380	525	90	190
Severely eroded rolling phase [5]	IIIe-1	12	40		18		2.5	1.0	2.1	.5	1.3			325	475	40	150
ntington silt loam	IIw-2	40	70	16	23	3.0	4.0	2.5	3.3	1.3	1.9	130	190	325	500	150	240
ntington fine sandy loam	IIw-2	35	65	14	22	2.8	3.6	2.2	3.0	1.1	1.7	120	200	320	520	145	215
erson loam:																	
Eroded undulating phase	IIe-3	28	56	15	22	2.5	3.5	1.9	2.9	.8	1.5	115	190	400	550	75	155
Eroded rolling phase	IIIe-3	24	48	12	20	1.8	2.8	1.7	2.6	.7	1.2	100	170	350	520	65	140
nsburg loam	IIIw-1	22	46		22			1.8	2.8	.7	1.6	70	180			70	140
dvale silt loam:																	
Eroded undulating phase	IIIw-1	20	45	14	22	1.5	2.5	1.8	2.8	.5	1.1	80	150	325	500	55	135
Eroded rolling phase	IIIw-1	17	40	10	17			1.5	2.4	.4	.9	50	120	280	450	40	100
kdale loam [6]	IVw-1		50		20				2.5	.6	1.2					50	150
dside silt loam [6]	IIw-1	40	70		20			2.5	3.3	1.3	1.9					160	240
ker fine sandy loam :																	
Eroded undulating phase	IIe-3	28	58	15	21	2.5	3.4	2.0	3.0	.8	1.5	120	200	450	625	55	140
Eroded rolling phase	IIIe-3	24	48	14	20	[7] 1.8	[7] 2.8	1.5	2.5	.7	1.2	110	170	350	525	50	135
silt loam:																	
Rolling phase	IVe-3	10	20	[4] 10	[4] 16			1.5	2.4	.5	1.0		[7] 50	200	450	45	120
Hilly phase	VIe-3	10	18					1.3	2.2	.5	.9				220	35	100
Steep phase	VIIe-3															30	70
shaly silty clay loam:																	
Eroded rolling phase	VIe-3	8	15					1.2	2.0	.4	.8			130	325	35	100
Eroded hilly phase	VIe-3							1.2	2.0	.4	.8					30	80
Eroded steep phase	VIIe-3															23	70
vin silt loam [6]	IVw-1		50						2.5	.6	1.4					90	200
ıvale cherty silt loam:																	
Eroded undulating phase	IIe-2	26	54	16	24	2.4	3.5	1.8	2.3	.7	1.4	75	120	330	550	85	170
Rolling phase	IIIe-2	22	44	[4] 14	[4] 20	[7] 2.0	[7] 3.0	1.7	2.7	.7	1.4	65	110	300	520	70	150
Eroded rolling phase	IIIe-2	21	40	[4] 13	[4] 20	1.9	2.3	1.6	2.3	.6	1.3	60	100	290	500	65	145
ıvale silt loam:																	
Eroded undulating phase	IIe-2	28	55	16	23	2.5	3.3	2.0	2.8	.8	1.5	100	180	340	560	90	180
Eroded rolling phase	IIIe-2	25	50	[4] 13	[4] 21	[7] 2.0	[7] 3.0	1.3	2.3	.7	1.4	80	150	250	525	70	140
se silt loam:																	
Eroded undulating phase	IIe-2	30	58	18	25	2.6	3.3	2.1	3.3	.9	1.8	85	150	340	580	100	200
Eroded rolling phase	IIIe-2	25	50	[4] 15	[4] 20	[7] 1.5	[7] 2.5	2.2	3.0	.7	1.4	70	130	300	525	90	180
se silty clay loam, severely eroded lling phase [5]	IVe-3	12	20		16		2.0	1.5	2.3	.4	.9		90	200	325	25	100
skingum fine sandy loam:																	
Hilly phase	VIe-3			8	14					.6	.8					35	120
Eroded hilly phase	VIe-3			8	14					.4	.8					35	120
skingum stony fine sandy loam:																	
Rolling phase	IVe-3															35	120
Hilly phase	VIe-3															25	70
ewah silt loam [6]	IIw-1	40	70		20			2.5	3.3	1.3	1.9				460	150	240
e cherty silt loam:																	
Eroded undulating phase	IIIw-1	25	50	14	20	2.0	3.0	1.8	2.8	.7	1.4	70	170	325	525	85	170
Rolling phase	IIIw-1	23	47	12	18	[7] 1.6	[7] 2.5	1.6	2.5	.6	1.2	60	110	300	500	80	160
Eroded rolling phase	IIIw-1	20	45	11	16	[7] 1.5	[7] 2.5	1.5	2.5	.5	1.0	60	110	280	480	75	155
o loam [6]	IIw-1	30	55		18			2.0	3.0	.9	1.7					100	210
e loam	IIw-2	32	60	13	20			2.0	3.0	1.0	1.6	110	190		[8] 500	130	220
sville loam, hilly phase	VIe-3															40	125

Footnotes at end of table.



of management—Continued

—	Potatoes		Cotton (lint)		Pasture	
	A	B	A	B	A	B
s	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
					30	110
2					60	180
					20	45
3	110	230	450	625	[3] 90	[3] 170
3	100	210	430	625	90	170
3			165	330	30	100
7	120	190	300	500	140	215
					45	90
					30	70
3			240	410	80	155
)			200	340	70	135
7			140	280	30	100
3				250	25	90
)			225	425	30	110
3			150	300	25	70
2			200	400	70	130

; or moderately sloping areas.
e for areas of the soil that have been reclaimed by chinery and by fertilizing heavily.
ds in columns B include the establishment of

il are for selected areas having relatively mild rom erosion.
selected areas of the soil.

The yields in columns B are based largely on estimates of men who have had experience with the soils and crops of the county. Known deficiencies of the soils were considered, and estimates were made on how much crop yields might increase if these deficiencies were corrected within practical limits. The yields in columns B may be used as production goals that may be attained by using improved management practices now feasible. Improved management refers to the proper choice and rotation of crops; the correct use of commercial fertilizers, lime, and manure; proper tillage methods; the return of organic matter to the soil; mechanical means of water control; the maintenance or improvement of productivity and workability; and the conservation of soil material, plant nutrients, and soil moisture. The requirements of improved management will vary according to the soils, but the practices given in table 7 are considered necessary to obtain the yields

in the soil survey report, are defined in the glossary. Aggregate is not defined in the glossary, although it is referred to in the definition of soil structure. It is defined as follows:

Aggregate: A cluster of primary soil particles held together by internal forces to form a clod or fragment.

Soil test data and engineering soil classifications

To be able to make the best use of the soil maps and the soil survey reports, the engineer should know the physical properties of the soil materials and the in-place condition of the soil. After testing soil materials and observing the behavior of soils when used in engineering structures and foundations, the engineer can develop design recommendations for the soil units

TABLE 9.—*Engineering test data*[1] *for soil*

Soil name and location	Parent material	Bureau of Public Roads report No.	Depth	Horizon	Moisture-density		Mechanical analysis[2]	
					Maximum dry density	Optimum moisture	Discarded in field sampling: Larger than 3 inches	Discarded in field sampling: 3 in. to 1 in.
			Inches		*Lb. per cu. ft.*	*Percent*	*Percent*	*Percent*
Allen loam:								
		88438	1–11		122	11		

Mechanical analysis [2]—Continued																Liquid limit	Plasticity index	Classification	
Percentage passing sieve [3]											Percentage smaller than [3]								
3-in.	2-in.	1½-in.	1-in.	¾-in.	⅜-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			A.A.S.H.O. [4]	Unified [5]
				100	95	92	87	80	71	55	49	32	18	13	20	4	A-4 (4)	ML-CL.
				100	98	97	94	88	71	66	61	50	29	23	27	10	A-4 (6)	CL.
			100	96	94	93	89	83	76	58	55	47	34	28	38	17	A-6 (7)	CL.
					100	99	99	98	95	77	64	32	15	11	19	2	A-4 (8)	ML.
								100	99	93	82	56	41	33	42	16	A-7-6 (11)	ML-CL.
									100	96	86	61	50	42	57	22	A-7-5 (16)	MH.
				100	99	98	97	96	95	49	43	27	16	12	21	4	A-4 (3)	SM-SC.
		100	97	96	93	89	86	85	84	57	52	38	26	21	31	10	A-4 (4)	ML-CL.
									100	93	82	50	34	25	35	11	A-6 (8)	ML-CL.
								100	99	92	90	79	41	27	38	12	A-6 (9)	ML-CL.
							100	99	93	63	59	44	22	15	26	7	A-4 (6)	ML-CL.
					100	99	96	91	85	65	58	36	18	12	21	4	A-4 (6)	ML-CL.
						100	99	95	91	78	72	57	30	22	25	10	A-4 (8)	CL.
						100	99	93	88	74	71	59	37	27	32	12	A-6 (9)	CL.
				100	99	98	97	91	88	80	73	53	36	30	32	13	A-6 (9)	CL.
				100	98	97	96	90	87	79	72	54	37	31	37	17	A-6 (11)	CL.
		100	97	97	97	97	97	95	94	89	85	75	60	50	64	34	A-7-5 (20)	MH-CH.
100			98	95	90	85	78	67	65	60	58	40	21	13	27	4	A-4 (5)	ML-CL.
100			90	81	67	55	47	37	35	32	31	26	11	8	24	4	A-2-4 (0)	GM-GC.
95			80	75	58	41	26	14	12	10	10	8	2	2	21	2	A-1-a (0)	GW-GM.
						100	99	88	85	76	69	48	23	18	23	5	A-4 (8)	ML-CL.
							100	95	93	89	85	69	43	33	37	16	A-6 (10)	CL.
							100	94	92	86	83	72	54	47	55	27	A-7-6 (18)	MH-CH.
				100	99	98	97	93	75	63	63	58	39	34	36	11	A-6 (6)	ML-CL.
		100	98	96	93	86	83	79	63	52	52	47	35	31	37	11	A-6 (4)	ML-CL.
							100	93	90	81	73	43	24	18	24	6	A-4 (8)	ML-CL.
							100	94	92	87	82	60	35	26	29	11	A-6 (8)	CL.
							100	95	93	88	84	71	46	38	43	19	A-7-6 (12)	CL.
100			97	97	94	87	80	70	64	51	48	36	16	10	26	5	A-4 (3)	ML-CL.
				100	95	90	85	73	69	60	59	50	31	17	26	6	A-4 (5)	ML-CL.
		100	98	96	90	87	84	71	66	55	54	50	41	32	43	19	A-7-6 (8)	CL.
	100	96	94	91	77	64	53	38	32	22	21	15	11	6	29	7	A-2-4 (0)	SM-SC.
100			96	92	84	74	64	44	36	29	26	18	12	9	20	4	A-2-4 (0)	SM-SC.
					100	99	99	98	90	40	39	31	12	7	NP	NP	A-4 (1)	SM.
							100	99	94	53	51	42	20	14	20	7	A-4 (4)	ML-CL.
							100	99	95	48	45	35	22	16	21	6	A-4 (3)	SM-SC.
									100	99	96	81	35	24	35	12	A-6 (9)	ML-CL.
			100	99	96	94	92	88	86	82	75	57	23	15	25	7	A-4 (8)	ML-CL.
							100	99	91	69	64	48	19	12	21	4	A-4 (7)	ML-CL.
							100	99	93	74	70	56	28	22	27	9	A-4 (8)	CL.
							100	98	89	75	73	62	40	33	43	19	A-7-6 (12)	CL.
					100	97	95	86	73	51	49	41	21	16	20	6	A-4 (3)	ML-CL.
					100	98	96	87	75	58	58	50	33	28	32	13	A-6 (6)	CL.
					100	99	97	89	79	63	62	57	44	41	41	13	A-7-6 (7)	ML.
		100	98	98	95	93	88	82	80	77	70	51	34	24	32	8	A-4 (8)	ML-CL.
		100	90	77	66	57	48	45	45	44	43	40	29	22	43	17	A-7-6 (4)	GC.
			100	99	97	94	89	81	76	68	63	46	29	23	31	14	A-6 (8)	CL.
				100	97	93	89	77	72	60	55	39	18	12	24	6	A-4 (5)	ML-CL.
98			96	93	86	79	72	61	57	48	46	38	19	13	27	7	A-4 (3)	SM-SC.
97			95	90	78	62	48	38	35	31	31	28	17	12	29	11	A-2-6 (0)	GC.
99			97	95	90	82	74	63	58	49	48	41	23	16	25	8	A-4 (3)	SC.

See footnotes at end of table.

TABLE 9.—*Engineering test data[1] for soil*

Soil name and location	Parent material	Bureau of Public Roads report No.	Depth	Horizon	Moisture-density		Mechanical analysis[2]	
					Maximum dry density	Optimum moisture	Discarded in field sampling	
							Larger than 3 inches	3 in. to 1 in.
			Inches		*Lb. per cu. ft.*	*Percent*	*Percent*	*Percent*
Muskingum stony fine sandy loam:								
SE¼NE¼ sec. 29, T. 6 S., R. 10 E.	Sandstone	88489	0–7		110	14		
		88490	7–17		119	12		
Talbott silty clay loam:								
NE¼SE¼ sec. 33, T. 7 S., R. 8 E.	Clayey limestone and shale.	88491	0–7		116	13		
		88492	7–27		116	15		
		88493	27–48		108	18		

[1] Tests performed by Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (A.A.S.H.O.).

[2] Mechanical analyses according to the American Association of State Highway Officials Designation: T 88–54. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the A.A.S.H.O. procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than

samples taken from 21 soil profiles—Continued

Mechanical analysis [2]—Continued														Liquid limit	Plasticity index	Classification	
Percentage passing sieve [3]											Percentage smaller than [3]						
3-in.	2-in.	1½-in.	1-in.	¾-in.	⅜-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			A.A.S.H.O. [4]	Unified [5]
	100	97	97	97	96	95	95	91	67	40	39	33	19	14	24	5	A–4 (1)	SM–SC.
			100	99	99	99	99	95	72	47	46	41	25	20	22	6	A–4 (2)	SM–SC.
				100	99	98	97	91	85	72	67	48	29	20	26	10	A–4 (7)	CL.
				100	99	99	98	91	84	68	65	54	33	27	32	13	A–6 (8)	CL.
					100	99	98	93	85	67	65	57	40	33	39	14	A–6 (8)	ML–CL.

2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[3] Based on total material. Laboratory test data corrected for amount discarded in field sampling.

[4] The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, A.A.S.H.O. Designation: M 145–49.

[5] The Unified Soil Classification System, Technical Memorandum No. 3–357, v. 1, Waterways Experiment Station, March 1953 (7).

Engineering classifications systems

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (*2*). In this system, soil materials are classified in seven principal groups. The groups range from A-1, consisting of gravelly soils of high bearing capacity, to A-7, consisting of clay soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol in the

The soil test data in table 9, together with information given in the remainder of the report and experience with the same soils in other counties, were used in preparing the highway soil engineering data and recommendations given in table 12. There may be considerable variation in the texture (grain size) of the materials in one layer of a soil compared to another layer of the same soil, hence it should not be anticipated that the engineering soil classification given in table 12 will apply to all portions of the specific soil series.

The engineering characteristics of rockland, stony land, and stony colluvium are not given in table 12.

TABLE 11.—*Characteristics of soil groups in Unified Soil Classification System* [1]

Major divisions	Group symbol	Soil description	Value as foundation material [2]	Value as base course directly under bituminous pavement	Value for embankments	Compaction characteristics and recommended equipment	Approximate range in A.A.S.H.O. maximum dry density [3]	Field (in-place) CBR	Subgrade modulus, k	Drainage characteristics	Comparable groups in A.A.S.H.O. classification
							Lb./cu. ft.		*Lb./sq.in./in.*		
Coarse-grained soils (*less than 50 percent passing No. 200 sieve*):											
	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	Excellent	Good	Very stable; use in pervious shells of dikes and dams.	Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	125–135	60–80	300+	Excellent	A-1.
	GP	Poorly graded gravels and gravel-sand mixtures; little or no fines.	Good to excellent.	Poor to fair.	Reasonably stable; use in pervious shells of dikes and dams.	Same	115–125	25–60	300+	Excellent	A-1.
Gravels and gravelly soils (*more than half of coarse fraction retained on No. 4 sieve*).	GM	Silty gravels and gravel-sand-silt mixtures.	Good	Poor to good.	Reasonably stable; not particularly suited to shells, but may be used for impervious cores or blankets.	Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	120–135	20–80	200–300+	Fair to practically impervious.	A-1 or A-2.
	GC	Clayey gravels and gravel-sand-clay mixtures.	Good	Poor	Fairly stable; may be used for impervious core.	Fair, use pneumatic-tire or sheepsfoot roller.	115–130	20–40	200–300	Poor to practically impervious.	A-2.
	SW	Well-graded sands and gravelly sands; little or no fines.	Good	Poor	Very stable; may be used in pervious sections; slope protection required.	Good; use crawler-type tractor or pneumatic-tire roller.	110–130	20–40	200–300	Excellent	A-1.
	SP	Poorly graded sands and gravelly sands; little or no fines.	Fair to good.	Poor to not suitable.	Reasonably stable; may be used in dike section having flat slopes.	Same	100–120	10–25	200–300	Excellent	A-1 or A-3.
Sands and sandy soils (*more than half of coarse fraction passing No. 4 sieve*).	SM	Silty sands and sand-silt mixtures.	Fair to good.	Same	Fairly stable; not particularly suited to shells, but may be used for impervious cores or dikes.	Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	110–125	10–40	200–300	Fair to practically impervious.	A-1, A-2, or A-4.
	SC	Clayey sands and sand-clay mixtures.	Fair to good.	Not suitable.	Fairly stable; use as impervious core for flood-control structures.	Fair; use pneumatic-tire roller or sheepsfoot roller.	105–125	10–20	200–300	Poor to practically impervious.	A-2, A-4, or A-6.
Fine-grained soils (*more than 50 percent passing No. 200 sieve*):											
	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity.	Fair to poor.	Not suitable.	Poor stability; may be used for embankments if properly controlled.	Good to poor; close control of moisture is essential; use pneumatic-tire or sheepsfoot roller.	95–120	5–15	100–200	Fair to poor	A-4, A-5, or A-6.
Silts and clays (*liquid limit of 50 or less*).	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays.	Fair to poor.	Not suitable.	Stable; use in impervious cores and blankets.	Fair to good; use pneumatic-tire or sheepsfoot roller.	95–120	5–15	100–200	Practically impervious.	A-4, A-6, or A-7.
	OL	Organic silts and organic clays having low plasticity.	Poor	Not suitable.	Not suitable for embankments.	Fair to poor; use sheepsfoot roller.[4]	80–100	4–8	100–200	Poor	A-4, A-5, A-6, or A-7.
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, and elastic silts.	Poor	Not suitable.	Poor stability; use in core of hydraulic fill dam; not desirable in rolled fill construction.	Poor to very poor; use sheepsfoot roller.[4]	70–95	4–8	100–200	Fair to poor	A-5 or A-7.
Silts and clays (*liquid limit greater than 50*).	CH	Inorganic clays having high plasticity and fat clays.	Poor to very poor.	Not suitable.	Fair stability on flat slopes; use in thin cores, blankets, and dike sections of dams.	Fair to poor; use sheepsfoot roller.[4]	75–105	3–5	50–100	Practically impervious.	A-7.
	OH	Organic clays having medium to high plasticity and organic silts.	Same	Not suitable.	Not suitable for embankments.	Poor to very poor; use sheepsfoot roller.[4]	65–100	3–5	50–100	Practically impervious.	A-5 or A-7.
Highly organic soils	Pt	Peat and other highly organic soils.	Not suitable.	Not suitable.	Not used in embankments, dams, or subgrades for pavements.					Fair to poor	None.

[1] Based on information in The Unified Soil Classification System (7). Ratings and ranges in test values are for guidance only. Design should be based on field survey and test of samples from construction site.

[2] Ratings are for subgrade and subbases for flexible pavement.

[3] Determined in accordance with test designation: T 99–49, A.A.S.H.O.

[4] Pneumatic-tire rollers may be advisable, particularly when moisture content is higher than optimum.

TABLE 12.—*Highway soil engineering*

UPLAND SOILS

Soil series, type or phase	Brief description of ground condition and soil material	Dominant slope	Estimated soil classification		Adaptability to winter grading [1]
			A.A.S.H.O.	Unified	
		Percent			
Apison	1 to 3½ feet of well-drained silty clay loam or	2–10	A–6 or A–7	CL, CH, or	Not adapted

UPLAND SOILS

Depth to seasonally high water table	Recommended location of grade line with respect to ground surface	Suitability as source of		Remarks
		Topsoil [2]	Sand-gravel	
Feet				
20+	Influenced by bedrock	Good	Not suitable.	
20+	Anywhere	Fair	Poor to fair	Suitability as source of topsoil depends on stoniness. Requires addition of sand to meet specifications for base course for primary roads; may be suitable for surfacing county roads.
1–2 (Perched)	Influenced by bedrock	Not suitable	Not suitable	Seepage in cut sections; artificial drainage may be required.
1–2 (Perched)	Influenced by bedrock	Good	Not suitable	Same.
20+	Influenced by bedrock in deep cuts.	Good to fair	Not suitable	Soil is only fair source of topsoil when some of surface material has been removed by erosion.
0–2	2 feet minimum above ground surface.	Not suitable	Not suitable.	
20+	Influenced by bedrock in deep cuts.	Fair	Poor	Suitability as source of topsoil depends on stoniness. Requires addition of sand to meet specifications for base course for primary roads or for use as surfacing on county roads.
20+	Influenced by bedrock	Good	Limited	Weathered conglomerate may be source of base course material, and weathered sandstone may be suitable for blending with coarser grained material to produce base course material; blasting may be required.
20+	Influenced by bedrock	Good	Limited	Same.
1–2 (Perched)	Influenced by bedrock	Fair	Not suitable	Seepage in cut sections; artificial drainage may be required.
0–1 (Perched)	2 feet minimum above ground surface.	Good	Not suitable	Depressed areas can usually be drained by use of open ditches.
20+	Influenced by bedrock	Good	Limited	Weathered conglomerate may be source of base course material, and weathered sandstone may be suitable for blending with coarser grained material to produce base course material; blasting may be required.
20+	Influenced by bedrock	Poor	Not suitable.	
20+	Influenced by bedrock	Not suitable	Not suitable.	
20+	Influenced by bedrock	Poor	Not suitable.	
10+	Influenced by bedrock	Fair	Not suitable.	
20+	Influenced by bedrock	Not suitable	Not suitable.	
20+	Influenced by bedrock	Not suitable	Not suitable.	
20+	Influenced by bedrock	Poor	Not suitable.	

COLLUVIAL SOILS

0–2 (Perched)	2 feet minimum above ground surface.	Good	Not suitable.	
20+	Influenced by bedrock	Poor to fair	Not suitable.	
20+	Influenced by bedrock	Poor	Not suitable	Suitability as source of topsoil depends on stoniness.
1–2 (Perched)	Influenced by bedrock	Good	Not suitable.	

COLLUVIAL SOILS (cont.)

Soil series, type or phase	Brief description of ground condition and soil material	Dominant slope	Estimated soil classification		Adaptability to winter grading [1]
			A.A.S.H.O.	Unified	
		Percent			
Greendale	5 to 12 feet of moderately well to well drained cherty silt loam to cherty clay loam derived from chert or cherty limestone, over bedrock; chert fragments range to more than 6 inches in size.	0–6	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Fair
Hermitage	4 to 10 feet of well-drained silty clay loam, silty clay, silt, and clay derived from limestone, over bedrock.	2–12	A–4, A–6, or A–7.	ML, CL, MH, or CH.	Limited
Jefferson	2 to 8 feet of well-drained sandy clay or silty clay derived primarily from sandstone and shale, over bedrock.	2–12	A–6 or A–7	CL, CH, or MH.	Not adapted
Leadvale	2½ to 8 feet of poorly to moderately well drained silty clay to shaly clay derived primarily from shale, over bedrock.	2–12	A–6 or A–7	CL, CH, or MH.	Not adapted
Minvale	4 to 20 feet of well-drained silty clay loam or cherty silty clay loam to clay or cherty clay derived from cherty dolomitic limestone, over bedrock.	2–12	A–2, A–4, A–6, or A–7.	GC, SC, ML, or CL.	Poor to fair
Muse	4 to 10 feet of well to somewhat excessively drained silty clay derived primarily from shale, over bedrock.	2–12	A–6 or A–7	CL, CH, or MH.	Not adapted
Ooltewah	5+ feet of poorly drained silt loam to silty clay derived from limestone, over bedrock.	0–2	A–4, A–6, or A–7.	ML or CL	Not adapted
Pace	4 to 20 feet of moderately well to well drained cherty silt loam to cherty silty clay derived primarily from cherty dolomitic limestone, over bedrock; chert fragments normally smaller than 2 inches.	2–12	A–2, A–4, or A–6.	GC, SC, ML, or CL.	Poor to fair
TERRACE SOILS					
Capshaw	4 to 15 feet of moderately well drained silty clay loam to clay, derived primarily from limestone, but in places from sandstone or shale, over bedrock.	0–5	A–6 or A–7	CL, CH, or MH.	Not adapted
Etowah	4 to 20 feet of well-drained silty clay loam to silty clay, derived primarily from limestone but in places from sandstone or shale, over bedrock.	2–5	A–6 or A–7	CL, CH, or MH.	Limited
Robertsville	Poorly drained silty clay derived primarily from limestone, but in places from sandstone or shale, over bedrock.	0–2	A–6 or A–7	MH or CH	Not adapted
Sequatchie	5+ feet of well-drained loam to silty clay loam, with small gravel or chert and sandstone fragments in places, over bedrock. Derived primarily from sandstone or shale, but in places from limestone.	2–5	A–4 or A–6	ML or CL	Limited
Tupelo	3 to 7 feet of somewhat poorly to poorly drained silty clay or clay derived primarily from clayey limestone, over bedrock.	0–2	A–6 or A–7	CL, CH, or MH.	Not adapted
BOTTOM-LAND SOILS					
Atkins	3+ feet of poorly drained stratified sand, silt, and clay, derived from sandstone and shale, over bedrock.	0–2	A–2, A–4, A–6, or A–7.	SM, SC, ML, or CL.	Not adapted
Dunning	1½ to 2½ feet of poorly drained clay on stratified silty and clayey materials derived from limestone, over bedrock.	0–2	A–4, A–6, or A–7.	ML, CL, MH, or CH.	Not adapted
Ennis	2 to 4 feet moderately well drained silt loam or cherty silt loam on chert, cherty limestone, or cherty dolomite. Depth to bedrock is greater than 4 feet.	0–2	A–2, A–4, or A–6.	GM, ML, or CL.	Limited
Hamblen	2½ to 4 feet of somewhat poorly drained silty clay to loam or sandy loam on stratified sand, silt, and clay derived primarily from sandstone and shale, over bedrock.	0–2	A–4 or A–6 on A–2, A–4, A–6, or A–7.	ML or CL on SM, SC, ML, or CL.	Not adapted
Huntington	2½ to 4 feet of well-drained silty clay to sandy loam on stratified sand, silt, and clay, derived primarily from limestone. Depth to limestone bedrock is 5 feet or more.	0–2	Same	Same	Limited

See footnotes at end of table.

data and recommendations—Continued

Depth to seasonally high water table	Recommended location of grade line with respect to ground surface	Suitability as source of		Remarks
		Topsoil [2]	Sand-gravel	
COLLUVIAL SOILS (cont.)				
Feet 10+	Influenced by bedrock in deep cuts.	Not suitable	Limited	Too cherty to be used as topsoil. Usually requires addition of sand to meet specifications for base course for primary roads or for use as surfacing on county roads; thickness of deposit may limit suitability.
20+	Influenced by bedrock	Fair	Not suitable.	
20+	Influenced by bedrock	Fair to good	Not suitable.	
0–2 (Perched)	Influenced by bedrock	Fair	Not suitable.	
20+	Influenced by bedrock	Poor	Limited	Material underlying some areas may be made suitable for use in base course of primary roads or surfacing on county roads by the addition of sand.
1–2 (Perched)	Influenced by bedrock	Fair	Not suitable.	
0–1 (Perched)	2 feet minimum above ground surface.	Good	Not suitable.	
10+	Influenced by bedrock	Unsuitable	Limited	Material underlying some areas may be made suitable for use in base course of primary roads or surfacing on county roads by the addition of sand.
TERRACE SOILS				
2–4	4 feet minimum above water table.	Good	Not suitable	Bedrock may be encountered in deep cuts if soil is shallow.
20+	Anywhere	Good	Not suitable	Same.
0–1	4 feet minimum above water table.	Poor	Not suitable.	
10+	Anywhere	Good	Not suitable	Bedrock may be encountered in deep cuts if soil is shallow.
1–2 (Perched)	Anywhere	Poor	Not suitable.	
BOTTOM-LAND SOILS				
0	2 to 4 feet above high water	Poor	Not suitable.	
0	Same	Not suitable	Not suitable.	
1–3	Same	Fair to good	Limited	Cherty materials underlying some areas may be suitable for base course.
0	[illegible]	[illegible]	[illegible]	

BOTTOM-LAND SOILS (cont.)

Soil series, type or phase	Brief description of ground condition and soil material	Dominant slope	Estimated soil classification		Adaptability to winter grading [1]
			A.A.S.H.O.	Unified	
		Percent			
Lindside	2½ to 4 feet of somewhat poorly drained silty clay loam to silt loam on stratified sand, silt, and clay, derived primarily from limestone. Depth to limestone bedrock is 5 feet or more.	0–2	Same	Same	Not adapted
Melvin	2 to 3 feet of poorly drained silty clay loam to sandy loam on stratified sand, silt and clay, derived primarily from limestone. Depth to limestone bedrock is 5 feet or more.	0–2	A–4, A–6, or A–7 on A–2, A–4, A–6, or A–7.	ML, CL, or CH on SM, SC, ML, or CL.	Not adapted
Philo	2 to 3½ feet of somewhat poorly drained silty clay to sandy clay loam on either stratified older alluvium or bedrock; older alluvium is clay to sandy clay, derived from sandstone or shale. Depth to bedrock is 2 to 7 feet.	0–2	A–6 or A–7	CL, CH, or MH.	Not adapted
Pope	3 to 4 feet of well-drained silty clay to sandy loam on stratified sand, silt, and clay, derived from sandstone or shale. Depth to bedrock is less than 7 feet.	0–2	A–4, A–6, or A–7 on A–2, A–4, A–6, or A–7.	ML or CL on SM, SC, ML, or CL.	Limited
Staser	1½ to 2½ feet of well-drained clay loam to loam on stratified sand, silt, and clay, derived primarily from sandstone or shale. Depth to bedrock is 5 feet or more.	0–5	A–4 or A–6 on A–2, A–4, A–6, or A–7.	Same	Limited

[1] The adaptability rating is for the soil material; rock excavation is permitted during the winter.

[2] Rating is for the surface or A-horizon material for use on embankment and cut slopes, and in ditches to promote the growth of vegetation.

data and recommendations—Continued

BOTTOM-LAND SOILS (cont.)

Depth to seasonally high water table	Recommended location of grade line with respect to ground surface	Suitability as source of		Remarks
		Topsoil [2]	Sand-gravel	
Feet				
1–2	Same	Good	Not suitable.	
0–1	Same	Poor	Not suitable.	
1–2	Same	Fair	Not suitable.	
2–3	Same	Good	Not suitable.	
2–3	Same	Good	Not suitable.	

Many of the soils have a perched water table at a slight depth, hence a survey should be made to determine the need for interceptor ditches and underdrains. Seepage in the back slopes of cuts may result in slumping or sliding of the overlying material. A decrease in the bearing capacity of the foundation soil below the pavement, as a result of the perched water table, may cause deterioration of the pavement; this water may be intercepted by the construction of deeper side ditches.

On ridges and mountains the vertical location of roads should be such that a minimum of rock excavation will be required; this may require slight embankment sections in much of the upland. Considerable excavation (sidehill cut) in bedrock is required where the roads traverse the valley walls. The unweathered bedrock will usually require blasting before it can be excavated.

The lower parts of the bottom lands may be flooded each year, and a continuous embankment may be required in order for the roadways constructed in these lowlands to be above the high water level. Suitable materials for use in these embankments may be obtained from the nearby terrace and colluvial soils.

The ratings given for suitability of the soils as sources of topsoil for use on embankment and cut slopes and in ditches of highways, to promote the growth of vegetation, are with respect to De Kalb County. In addition to being fertile, the topsoil material should not contain stones or large gravel particles.

The cherty residuum of Clarksville and Fullerton

quired for laboratory testing, and an adequate soil investigation can be made at minimum cost.

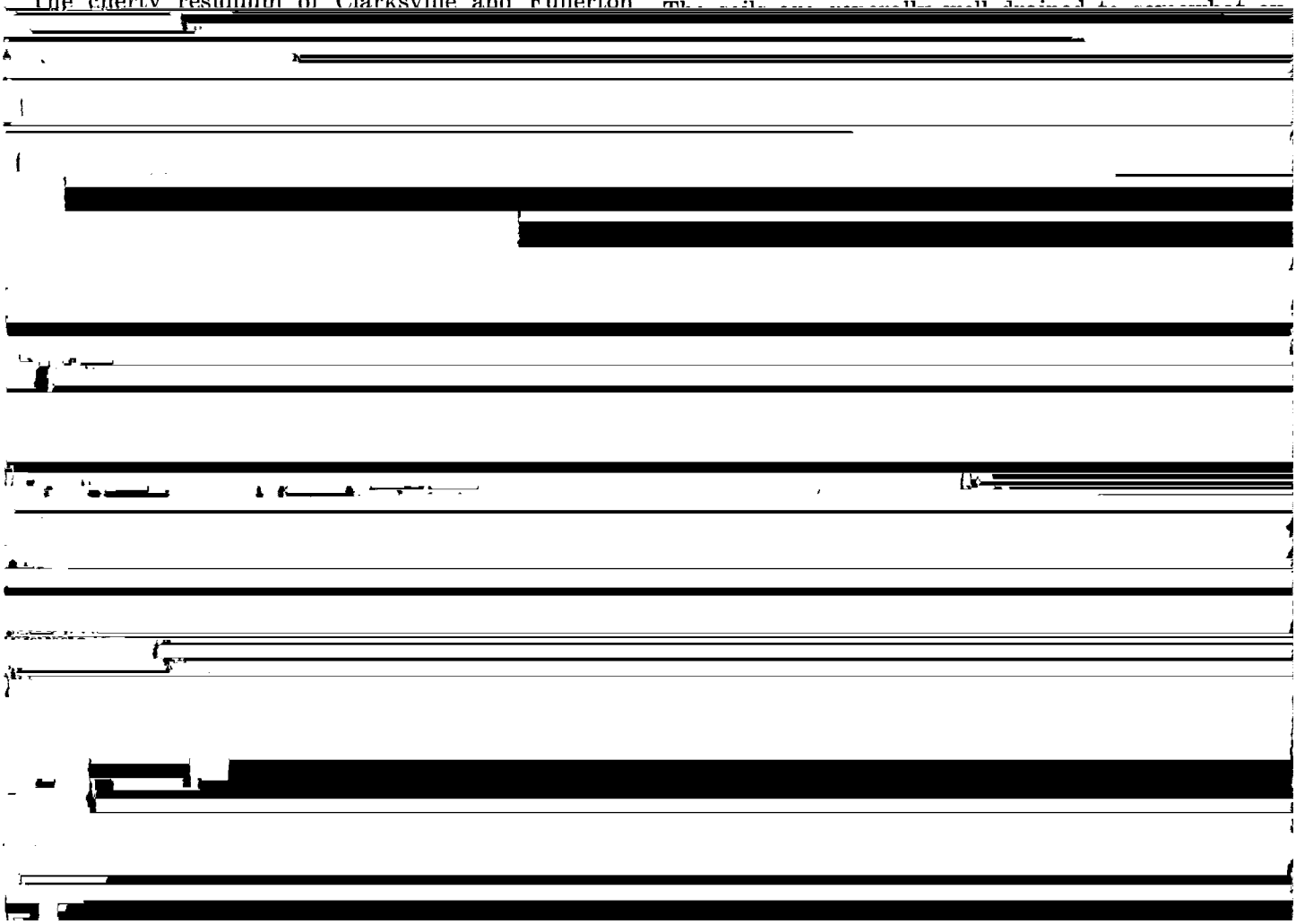
Soil Associations

Soils that occur together in a characteristic pattern make up a soil association. An association may consist of only a few or of many soils. The soils may be similar or may be of many different types. Although closely associated geographically, the soils in an association may differ in their suitability for agricultural use.

The boundaries of the seven soil associations in the county are shown on the colored soil association map in the back of the report. A description of each soil association follows.

Hartsells-Muskingum Association

The Hartsells-Muskingum is the most extensive soil association in De Kalb County. It occupies more than half of the county and occurs on the plateau areas of Sand and Lookout Mountains. The parent rock is mainly sandstone and conglomerate, interbedded in places with acid shale. The surface is predominantly undulating to rolling in all places except the narrow steep strips along the larger drains. Runoff for the extensive smooth areas is medium, but on the narrow steeper slopes along the drains it is rapid to very rapid.



smoother parts of the association and are 1 to 3½ feet deep to partly disintegrated shale. Muskingum and Pottsville soils occupy the few steep slopes along the drains.

This association is much less extensive than the Hartsells-Muskingum association and occurs in rather small widely distributed areas. The dominant soils have a firmer, finer textured subsoil than the Hartsells soils and are somewhat shallower to bedrock. The surface relief, for the most part, is undulating to rolling; a few small areas are hilly. Runoff is medium to rapid, and the soils are moderately well drained to somewhat excessively drained.

Much of this association has been cleared. The remaining forested areas are usually on the stronger slopes. The soils of this association, like those of the Hartsells-Muskingum, are low in fertility and are acid.

Crossville-Muskingum-Hartsells Association

The Crossville-Muskingum-Hartsells association consists chiefly of Crossville soils. It also includes small areas of Hartsells soils and narrow strips of hilly and steep Muskingum soils along the larger drains. Except on the Muskingum soils, the slopes range from undulating to rolling. The Crossville soils are brown, permeable, and somewhat more fertile than the Hartsells soils. On an average they are shallower to bedrock. Their internal drainage is somewhat poorer or less adequate than that of the Hartsells soils, and seepage is common.

This fairly large association is much less extensive than the Hartsells-Muskingum and the Apison-Pottsville-Muskingum associations. Much of the acreage is on Lookout Mountain, but a few small areas are on Sand Mountain.

Probably more than half of the total area of this

Clarksville-Fullerton-Litz Association

The Clarksville-Fullerton-Litz is the largest soil association in the limestone valleys. It consists chiefly of hilly and steep chert ridges, with narrow strips of shale on the slopes. The shale is exposed on the northwestern slope of the eastern chert ridge and on the southeastern slope of the western chert ridge. Clarksville and Fullerton soils dominate on the chert ridges, and Litz soils on the shale slopes.

The Fullerton and Clarksville soils are very deep to bedrock, but they are very cherty in most places. The chertiness, together with the strong slope and low fertility, makes these soils poorly suited to crops, except on the smoother parts. The Litz soils, chiefly because of their strong slopes and shallow depth to bedrock, are not well suited to tillage. If fertilizer is applied in large amounts, the tillable areas are suited to cotton, corn, and certain grasses and legumes for hay and for pasture. The only areas suited to intensive cultivation are the narrow strips of the less cherty soils along the drainageways. A large part of the association is in forest.

Colbert-Tupelo-Etowah Association

The Colbert-Tupelo-Etowah association occupies the nearly level to undulating floor of the limestone valley that lies between the two chert ridges. In general, this area is a strip from ⅓ to 1 mile wide that extends from the southern boundary of the county northeastward along Big Wills Creek to the Alabama-Georgia State line east of Sulphur Springs.

Many kinds of soils make up this association, but in general internal drainage is somewhat slow in all of them. All the soils are rather fine textured, and the surface soil in most places is silt loam, silty clay loam

eroded. Some of the area directly below Lookout Mountain contains rock fragments that interfere with field operations.

This association generally consists of red, moderately deep, friable soils derived from colluvium that sloughed from the adjacent steep slopes. Much of the acreage

Crumb (*See also* Structure, type). Generally soft, small, porous aggregates, tending toward a spherical shape, as in the A_1 horizons of many soils. This variety is closely related to granular structure.

Drainage, soil. The rapidity and extent of the removal of water from the soil, in relation to additions, especially by runoff, by flow through the soil to underground spaces, or by a

Poorly drained: Water is removed so slowly that the soil remains wet for a large part of the time. The water table is commonly at or near the surface during

est dimension; and coarse, commonly more than 15 mm. (about 0.6 in.) along the greatest dimension (*4*).

Nutrient, plant. Any element taken in by a plant, essential to its

[redacted]

Imperfectly or somewhat poorly drained: Water is removed from the soil slowly enough to keep it wet for significant periods, but not all of the time.

Moderately well drained: Water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time.

Well drained: Water is removed from the soil readily, but not rapidly. A well-drained soil has good drainage.

Somewhat excessively drained: Water is removed from the soil rapidly so that only a relatively small part is available to plants. Only a narrow range of crops can be grown on these soils, and yields are usually low without irrigation.

Excessively drained: Water is removed from the soil very rapidly. Excessively drained soils commonly are shallow to bedrock and may be steep, very porous, or both. Enough precipitation commonly is lost from these soils to make them unsuitable for ordinary crop production.

Erosion. The wearing away of the land surface by detachment and transport of soils and rock materials through the action of moving water, wind, and other geological agents. The classification followed in defining, naming, and mapping the erosion is expressed in terms as follows: Slightly eroded, moderately eroded, severely eroded, and gullied land.

SLIGHTLY ERODED: Soil mapped without indicating erosion, as Capshaw silt loam. Such soil may have lost as much as

sue. Essential nutrients include nitrogen, phosphorus, calcium, potassium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and other elements mainly from the soil; and carbon, hydrogen, and oxygen, largely from the air and water.

Parent material. The unconsolidated mass of rock material (or peat) from which the soil profile develops.

Permeable. Easily penetrated, as by water or air.

Productivity, soil. The present capability of a soil to produce a specified plant or sequence of plants under a defined set of management.

Profile, soil. A vertical section of the soil, from the surface into the parent material.

Reaction, soil. (*See* Acidity.)

Relief. Elevations or inequalities of the land surface, the slope gradient, and the pattern of these, considered collectively.

Sand. Rock or mineral fragments having diameters ranging between 0.05 mm. (0.002 in.) and 2.0 mm. (0.08 in.). The term sand is also applied to soils containing 85 percent or more of sand; percentage of silt, plus 1½ times the percentage of clay shall not exceed 15.

Silt. Mineral soil grains ranging from 0.05 mm. (0.002 in.) to 0.002 mm. (0.000079 in.) in diameter.

Soil. Natural body on the surface of the earth characterized by conformable layers resulting from modification or parent material by physical, chemical, and biological forces over periods of time.

Soil separates. The individual size groups of soil particles, as

[redacted]

EXCELLENT: Soils of excellent workability are generally light- to medium-textured, stone-free, and nearly level. They require the minimum of effort for tillage and harvesting, and all kinds of farm machinery can be used on them.

VERY GOOD: Soils having very good workability may have such features as fine texture, small quantities of rock fragments, or somewhat uneven but mild slopes, which makes the use of farm machinery somewhat more difficult than on soils having excellent workability. All common types of farm machinery can be used on them, however.

GOOD: A soil with good workability is suited to the use of all common types of farm machinery, but more effort is required to obtain their greatest efficiency than on soils of very good workability.

FAIR: Soils of fair workability are poorly suited to the use of heavy farm machinery. Normal farming operations are more difficult than on soils of good workability.

POOR: Silty clay or clay soils, hilly soils, or soils that contain enough chert or gravel to interfere seriously with tillage are classified as having poor workability. The use of all types of farm machinery is almost precluded.

VERY POOR: Soils with very poor workability are so steep, cherty, or both, that tillage is generally done with hand implements.

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